COURSE STRUCTURE, 3RD SEMESTER

COURSE STRUCTURE OF 3rd SEMESTER (Computer)

Sl N	Code No	Subject	Study Scheme Contact hours/week			Evaluation Scheme									
						Theory					Practical			Total Marks(Theory+Practical)	Credit
			L	T	P	ESE	Sessional(SS)			Pass(ESE+SS)	Practical Test(PT)#	Practical Assessment(PA)@	Pass(PT+PA)		
							TA	HA	Total(TA+HA)						
1	Co-301	Computer Application and Programming (All branch)	3	0	3	70	10	20	30	33/100	25	25	17/50	150	4
2	Hu-302	Engineering Economics & Accountancy	3			70	10	20	30	33/100				100	3
3	Sc-303	Mathematics-III	3	1		70	10	20	30	33/100				100	3
4	Co-303	Computer Architecture & Organisation	3	1		70	10	20	30	33/100				100	4
5	El -304	Elements of Electrical Engineering	3		3	70	10	20	30	33/100	25	25	17/50	150	4
6	Co-302	Elements of Multimedia	3	1	3	70	10	20	30	33/100	50	50	33/100	200	5
7	Co-310	Professional Practice- I	1		2						25	25	17	50	2
		Total	19	3	11									850	25
			33												

1. Course Title–Computer Application & Programming (All Branches)

1. Course title: Computer Application & Programming

2: Course Code –Co-301

3: Semester- 3rd

4: Aim of the Course :

- To give basic concepts related to organisation of a computer
- To give fundamental terminologies in networking
- To develop simple programs in C.

5: Course Outcome:

On completion of the course students will be able to:

- Explain the basics of a computer hardware and software
- Solve problems related to number systems
- Define basics of Operating System
- Familiarize with networking components
- Write simple C programs

6: Prerequisites for the Course: Have basic idea about a computer and its functions.

7: Teaching Scheme (in hours):

Teaching Scheme			
L	T	P	Total hours per week
3	0	3	6

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	25	25
Pass Marks	33		17	

9: Detailed Course Content:

Unit	Topic/Sub-Topics	Intended Learning Outcome	Hours
1	**Computer Architecture:** Brief history, Charles Babbage Machine, Von Neuman Architecture, block diagram, memory &it's different types, I/O devices, Role of O.S., computer languages, translator software, editor. Data, different types of data, information and its characteristics	1. Define a computer and identify its parts. 2. Define computer memory & describe its different types. 3. Define computer languages & translators. 4. Describe the characteristics of information.	**8**
2	**Number System and codes:** Different number system- decimal, binary, octal, hexadecimal number system, their conversion, 1's and 2's Complement, subtraction using complements. Different codes- ASCII, BCD, Ex-3, Gray. Conversion from Gray to binary and vice-versa, BCD addition.	5. Define decimal, binary, octal & hexadecimal number systems. 6. Convert between different number systems. 7. Define 1's & 2's complements. 8. Subtract using 1's & 2's complements. 9. Describe some different codes.	**8**

Unit	Topic/Sub-Topics	Intended Learning Outcome	Hours
3	**Introduction to Operating System:** Definition, single user and multi-user OS, different function performs by OS, various popular OS like DOS, Windows, UNIX/LINUX. DOS and UNIX commands.	10. Define operating system. 11. Operate different commands of DOS, Windows & UNIX/LINUX.	**5**
4	**Computer Network and the Internet:** Definition, necessity of network, different types of network-LAN, MAN, WAN, network topology, transmission media, different network devices like NIC, hub, bridge, switch, gateway. Introduction to the internet, Internet services, browser, search engine.	12. Define network. 13. Describe different types of network. 14. Define network topology. 15. Describe different network devices. 16. Define internet & describe different internet services. 17. Explain use of different browsers & search engines.	**6**
5	**Introduction to C programming:** Fundamentals of programming-Algorithm & Flowchart, source code and object code,, Basic structure of C programs, Executing a C program, Constants, Variables, and data types. Operators and expression, Input Output function like printf, scanf, getchar, putchar, gets, puts, Decision making and branching using IF..Else, Switch, looping using for, while, and do-while, array.	18. Write algorithm and flow charts for simple programs. 19. Define basic terminology of C language. 20. Write small programusing C language. 21. Write diversified solutions using C language. 22. Differentiate between IF..Else and Switch statement.	**15**
	Internal Assessment		**3**

10: Distribution of Marks:

Unit	Topic	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Computer Architecture	6	5	5	16
2	Number System and codes	4	2	8	14
3	Introduction to Operating System	4	2	4	10
4	Computer Network and the Internet	5	3	6	14
5	Introduction to C programming	6	3	7	16
		25	15	30	70

11: Table of specification :

Unit	Topics (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Computer Architecture	8	19	✓			
2	Number Systems & Codes	8	19	✓		✓	
3	Introduction to Operating Systems	5	12	✓			
4	Computer Network & the Internet	6	15	✓		✓	
5	Introduction to C Programming	15	35	✓		✓	
Total		Σ b=42	100				

K = KnowledgeC =Comprehension A =ApplicationHA =Higher Than Application (Analysis, Synthesis, Evaluation)

$$c = \frac{b}{\Sigma b} * 100$$

Detailed Table of Specifications

Unit	Topics	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Computer Architecture	7			7	5				5	4				4
2	Number Systems & Codes	4			4	2				2	4		4		8

3	**Introduction to Operating Systems**	4			4	2				2	4				4
4	**Computer Network & the Internet**	5			5	3				3	3		4		7
5	**Introduction to C Programming**	5			5	3				3	3		4		7
Total		25			25	15				15	18		12		30

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

10. Intellectual Skills :

- Logical reasoning
- Relating programming concepts in problem solving

11. Motor Skills :

- Learn to use and handle a computer and its peripherals.

List of Lab Exercises :

I. Basic commands for computer system maintenance.

II. Preparation of Documents

Introduction to Word processing, Opening a document, preparing documents, inserting diagrams and tables, Editing document- (a) Character, word and line editing, (b) Margin Setting, Paragraph alignment, (c) Block Operations, (d) Spell Checker, (e) Saving a document, (f) Mailmerge.

III. Information Presentation through Spread Sheet

Application of Spread Sheet, Structure of spreadsheets, Preparing table for simple data and numeric operations, Using formulae and functions in excel operations, Creation of graphs, Pie charts, bar charts.

IV. Preparation of presentation

Creation of electronic slides on any topic, Practice of animation effect, presentation of slides.

V. Programming in C

Editing a C program, defining variables and assigning values to variables Arithmetic and relational operators, arithmetic expressions and their evaluation Practice on in iput/output function like getchar, putchar, gets, puts, scanf, printf etc. Programming exercise on simple if statement, If..else statement, switch statement Programming exercise on looping with do-while, while, for loop and array.

2. Course Title– Engineering Economics and Accountancy (All Branches)

1. Course Title : **ENGINEERING ECONOMICS AND ACCOUNTANCY**
2. Course Code: **Hu – 302**
3. Semester: 3rd

4. Aim of the Course:

   1. To introduce the students to some important economic and accounting terms.

   2. To acquaint the students with some economic laws and with the functions of money, bank etc.

   3. To make the students capable of recording business transaction under double entry system.

   4. To introduce the students about financial statements.

5. Course Outcomes:

On completion of the course on EEA, students will be able to

- CO_1 = Define some important economic and accounting terms.
- CO_2 = explain some basic economic laws.
- CO_3 = Describe overall economic environment.
- CO_4 = explain double entry system of book keeping.
- CO_5 = record business transactions under double entry system of book keeping
- CO_6 = define financial statements.

1. **Teaching Scheme (in hours)**

Lecture	Tutorial	Practical	Total
42 hrs	**3 hrs**	**--**	**45 hrs**

2. **Examination Scheme:**

Theory				Practical				Total Marks
Examination Full Marks	Sessional Full Marks	Total Marks	Pass Marks	Examination		Sessional		
70	30	100	33	--	--	--	--	100

3. Detailed Course Content:

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
Part – A : Engineering Economics				**21 hrs**
1.0	**Introduction to Economics :**	i) Definition of Economics, its utility and scope of study ii) Definition of Engineering Economics ii) Meaning and concepts of Utility, Consumption, Value, Price, Goods and National Income, inflation iii) Wants – Definition and characteristics iv) Wealth & Welfare– Definition, meaning and types	i) explain core economic terms concepts and theories	5
2.0	**Demand and Supply :**	i) Meaning and types of Demand ii) The Law of Demand, its limitations iii) Preparation of Demand Schedule iv) Meaning of Supply ii) The Law of Supply, its limitations iii) Preparation of Supply Schedule	Define the Laws of Demand and Supply	4
3.0	**Production :**	i) Meaning and factors of production ii)Factors determining efficiency of labour iii) Savings, investment and capital formation iv)Meaning of production function	i) Define factors of production ii) Explain formation of capital	5
4.0	**Money:**	i) Meaning of money ii) Types of money iii) Functions of money	i) Understand meaning and functions of money	2

Chapter No.	**Chapter Title**	Content	Intended Learning Outcomes	Duration (in hours)
5.0	**Banking Organisation :**	i) Central Bank – its functions ii) Commercial banks – its functions	i) Distinguish the functions of different banks	3
6.0	Pricing	i) Objectives of pricing policy ii) price determinants iii) Price discrimination	i) explain pricing policy	2
Part – B : Accountancy				**21 hrs**
7.0 (A)	**Introduction to Book-Keeping and Accounting:**	i) Definition & objectives of Book-keeping ii) Need and advantages of Book-keeping iii) Definition of Accounting iv) Difference between Book-keeping and Accounting v) Double Entry System – main features vi) Advantages and disadvantages of Double Entry System	i) Define Double Entry System of Book Keeping ii) State its objectives, features merits and demerits	3
(B)	**Introduction to Computerised Accounting System:**	i) Components of Computerised Accounting Software ii) Need for Computerised Accounting iii) Difference between Manual Accounting and Computerised Accounting	i) Identify components of computerized accounting software	2
8.0	**Transaction:**	i) Definition ii) Meaning of Account iii) Classification of Accounts: - Traditional Approach - Modern Approach iv) Meaning of Debit and Credit v) Rules of Debit and Credit	i) State the meaning and rules of Debit and Credit	2

Chapter No.	**Chapter Title**	Content	Intended Learning Outcomes	Duration (in hours)
9.0	**Journal and Ledger**	i) Meaning Journal ii) Recording of Transactions in Journal iii) Meaning of Ledger iv) Objectives and utility of Ledger v) Posting and balancing of Ledger vi) Distinction between Journal and Ledger vii) Names of different Books of Accounts	i) Record business transactions under double entry system in books of accounts	4
10.0	**Cash Book:**	i) Meaning and importance of Cash Book ii) Characteristics and advantages of Cash Book iii) Discount – Trade Discount and Cash Discount iv) Different types of Cash Book: - Single Column Cash Book - Double Column Cash Book - Triple Column Cash Book v) Bank Reconciliation Statement – Basic idea	i) Differentiate different types of Cash Book ii) Record transactions in Cash Book	4
11.0	**Trial Balance & Errors in Accounting:**	i) Meaning and objects of Trial Balance ii) Main features and advantages of Trial Balance iii) Preparation of Trial Balance iv) Types of errors in Accounting	i) Explain meaning and features of Trial balance	3

Chapter No.	**Chapter Title**	Content	Intended Learning Outcomes	Duration (in hours)
12.0	**Components of Final Accounts:**	i) Meaning and objectives of Trading Account ii) Contents of Trading Account iii) Meaning and objectives of Profit and Loss Account iv) Contents of Profit and Loss Account v) Meaning of depreciation, revenue expenditure and capital expenditure vi) Contents of Balance Sheet	i) Identify different components of Financial Statements	3
	Class Test			3 hrs
	Total			**45 hrs**

9 . TABLE OF SPECIFICATIONS for Engineering Economics & Accountancy

Sl. No	**Topic** (a)	**Time allotted in hours (b)**	**Percentage Weightage (c)**	Knowledge	Comprehension	**Application**	**HA**
1	Introduction to Economics	5	12	5	3	0	0
2	Demand & Supply	4	9	2	4	0	0
3	Production	5	12	6	2	0	0
4	Money	2	5	4	0	0	0
5	Banking Organisation	3	7	3	2	0	0
6	Pricing	2	5	2	2	0	0

Sl. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	Knowledge	Compre-hension	Application	HA
7	(A) Introduction to Book-Keeping	3	7	5	0	0	0
	(B) Introduction to Computerised Accounting System	2	5	3	0	0	0
8	Transaction	2	5	2	1	0	0
9	Journal & Ledger	4	9.5	2	2	3	0
10	Cash Book	4	9.5	0	5	2	0
11	Trial Balance & Errors in Accy	3	7	5	0	0	0
12	Components of Final Accounts	3	7	2	3	0	0
Total		**42hrs**	**100**	**41**	**24**	**5**	**0**

K = Knowledge C = Comprehension A = Application

A = Higher than Application (Analysis, Synthesis, Evaluation)

$$\mathbf{C}=\frac{b}{\sum b}\times 100$$

10 Distribution of Marks:

DETAILED TABLE OF SPECIFICATIONS FOR EEA

Sl. No	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE					Grand Total
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T	
1	Introduc	3	1	0	4	2	2	0	0	4	0	0	0	0	0	8
2	Demand &Suppl	0	0	0	0	0	0	0	0	0	2	4	0	0	6	6
3	Production	1	0	0	1	2	0	0	0	2	3	2	0	0	5	8
4	Money	2	0	0	2	2	0	0	0	2	0	0	0	0	0	4
5	Banking Organis	1	0	0	1	0	0	0	0	0	2	2	0	0	4	5
6	Pricing	2	2	0	4	0	0	0	0	0	0	0	0	0	0	4
7	Introdu to B K	2	0	0	2	3	0	0	0	3	0	0	0	0	0	5
	Introduc to Comput	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3
8	Transact	2	0	0	2	0	1	0	0	1	0	0	0	0	0	3
9	Journal & Ledge	1	0	0	1	0	0	0	0	0	1	2	3	0	6	7
10	Cash Book	0	2	0	2	0	0	0	0	0	0	3	2	0	5	7
11	Trial Balance	3	0	0	3	2	0	0	0	2	0	0	0	0	0	5
12	Componts F/Ac	0	0	0	0	0	0	0	0	0	2	3	0	0	5	5
	Total	20	5	0	25	11	3	0	0	14	10	16	5	0	31	70

K = Knowledge C = Comprehension A = Application

HA = Higher Than Application**Higher than Application (Analysis, Synthesis, Evaluation)**

T = Total

11 Suggested implementation Strategies: Modified syllabus may be implemented with effect from July, 2018 (Starting with the present batch (2018) of 2nd Semester students)

12 **Suggested learning Resource**:

a. Book list

Sl. No.	Title of Book	Name of Author(s)	Publisher
1	Introductory Micro Economics	Sandeep Garg	DhanpatRai Publication Pvt. Ltd. New Delhi
2	Introductory Macro Economics	Sandeep Garg	DhanpatRai Publication Pvt. Ltd. New Delhi
3	Theory and Practice of Accountancy	B. B. Dam R. A. Sarda R. Barman B. Kalita	Capital Publishing Company, Guwahati – 5
4	Book-Keeping & Accountancy	Juneja, Chawla &Saksena	Kalyani Publisher, New Delhi - 110002
5	Tally. ERP 9 For Beginners	Tally Solutions Pvt. Ltd.	Sahaj Enterprises, Bangalore
6			
7			
8			

b. List of Journals

c. Manuals

d. Others

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3 Course Title– Mathematics-III

1.Course Title: Mathematics – III

2.Course Code : Sc – 303

3.Semester : Third Semester

4.Aim of the course:

- To learn about derivatives of functions having two or more variables.
- To learn about formation and solution of equations involving differential co-efficients.
- To learn how to collect, compile and tabulate similar or different types of large data and to draw valid conclusions from them.
- To learn the use of matrices for solving simultaneous equations.
- To learn method of solving two variable linear programming models by the graphical solution.

5. Course Outcome:

On completion of the course, students will be able to

- Recognize and differentiate functions having two or more variables.
- Form and solve first and higher order ordinary differential equations having differential coefficients.
- Calculate the measures of central tendency and measures of dispersion from statistical data.
- Determine the correlation co-efficient of bivariate distribution.
- Calculate the probability of occurrences of events under different conditions.
- Solve simultaneous equations using matrices and also solve two variable linear programming models by the graphical solution method.

6. Teaching scheme(in hours):

Teaching scheme(in hours)		
Lectures	**Tutorial**	**Total (per week)**
3	**1**	**4**

7. Examination Scheme:

Theory			Total Marks
ESE Full Marks	**Sessional Full Marks**	**Pass Marks (ESE+Sessional)**	**100**
70	**30**	**33**	

8.Detailed Course Content:

Chapter No.	Chapter Title	Contents	**Intended learning outcomes**	**hours**
		GROUP-A: DIFFERENTIAL CALCULUS Hours: 2 Marks: 5		
A1	Partial differentiation	1.1. Function of two or more variables, Definition and meaning of partial derivatives (first order).	Understand functions having two or more variables.	2
		GROUP – B: DIFFERENTIAL EQUATION Hours: 21 Marks: 30		
B 1	Differential Equation	1.1. Definition, classification, order and degree of a Differential Equation. 1.2. Formation of Ordinary Differential Equations.	Recognize and form differential equations.	3
B 2	Ordinary differential equations of first order and first degree	2.1. Separation of variables. 2.2. Homogeneous equations. 2.3 Equations reducible to homogeneous form. 2.4. Exact equations. 2.5. Linear equations. 2.6. Bernoulli's equations. 2.7. Application of Differential Equations[Laws of voltage ,current related to EC,RC,LRC]	Solution of different types of first order and first degree ordinary differential equations and their application in solving different types of circuit related problems.	7
B 3	Differential Equations of first order and higher degree	3.1. Left hand side resolved into factors, 3.2.Equations solvable for x, 3.3. Equations solvable for y, 3.4. Clairaut's equations.	Solution of different types of first order and higher degree ordinary differential equations.	4

B 4	Differential Equations of second order	4.1. Differential Equations of second order with constant co-efficient and right hand side zero. 4.1.1. Operator D, Auxiliary equation. 4.1.2. Rules for real and equal, real and unequal and complex roots. Complete solution. 4.2. Differential Equations of second order with constant co-efficient and right hand side a simple function of x. [Exponential , Trigonometric and algebraic function].	To know about Complementary function, particular integral, General solution, particular solution, completesolution of different types of second order differential equations.	7
		GROUP – C: STATISTICS AND PROBABILITY Hours: 13 Marks: 18		
C 1	Measures of Central Tendency	Mean, Median, Mode.	Basic measures of central tendency	3
C 2	Measures of Dispersion	2.1. Range, Quartile Deviation. 2.2. Mean Deviation (from mean, median, mode). 2.3. Standard Deviation, Variance, Co-efficient of variation.	Different types of measures of dispersion	5
C 3	Correlation	3.1. Definition of Bivariate distribution, scatter diagram. 3.2. Determination of Karl-Pearson's co-efficient of Correlation.	Correlation in bivariate distribution	2
C 4	Probability	4.1.Classical definition of probability 4.2. Addition and multiplication laws, related examples (simple cases).	Definition and uses of probability.	3

		GROUP – D: Graphics, Matrix, Linear Programming problems. Hours: 9 Marks: 17		
D1	Graphics	1.1. Graphs of Trigonometric functions.	Tracing of curves (trigonometric)	2
D2	Matrix	2.1. Transpose of a matrix, 2.2. Adjoint of a square matrix 2.3. Inverse of a matrix 2.4. Solution of Simultaneous Linear equations. 2.5. Characteristic Equations.	1. Use of matrices for solving simultaneous equations. 2. Computation of determinants and eigenvalues of a matrix.	4
D3	Linear Programming Problems(Basics)	3.1. Introduction of system of Linear Inequations involving two variable and graphical solution of the system. 3.2. Mathematical formulation of LPP (two variables). 3.3.Unique optimal feasible solution of LPP with two variables by graphical method.[Infinite no. of solutions, unbounded solutions and no solution cases may be discussed but not for the examination point of view)	Method of solving two variable linear programming models by the graphical solution procedure.	3

9. Distribution of Marks:

Chapter No.	**Chapter Title**	**Type of Question**			**Total Marks**
		Objective Type (compulsory)	**Short questions**	**Descriptive questions**	
A1	**Partial Differentiation**		**2**	**3**	**70**
B1	**Differential Equation**	**1+1+1=3**	**2**		
B2	**Diff. Equation of first ord. first degree**	**1+1+1+1=4**	**2**	**3**	

B3	**Diff. Equation of first ord. higher degree**	**1+1+1=3**	**2**	**3**	
B4	**Diff. Equation of second order**	**1+1+1=3**	**2**	**3**	
C1	**Measures of Central Tendency**	**1+1=2**	**2**		
C2	**Measures of Dispersion**	**1+1=2**	**2**	**3**	
C3	**Correlation**			**3**	
C4	**Probability**	**1+1=2**	**2**		
D1	**Graphics**	**1+1=2**		**3**	
D2	**Matrix**	**1+1=2**	**2**	**3**	
D3	**LPP**	**2**		**3**	
		25	**18**	**27**	**70**

10. Suggested implementation strategies: The syllabus can be completed by taking regular classes along with tutorial classes. Audio-Visual aids also can be used.

10. Suggested Learning Resources:

1. Applied Mathematics (vol. I&II) by R . D. Sharma

2. Engineering Mathematics by H .K. Das

3. Mathematics for Polytechnics by S.P.Deshpande.

4. An Introduction to polytechnic mathematics Vol-II byParbin Ahmed, Ajanta Choudhury, Geetali Das .

Annexure-I

TABLE OF SPECIFICATIONS FOR THEORY

Sr. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	**DIFFERENTIAL CALCULUS**	2	4.4	2	0	3	
2	**DIFFERENTIAL EQUATION**	21	46.7	9	16	5	
3	**STATISTICS AND PROBABILITY**	13	28.9	4	6	8	
4	**GRAPHICS, MATRIX, LPP**	9	20	4	7	6	
Total		Σ b=45	100				

K = Knowledge C = Comprehension A = Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation) . $c = \frac{b}{\sum b} \times 100$

DETAILED TABLE OF SPECIFICATIONS FOR THEORY

Sr. No	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	**DIFFERENTIAL CALCULUS**					**2**				**2**			**3**		**3**
2	**DIFFERENTIAL EQUATION**	**7**	**6**		**13**	**2**	**4**	**2**		**8**		**6**	**3**		**9**

3	**STATISTICS AND PROBABILITY**	**4**	**2**		**6**		**4**	**2**		**6**			**6**		**6**
4	**GRAPHICS,MATRIX,LPP**	**4**	**2**		**6**			**2**		**2**		**3**	**3+3**		**9**

K = Knowledge, C= Comprehension, A = Application, HA = Higher Than Application, T=Total

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4. Course Title: Computer Architecture and Organisation

1: Course Title–Computer Architecture and Organisation

2: Course Code –CO-303

3: Semester- 3rd

4: Aim of the Course:

- To give basic knowledge about design and organization of a computer.
- To give knowledge about the architecture of a computer.
- To know about memory and data transfer schemes.

5: Course Outcome:

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

- Explain the operation of electronic logic elements
- Describe the organisation of a computer system in terms of its main components
- Explain different computer architectures
- Define I/O devices and input/output mechanisms
- Analyse different types of memory

6: Pre-requisite of the Course: Students must have fundamental idea about the various units of a computer and their function.

7: Teaching Scheme:

Teaching Scheme			
L	T	P	Total Hours per week
3	1	-	3

8: Examination Scheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	-	-
Pass Marks	33		-	-

9: Detailed Course Content:

Unit	Topics/ Sub-topics	Intended Learning Outcome	Hours
1	**Introduction to Computer Architecture** Stored program concept — Von Neumann architecture (definition only) , Functional units, Bus structure, brief introduction to logic gates, flip-flop, encoder/decoder, multiplexer, half adder/full adder	1. Define a computer and identify its parts. 2. Define and explain computer bus architecture . 3. Define various logic gates and combinational circuits .	**5**
2	**Number Representation** Signed numbers, Fixed point and floating point representation, Complements, various Arithmetic operation (with signed magnitude & floating point numbers), Booth's algorithm	4. Define various number system like decimal, binary, octal & hexadecimal number systems. 5. Conversion from one number system to another number system 6. Define 1's & 2's complements. 7. Subtract using 1's & 2's complements. 8. Describe working of Booth's algorithm.	**6**
3	**Basic Computer Organisation and Design** Instruction codes, Computer registers, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Complete computer description, Design of Basic computer, design of Accumulator Unit.	9. Define computer codes and instructions . 10. Define various I/O and concept of interrupt . 11. Design a computer and Accumulator unit .	**7**

4	**Central Processing Unit** Component of ALU(in block diagram only), General Register organisation, Stack organisation, Instruction format, Different types of Instructions, addressing modes; Hardware control unit- its different functions, Microprogrammed control unit – control memory, micro program example, design of control unit.	12. Define the various components of ALU. 13. Explain the difference between register and stack organisation of CPU design . 14. Define various instruction formats and addressing modes. 15. Explain the difference between Hardwired and Micro programmed control unit .	**10**
5	**Memory Organisation** Concept of bits, bytes and words, storage of numbers and characters, Memory hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory	16. Define bit, byte and word. 17. Explain the memory hierarchy . 18. Define the various types of memory used in a computer system. 19. Explain cache memory and virtual memory .	**7**
6	**Input-Output Organisation** Various I/O devices, Input-output interface, Asynchronous Data Transfer, Mode of Transfer, Priority interrupt, DMA, Input-output processor	20. Define various modes of data transfer. **21.** Explain the concept of Interrupt and DMA.	**7**
	Internal Assessment		**3**

10: Distribution of Marks:

Unit	Topic	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	**Introduction to Computer Architecture**	**2**	**-**	**5**	**7**

2	**Number Representation**	**3**	**-**	**5**	**8**
3	**Basic Computer Organisation and Design**	**6**	**6**	**5**	**17**
4	**Central Processing Unit**	**8**	**7**	**5**	**20**
5	**Memory Organisation**	**3**	**2**	**5**	**10**
6	**Input-Output Organisation**	**3**	**-**	**5**	**8**
		25	**15**	**30**	**70**

11: Table of Specification:

Unit	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	**Introduction to Computer Architecture**	5	11	✓	✓		
2	**Number Representation**	6	14	✓	✓	✓	
3	**Basic Computer Organisation and Design**	7	17	✓	✓		
4	**Central Processing Unit**	10	24	✓	✓	✓	
5	**Memory Organisation**	7	17	✓	✓	✓	
6	**Input-Output Organisation**	7	17	✓	✓		
Total		Σ b=42	100				

K = Knowledge C = Comprehension A =Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation)

$$c = \frac{b}{\Sigma b} * 100$$

Unit	Topic	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	**Introduction to Computer Architecture**	1	1		2							5			5
2	**Number Representation**	2	1		3								5		5
3	**Basic Computer Organisation and Design**	3	3		6	3	3			6		5			5
4	**Central Processing Unit**	5	3		8	4	3			7			5		5
5	**Memory Organisation**	1	2		3		2			2			5		5
6	**Input-Output Organisation**	2	1		3							5			5

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

12: Suggested Implementation Strategies:

13: Suggested Learning Resources:

1. Computer System Architecture – by Mano ,PHI
2. Computer Organisation& Architecture – by Stallings, PHI
3. Computer Organisation – by Carl Hamacher, ZvonkoVranesic and SafwatZaky, MGH

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5. Course Title– Elements of Electrical Engineering

1. Course Title: Elements of Electrical Engineering

2. Course Code: El - 304

3. Semester: 3rd

4. Rationale of the Subject:

Technology integration is the main characteristic of present engineering development. Now a day, it is necessary to possess basic knowledge of various engineering discipline. The main objective of this subject is to enhance the knowledge and skill level in inter disciplinary area. This course is designed to impart basic knowledge of Electrical Engineering to the students of other disciplines like Civil, Mechanical etc.

5. Aim:

1. To impart basic knowledge of electrical engineering and preliminary idea of DC machine and transformer to the student of branches other than electrical.

2. To enhance the knowledge and skill level of electrical engineering in interdisciplinary area.

6. Objective:

The student will be able to

1. Know circuits with series and parallel resistances, power, energy.

2. Know AC wave form and its various quantities.

3. Interpret the response of R, L, C to AC supply.

4. Know calculation of various parameters of AC series circuit.

5. Know construction, working principle and use of DC machine, transformer.

6(a) COURSE OUTCOMES:-

On successful completion of the course the student will be able to –

CO 1: Define conductor, insulator, current, voltage. Understand Ohm's law, work, power, energy and solve numerical problem.

CO 2: Explain construction, working principle, application, starting and operation of DC generator and motor.

CO 3: Develop emf equation of single phase ac system, analyze R, L, C, R-L, R-C and R-L-C circuit and know the use of j operator.

CO 4: Understand the construction and working principle of transformer.

CO 5: Know construction, working principle and starting of induction motor.

7. Pre-Requisite:

1. Resistance, inductance, capacitance.
2. Simple differential calculus & integral calculus, matrix.

8. Teaching Scheme (in hours per week):

Lecture	Tutorial	Practical	Total
3hrs		3hrs	6hrs/week

9. Examination Scheme:

Theory Theory			Pass marks (ESE+SS)	Practical		Pass marks(PT+PA)	Total marks (Th+Pr)	Credit
	Sessional(SS)			PT	PA			
ESE	TA	HA	33/100	25	25	17/50	150	4
70	10	20						

10. Detailed Course Content:

Chapter No	Chapter Title	Content	Duration (in hours)
1.0	Introduction	1.1 Conductor and Insulator --- Type, Properties and Uses 1.2 Definitions – Current, Voltage, Resistance	1
2.0	Work, Power, Energy and DC Circuit	2.1 Work, Power, Energy – definitions and units, relations, simple problems 2.2 Resistance and resistivity, Conductance and conductivity, Factors on which resistance depends, Effect of temperature on resistance 2.3 Ohm's law, resistance in series, Voltage division rule, Resistance in parallel, Current division rule, Simple problems 2.4 Network terminology – Circuit, parameter, Linear circuit, Non-linear circuit, Bilateral circuit, Unilateral circuit, Electric network, Active and passive element, Active and passive network, Node, Junction, Branch, Loop, Mesh. 2.5 Kirchhoff's point law, Voltage law and problems	9
3.0	D. C. Generator	3.1 Faraday's laws of electromagnetic induction 3.2 Fleming's right hand rule 3.2 Principle of D. C. Generator, Construction, types, Emf equation, Uses and simple problems	5
4.0	D. C. Motor	4.1 Lenz's law 4.2 Fleming's left hand rule 4.2 Principle of D. C. motor, Construction, types, Back Emf, Uses and simple problems	5
5.0	A.C. Fundamentals	5.1 Definitions, Equations, Cycle, Time period, Frequency, Amplitude, Phase, Phase difference, RMS value, Average value, Maximum values, form factor, Crest factor, Simple problem	3
6.0	A.C. Series Circuit	6.1 Definitions – Inductance, Inductive reactance, Capacitance, Capacitive reactance, impedance 6.2 A. C. through pure resistance, pure inductance and pure capacitance 6.3 A. C. through R—L, R—C and R—L – C seriescircuit and their problems 6.4 Resonance and problems	8
7.0	Phasor Algebra	7.1 J operator 7.2 Rectangular, polar and trigonometrical form of phasor. 7.3 Addition, subtraction, multiplication and division of phasor	2

8.0	Transformer	8.1 Working principle, Construction, types, Emf equation, Transformation ratio, Ideal transformer, their problems 8.2 Losses of transformer, Rating of transformer 8.3 C. T. and P.T., Auto transformer,	5
9.0	Induction Motor	9.1 3 phase induction motor – Principle, Construction, Uses, Synchronous speed, full load speed, Slip, Percentage of speed	4
CLASS TEST			3

11. TABLE OF SPECIFICATION FOR THEORY

Sl no	Topics (a)	Time allotted in Hrs (b)	Percentage Weightage (c)	Modified % Weightage (d)	K	C	A	HA
1	Introduction	1	3	3	5		0	
2	Work ,Power , Energy and DC circuit	9	21	21	6	1	4	
3	D.C generator	5	12	12	3	1	5	
4	D.C motor	5	12	12	3	0	7	
5	A.C fundamentals	3	6	6	5	1	4	
6	A.C Series circuit	8	20	20	7	2	4	
7	Phasor Algebra	2	4	4	3		0	
8	Transformer	5	12	12	2		4	
9	Induction motor	4	10	10	1		2	
	Total	42	100	100	35	5	30	

12. DETAILED TABLE OF SPECIFICATIONS FOR THEORY EXAM

Sl no.	Topics	Objective type				Short answer type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Introduction	1			1	1					3				3
2	Work, Power, Energy and D.C circuit	2	1	2	5			2		2	4				4
3	D.C generator	1	1		2	2		2		2			3		3
4	D.C motor	1		1	2	2		2		2			4		4
5	A.C fundamental	2	1		3			2		2	3		2		5
6	A.C Series circuit	1	2		3	2		2		2	4		2		6
7	Phasor algebra	1			1						2				2
8	Transformer	2			2								4		4
9	Induction motor	1			1								2		2

13. Suggested Implementation Strategies:

This is a fundamental subject. It is necessary to handle the subject carefully so that students can develop clear understanding of principles and concepts and develop skill in their application in solving related problems. Teacher may give emphasis on laboratory experiments and give lot of home assignments.

14. Suggested Learning Resources:

Book List: 1.Fundamentals of Electrical Engineering by Tarlok Singh, S. K. Kataria& Sons,

2. Electrical Technology Vol.-I & Vol.-II by B. L. Thereja& A. K. Thereja, S. Chand & Co.

3. Basic Electrical Engineering by V. K. Mehta &Rohit Mehta, S. Chand & Co.

4. Fundamentals of Electrical & Electronics Engineering by S. Ghosh,PHI

5. Electrical Technology Vol.-I by J. B. Gupta, S. K. Kataria& Sons

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5. Course Title :- Element of Electrical Engineering (Practical)

3rd Semester

CODE No. El – 304P

Practical: Full Marks: 50, Test/viva =25 Sessional (TA+HA) Marks: 25,

Pass Marks: 17/50

Skills to be developed

a)Intellectual Skills:-

1. Skill of analyzing results.
2. Skill of identification of instruments.

b) Motor Skill:-

1. Skill of connecting the instruments/machines properly.
2. Skill of taking the reading of the instrument properly.
3. Skill of drawing phasor diagram and graph.

List of Practical

1. To find the following for a filament lamp
   a) Variation of resistance with voltage
   b) Variation of power with voltage
2. Verification of Ohm's law.
3. Verification of Kirchhoff's laws.
4. Testing of fuse and find out the fusing constant.
5. To find out the voltage-current relationship in an R-L series AC circuit to determine power factor of the circuit.
6. To find out the voltage-current relationship in an R-C series AC circuit to determine power factor of the circuit.
7. To find out the voltage-current relationship in an R-L-C series AC circuit to determine power factor of the circuit.
8. Study of two point starter and DC series motor & starting of DC series motor.
9. Study of three point starter and DC shunt motor & starting of DC shunt motor.
10. Find the transformation ratio of single phase transformer.

Reference Book:

Lab manual on basic Electrical Engineering and Electrical MeasurementBy S K Bhattacharjee, K M Rastogy

Lab Course in Electrical Engineering by S G Tarnekar, P K Kharbandha

A Text Book of Practical in Electrical Engineering by Dr. N. K. Jain

6. Course Title: Elements of Multimedia

1. Course Title - Elements Of Multimedia

2:Course Code – CO- 302

3: Semester- 3rd

4:Aim of the Course:

- To learn about the different media elements.
- To use different media tools.
- To develop mini projects using multimedia tools.

5:Course Outcome :

On completion of the course, students will be able to:

- Create of media elements like audio, image, video, interactive programming and design
- Use standard media development tools such as , Adobe Photoshop, Sound Forge, and video editing software
- Create unique and meaningful projects that illustrate the concepts learned.

6:Pre-requisites:

- Computer fundamentals
- Basic idea about multimedia.

7:Teaching Scheme:

Teaching Scheme			
L	T	P	Total hours per week
3	1	3	7

8:Examination Scheme:

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	50	50
Pass Marks	33		33	

9:Detailed Course Content:

Unit	Topics/Sub-topics	Intended Learning Outcome	Hours
1	**Overview of Multimedia :** 1.1 introduction to Multimedia 1.2 ackground of Multimedia 1.3 eed of Multimedia 1.4 resent market and future potential 1.5 imension of Multimedia 1.6 ultimedia Product Possibilities 1.7 ultimedia Contents 1.8 ultimedia in Educatio**n**	1. escribe the integration of the fundamental digital media building blocks into an interactive multimedia system 2. xplain the uses of Multimedia in different fields with special emphasis on Education	5
2	**Introduction to Sound & Audio :** 2.1 Basics of acoustics, psycho acoustics 2.2 Musical sound and noise, elementary Sound System 2.3 Microphones, amplifiers, Digital representation – PCM, ADC, DAC, of sound, audio compression, digital audio formats	1. xplain acoustics, Digital and Analog Sound, and Conversion from Digital domain to Analog and Vice versa 2. escribe audio compression and digital audio format.	8
3	**Introduction to Image and Graphics** 3.1 Introduction to Image 3.2 Perception of human eyes 3.3 Vector and raster graphics 3.4 Digital representation of image, colour, 16	1. nalyze image components, its factors that effects image in multimedia	17

	bit, 24bit colour depth 3.5 Basic colour theory 3.6 Colour Characteristics – Hue, Saturation, Luminance 3.7 Colour Palette 3.8 Monitor and Print display 3.9 Basic image processing criteria 3.10 Image compression –JPEG, BMP, TIFF, GIF, lossy and non-lossy 3.11 Image evaluation 3.12 Layers 3.13 Filters 3.14 Image manipulation- scaling, cropping, rotation 3.15 Colour printers- basic 3.16 Image capture- scanning basics 3.17 Digital still camera	2. efine the underlying concepts and techniques of image compression. 3. Demonstrate the working principle of image capturing and displaying devices.	
4	**Motion Video Technology :** 4.1 Introduction to video 4.2 Video in Multimedia 4.3 Basics of motion video 4.4 Sources for motion video objects 4.5 Video formats, lines, frames, fields 4.6 Synchronisation aspects ratio etc. 4.7TV Broadcast Standards- PAL, NTSC, SECAM etc. 4.8 Horizontal, vertical resolution 4.9 Analog video camera principle- Monochrome, colour video concepts 4.10 Types of cameras – Luma, Chroma 4.11 Component and composite video 4.12 Digitization basics 4.13 Spatial resolution & Bandwidth 4.14 Sampling &Nyquist theorem 4.15 Sampling RGB, Composites	1. nalyze video components, its factors that effects video in multimedia 2. emonstrate the features of different TV Broadcast Standards 3. emonstrate the working principle of video capturing and displaying devices 4. efine the underlying concepts and techniques of video compression.	12

	4.16 Magnitude domain discretization 4.17 Colour Bitmap Encoding 4.18 Video compression lossless and lossy		
	Internal Assessment		**3**

6. Course Title:Elements of Multimedia Laboratory

Element of Multimedia Practical

Interpersonal skills:

- Design forms using audio, video .
- Create mini multimedia projects.

Motor Skills:

- Proper use of computer and software.

List of Lab Exercises:

1. Sound Editing
   Importing, Recording, Editing, Repairing Audio.
   Mixing and Applying Effects on Audio, Video and Image Synchronized with Audio

2. Image Editing
   Working with Images using different tools, Layers, ColourPallettes, Animation, Synchronization with Audio

3. Video Editing
   Capturing Clips, Editing, Mixing, Synchronization with Audio.

10: Distribution of Marks:

Unit	Topics	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Overview of Multimedia	2	2	4	8
2	Introduction to Sound &	6	3	5	14

	Audio				
3	**Introduction to Image and Graphics**	**10**	**6**	**12**	**28**
4	**Motion Video Technology**	**7**	**4**	**9**	**20**
		25	**15**	**30**	**70**

11: Table of Specification:

Unit	**Topic (a)**	**Time allotted in hours (b)**	**Percentage Weightage (c)**	**K**	**C**	**A**	**HA**
1	**Overview of Multimedia**	5	12	√		√	
2	**Introduction to Sound & Audio**	8	19	√		√	
3	**Introduction to Image and Graphics**	17	40	√		√	
4	**Motion Video Technology**	12	29	√		√	
Total		Σ b=42	100				

K =Knowledge C = Comprehension A =Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation)

$$c = \frac{b}{\Sigma b} * 100$$

Detailed Table Of Specifications

Unit	**Topics**	**Objective**				**Short**					**Descriptive**				
		K	**C**	**A**	**T**	**K**	**C**	**A**	**HA**	**T**	**K**	**C**	**A**	**HA**	**T**
1	**Overview of Multimedia**	2			2	2				2	2		2		4
2	**Introduction to Sound & Audio**	6			6	3				3			5		5
3	**Introduction to Image and Graphics**	6		4	10	4		2		6	6		6		12
4	**Motion Video Technology**	5		2	7	2		2		4	4		5		9

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

12:Suggested Implementation Strategies:

13:Suggested Learning Resources:

1: Fundamentals of Multimedia by Li

2: Introduction To Multimedia Systems by Bhatnager

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7 Course Title: Professional Practice-I

1: Course Title – Professional Practice - I

2: Course Code – CO- 310

3: Semester- 3rd

4: Aim of the Course :

- To introduce to the recent developments in the areas covered in this semester.
- To improve communication skill.

5: Course Outcome :

On completion of the course students will be able to :

- Express themselves in discussions.
- Identify the recent developments in relevant areas.
- Compile reports.
- Analyse areas beyond the books.

6: Pre-requisites :

- Basic knowledge in the subjects covered in the semester.

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total hours per week
1	-	2	3

8: Examination Scheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	-	-	25	25
Pass Marks	-		17	

9: Detailed Course Content :

Unit	Exercises/Activities	Hours
1	**Industrial Visits :** Students are to be taken to structured industrial visits and report of the same to be submitted by the individual student, to form part of the team work . Visits to **any two** of the following : • Nearby Computer related educational institute • Nearby software development centre • Nearby H/W repairing centre • Visits to computer centre	**10**
2	**Guest Lecture(S)** : Lectures by professional / Industrial Expert / Student to be organised to give a wider view of the selected topics from any three of the following areas. • Health Care Topics . • Basics of Computer Hardware (Motherboard) • Algorithm and logic development • Operating System	**6**
3	**Group Discussion:** Students are to form groups and discuss on a chosen topic listed below. A brief report on the same is to be prepared and submitted by each student including the points discussed during the discussion providing a concluding remark. Any two topics for group discussions may be selected by faculty members from the suggested topics – • Current development in the area of computer hardware development. • Recent sports and games activities. • The importance of discipline in professional activities. • Current issues related to environment.	**6**
4	**Student Activities** The students in a group of 3 to 4 will perform any one of the following activities and present a report on the activity performed. (similar related activities may be considered for assigning the students) : • Area wise study on level of computer literacy • Collect information on specification of computers • Collect information on recent developments in computer peripherals	**8**

XxxxxxXXXXXXXXXXXXXXXXXXXXXXXXXXXXXxxxxxxx

COURSE STRUCTURE, 4TH SEMESTER

COURSE STRUCTURE OF 4th SEMESTER (Computer Engineering)

Sl N	Code No	Subject	Study Scheme Contact hour/week			Evaluation Scheme										
						Theory					Practical			Total Marks(Theory+Practical)	Credit
			L	T	P	ESE	Sessional(SS)			Pass(ESE+SS)	Practical Test(PT)#	Practical Assessment(PA)@	Pass(PT+PA)		
							TA	HA	Total(TA+HA)						
1	CO-401	Data Structure	3	1	3	70	10	20	30	33/100	25	25	17/50	150	5
2	CO-402	System Programming	3			70	10	20	30	33/100	-	-		100	3
3	CO-403	Microprocessor And Interfacing	3		3	70	10	20	30	33/100	25	25	17/50	150	4
4	CO-404	Advanced C and C++	3		3	70	10	20	30	33/100	25	25	17/50	150	4
5	CO-405	Computer Hardware and Networking	1	1	3	35	5	10	15	17/50	50	50	33/100	150	4
6	CO-406	Digital Electronics	2		3	35	5	10	15	17/50	25	25	17/50	100	3
7	CO-410	Professional Practice- II	1		2						25	25	17/50	50	2
		Total	16	2	17									850	25
			35												

1.Course Title–Advanced C and C++

2: Course Code – CO- 404

3: Semester- 4th

4: Aim of the Course:

- To develop idea about concepts in programming
- To learn the advance features of C
- To learn C++ programming and develop programs of medium complexity in the programming languages.

5: Course Outcome:

On completion of the course students will be able to :

- Develop programs in C using advanced features
- Implement the concept of object oriented programming
- Improve logic development skill
- Develop programs in C++

6: Prerequisite of the Course : Basic idea of C programming language.

7: Teaching Scheme (in hours):

Teaching Scheme			
L	T	P	Total hours per week
3		3	6

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	25	25
Pass Marks	33		17	

9: Detailed Course Content:

Unit	Topics/sub-topics	Intended Learning Outcome	Hours
1:	**Overview of C:** Data types, Decision and control structure	1. Acquire the basics of C Programming Language 2: Write small C programs using control structures	**2**

2	**Array,Functions, Pointers and File:** Arrays- definition, types, initialization, passing arrays to functions, Strings, Functions-definition, prototype, passing parameters, Recursion, Pointers-declaration, operations on pointers, pointers and arrays, pointers and functions, pointers and strings. Structure & Union - definition, processing, structure and pointers, passing structures to functions, File- defining, opening and closing file, I/O operations on file, error handling, random access, command line arguments.	1. Explain the basic data structures 2.Explain what a pointer is and it is beneficial in dynamic memory allocation 3.Define own functions and data types 4. Choose the better parameter passing technique. 5. Minimise the memory usage 6. Provide better security to the transferred data 7. Manage data permanently based on the concept of file handling in C	**12**
3	**Introduction to C++:** Basic concepts of object oriented programming, data types, operators, expressions, scope resolution operator, type cast operator, manipulator	1. Define OOPS and its characteristics. 2. Handle data in improved way based on the enhanced data type knowledge. 3.Define scope resolution operator	**3**
4.	**Classes and Objects:** Class declaration and definition, creating objects, defining member function, private member function, static data member, static member function, array of objects, object as function arguments, constructor and destructor, copy constructor	**1**. Define the basic concepts of OOPS-class and object **2**. Explain the different access specifiers used in C++. **3**. Differentiate between member data and member function. **4**. Differentiate between constructor and destructor and their usage **5**. Develop Objects based programs.	**4**
5.	**Function and Operator Overloading:** Function prototyping, call by reference, return by reference, inline function, friend function, virtual function, function overloading, operator overloading, rules for overloading operators, overloading unary and binary operator, type conversion, pointers, pointers and string, pointers to objects, this pointer	**1**. Differentiate amongst the parameter passing techniques . **2**. Access private members of different classes. **3**. Assign different tasks to the same functions and operators based on the knowledge of overloading. **4**. Use 'this' pointer.	**6**

		5. Handle strings in programming in better way 6. Explain and use dynamic programming based on virtual function and pointers 7. Develop more efficient programs after completion of the chapter	
6.	**Inheritance** Definition of inheritance, various forms of inheritance, defining derived classes, virtual base class, abstract classes	**1.Define inheritance** 2.Differentiate amongst different types of inheritance 3. Explain virtual base class and abstract 4. Provide security to the members of a class	**7**
7	**Template and Exception handling** Definition of templates, class templates, function templates, overloading template functions, member function templates, non-type template arguments, Catch statement,Throwing exception	1. Manipulate different types of data by the same functions based on the concept of template 2. Develop objects based softwares	**3**
8	**File handling** Classes for File stream, Opening and closing file, File modes, Types of files-Sequential and random	1: Define the basic concepts in file handling 2:Write programs using file.	**5**
	Internal Assessment		**3**

Practical:

Intellectual Skills :

- Develop logical thinking
- Relate the concepts of programming to solve problems.

Motor Skills :

- Learn to operate and handle a computer.

List of Lab Exercises :

I. Programming in C

Programming exercise on control structure- Branching and Looping

Programming exercise on use of array, function, pointer, structure, union and file

II. Programming in C++

Programming exercise on class, objects and constructor

Programming exercise on function overloading, inline function

Programming exercise on operator overloading (unary and binary), virtual function and pointers

Programming exercise on various forms of inheritance

Programming exercise on use of Templates (class and function)

Programming exercise on File handling

10: Distribution of Marks:

Unit	Topics	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	**Overview of C**	**2**	**1**	**2**	**5**
2	**Arrays, Functions, Pointers and File**	**5**	**3**	**6**	**14**
3	**Introduction to C++**	**2**	**1**	**2**	**5**
4	**Classes and Objects**	**5**	**4**	**4**	**13**
5	**Function and Operator Overloading**	**4**	**1**	**4**	**9**
6	**Inheritance**	**3**	**2**	**4**	**9**
7	**Templates and Exception handling**	**1**	**1**	**3**	**5**
8	**File handling**	**3**	**2**	**5**	**10**
		25	**15**	**30**	**70**

11: Table of Specification

Unit	Topics (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Overview of C	2	5	√	√		
2	Arrays, Functions, Pointers and File	12	28	√	√	√	√
3	Introduction to C++	3	7	√		√	
4	Classes and Objects	4	10	√	√	√	
5	Function and Operator Overloading	6	14	√	√	√	
6	Inheritance	7	17	√	√	√	
7	Templates and Exception handling	3	7	√		√	
8	File handling	5	12	√	√	√	
Total		42	100				

K = Knowledge C = Comprehension A =Application HA = Higher Than Application (Analysis, Synthesis, Evaluation) $c = \frac{b}{\Sigma b} * 100$

Detailed Table Of Specifications

Unit	Topic	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Overview of C	1	1		2	1				1		2			2
2	Arrays, Functions, Pointers and File	3	2		5	1	2			3		2	2	2	6
3	Introduction to C++	2			2	1				1	2				2
4	Classes and Objects	2	2	1	5	2		2		4		2	2		4
5	Function and Operator Overloading	2	2		4	1				1			4		4
6	Inheritance	3			3	2				2		2	2		4
7	Templates and Exception handling	1			1	1				1			3		3
8	File handling	2		1	3	2				2		2	3		5
	Total				25					15					30

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

12: Suggested Implementation Strategies:

1. As the subject is taught to the students of computer engineering, logic and programming skill development needs to be emphasised.
2. Too much of hardware details could be avoided as that will be covered in other subjects.
3. Programming section theory could be taught side by side in the lab.

13: Suggested Learning Resources :

1. Let us C by Y. Kanetkar, BPB
2. Programming in ANSI C / E. Balagurusamy / Tata McGraw-Hill
3. Object Oriented Programming with C++, E Balagurusamy, Tata McGraw-Hill

2:Course Title - Computer Hardware and Networking

2: Course Code –CO- 405

3: Semester- 4th

4: Aim of the Course :

- To give knowledge about computer parts and networking devices.
- To provide hands on practice in assembling, de-assembling of computer.
- Provide hands on practice of installation and networking basics.

5: Course Outcome:

On completion of the course, students will be able to :

- Identify various components of Computer Systems and their functions
- Maintain, upgrade, and troubleshoot PC system.
- Upgrade and trouble shoot Personal Computers.
- Connect computers and set up network connections.

6: Pre-requisite of the Course:

- Basic knowledge of computer and peripherals.
- The students are expected to know the components of motherboard.

7: Teaching Scheme:

Teaching Scheme			
L	T	P	Total hours per week
1	1	3	5

8: Examination Scheme:

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	35	15	50	50
Pass Marks	17		33	

9: Detailed Course Content:

Unit	Topics/Sub-topics	Intended Learning Outcome	Hours
1	**Introduction to Computer System Layout:** 1.1 Identification of System Layout. a) Front Panel Indicators and Switches. b) Front side and rear side Connectors. 1.2 Familiarize the Computer System Layout: Making Positions of SMPS, Motherboard, FDD, HDD, CD, DVD and add on cards.	1. Identify system Layout and to locate the internal components of a computer system.	**3**
2	**Installation and configuration of Secondary memory and BIOS:** 2.1 BIOS set up: Configuring bios setup program and practicing the trouble shooting of typical problems using BIOS utility. 2.2 a) Install Hard disk. b) Configure CMOS- Setup. c) Partition HDD using FDISK. d) Format Hard Disk. e) Master/Slave/IDE Devices. 2.3 a) Install and configure a CD- Writer and a DVD writer. b) Recording a blank CD and DVD.	2. Configure BIOS and CMOS setup. 3. Partition, format and install a hard disk. 4. Configure and install a CD-Rom/ CD and DVD writer and burn CD/DVD	**3**

3	**Installation of different devices:** 3.1 Printer Installation and Servicing. a) Head Cleaning. b) Install and Configure Dot Matrix and Laser Printer. c) Troubleshoot DMP and Laser printer. d) Check the data cable connectivity. 3.2 Network Installation and Troubleshooting a) NIC, Router Installation. b) Installing NIC, router and Modem for XP/Linux Environment. c) Configuring using device drivers. d) Diagnosis and trouble shooting. 3.3 Installation of multimedia components a) Install audio/video devices, microphone, speaker and head set and Digital camera. b) Trouble shoot the audio-video devices. c) Install and configure Web Cam.	5. Install, configure and troubleshoot dot matrix, ink-jet and laser printer. 6. Install and configure NIC, Router, audio-visual devices like: microphone, speaker, head-set, digital camera and web-cam.	**5**
4	**Trouble shooting basics :** 4.1 a) Identifying the Problems in PC with add on Cards. b) Identify problems with software installation using drivers available in the motherboard CD. 4.2 Practice with scan disk, disk cleanup, disk De-fragmentation, Virus Detection and Rectification Software. 4.3 Practice with backup and restore data in a network server using external storage Device. 4.4 Assemble a PC with add on cards and check the working condition on the system.	7. Troubleshoot a PC, to solve hardware-software problem and to use software diagnostics tools. 8. Perform backup and recovery of data using an external hard disk. 9. Assemble a PC.	**5**

5	**OS installation:** Windows and Linux- Operating System Installation.	10. Install OS : Linux and Windows	**2**
	Internal Assessment		**2**
	Networking Section		
6	**Basics of Networking :** 6.1 Do the following cabling works in a network a) Cable Crimping. b) Creating straight Cable. c) Creating Cross Cable. 6.2 Establish a LAN connection amongst three nodes in a bus topology. 6.3 Establish Peer to Peer network connection between two nodes in LAN. 6.4 Interface PCs using connectivity devices-Hub, router and switch.	11. Learn networking basics. 12. Establish LAN and peer-to-peer connections amongst the PCs. 13. To use hub, router and switch.	**3**
7	**LAN Configuration:** 7.1 a) Configure IP address in a system in LAN (TCP/IP Configuration). b) Configure DNS to establish interconnection between systems. 7.2 a) Transfer files between systems in LAN using FTP Configuration. b) Login a system remotely using telnet protocol. 7.3 a) Install and configure Network interface card in a LAN system. b) Share a file and printer(remotely) between two system in a LAN.	14. Configure LAN. 15. Transfer files between nodes within a network. 16. Share files and printers remotely.	**3**

8	**Security fundamentals:** 8.1 Establish security in a system using firewall configuration. 8.2 Create and share the user rights by accessing server for a specific user groups. 8.3 Install and configure the following: a) A DHCP server in windows with IP Address ranging from 192.168.1.1 to 192.168.1.100 b) Configure a DHCP Client 8.4 Transfer Files Between systems using wireless Communication. 8.5 Configure Mail Server.	17. Configure firewall and different servers like: mail server, DHCP client & server.	**2**
9	**Implementation of networking basics:** Write a Client Server Program to connect different PCs	18. Write programs to connect PCs	**1**
	Internal Assessment		**1**

Practical :

Intellectual skills :

- Develop logical thinking for trouble shooting .
- Decide on LAN structure depending on the number of nodes.

Motor skills :

- Proper handling of tools.
- Proper technique for Assembling and De - assemling a PC.
- Connecting the components to establish a LAN.

The **lab exercises** are to be conducted in connection with the theory syllabus provided.

10: Distribution of Marks :

Unit	Topics	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Introduction to Computer System Layout	1		3	4
2	Installation of configuration of memory	2	2		4
3	Installation of different devices	1	2	3	6
4	Trouble shooting basics	3		3	6
5	OS installation	1	1		2
6	Basics of Networking	1		3	4
7	LAN Configuration	1		3	4
8	Security fundamentals	1	2		3
9	Implementation of networking basics	1	1		2
		12	8	15	35

11: Table of specification

Unit	Topics (a)	Time allotted in hours (b)	Percentage of weightage (c)	K	C	A	HA
1	Introduction Comp. System Layout	3	12%	√			
2	Installation and configuration of memory	3	11%			√	
3	Installation of different devices	5	18%			√	
4	Trouble Shooting Basics	5	18%		√		
5	OS Installation	2	8%			√	
6	Basic of Networking	3	11%	√			
7	LAN Configuration	3	11%		√		
8	Security Fundamentals	2	7%	√			
9	Implementation of Network Basic	1	4%		√		
	Total	∑b=27	100%				

K= Knowledge C=Comprehension A=Application HA=Higher then Application (Analysis, Synthesis, Evaluation)

$$c = \frac{b}{\sum b} \times 100\%$$

Detailed Table of specification

Unit	Topics (a)	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	**Introduction Comp. System Layout**	1			1					0	3				3
2	**Installation and configuration of memory**			2	2			2		2					0
3	**Installation of different devices**			1	1			2		2			3		3
4	**Trouble Shooting Basics**		3		3					0			3		3
5	**OS Installation**			1	1			1		1					0
6	**Basic of Networking**	1			1					0	3				3
7	**LAN Configuration**		1		1					0		3			3
8	**Security Fundamentals**	1			1	2				2					0
9	**Implementation of Network Basic**		1		1		1			1					0
	Total				**12**					**8**					**15**

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

12: Suggested Implementation Strategies :

1: As this subject is heavily based on practical concepts, it is to be taught in the lab with the theoretical concepts given side by side.

2: Theory classes will cover the theoretical aspects required to perform the lab exercises.

13: Suggested Learning Resources :

1: Repairing and Upgrading PC's by Scott Mueller, Pearson

2: The Complete PC Upgrade and Maintenance Guide by Mark Minasi

3: Modern Computer Hardware Course by by ManaharLotia , Pradeep Nair and PayalLotia.

3.Course Title: Data Structure

2: Course Code:CO- 401

3: Semester: 4th

4: Aim of the course:

- To develop appropriate data structures in developing software to solve problems.
- To learn principles of algorithms.
- To familiarize with control and data structures of any programming language.

5: Course Outcome :

On completion of the course, students will be able to :

- Define various data structure
- Explain algorithm for performing various operation on these data structure+
- Differentiate among different sorting techniques.
- Implement concepts of tree, searching, arrays, string etc..

6: Pre-requisites of the Course :

- Knowledge about programming logic

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total Hours per week
3	1	3	7

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	25	25
Pass Marks	33		17	

9: Detailed Course Content :

Unit	Topic/ Sub-topic	Intended Learning Outcomes	Hours
1	**Introduction and Overview:** 1.1 Introduction 1.2 Basic Terminology 1.3 Elementary Data Organization 1.4 Data Structure 1.5 Data Source Operation 1.6 Algorithms, Complexity, Time-space Trade off	**After completion of the course, students should be able to** 1. Define data structure. 2. Define the basic terminology related to data structure. 3. Define complexity of an algorithm.	**2**
2	**Preliminaries:** 2.1 Introduction 2.2 Mathematical notation and function 2.3 Algorithm Notation 2.4 Control Structure 2.5 Complexity of Algorithms 2.6 Sub Algorithms 2.7 Variables 2.8 Data Types	4. Apply various mathematical functions and notations to find out Algo. Complexity. 5. Describe various control structure of program. 6. Define running time of algorithm using Big Oh, Theta and Omega notation.	**3**
3	**String Processing:** 3.1 Introduction 3.2 Basic Terminology 3.3 Storing Strings 3.4 Character Data Types 3.5 String Operation 3.6 Word Processing 3.7 Pattern Matching Algorithms	7. Define different terms related to string processing. 8. Apply various string operations on given strings. 9. Explain the Pattern matching algorithms and apply them on given string.	**4**

4	**Arrays, Records and Pointers :** 4.1 Introduction 4.2 Linear Arrays 4.3 Representation of Linear Arrays in memory 4.4 Traversing Linear Array 4.5 Inserting and Deleting 4.6 Sorting- Bubble Sort 4.7 Search- Linear Search 4.8 Binary search 4.9 Multidimensional Array 4.10 Pointers- pointer Array 4.11 Records- record Structure 4.12 Representation of Records in Memory, Parallel Arrays 4.13 Matrices 4.14 Spares Matrices	10. Define arrays, records and pointers. 11. Describe the representation of linear and multi-dimensional array in memory. 12. Explain the working principle of Bubble sort with the help of one example. 13. Define pointer array, matrices and spares matrices and explain representation of records in memory.	**5**
5	**Linked Lists :** 5.1 Introduction 5.2 Linked Lists 5.3 Representation of Linked List in Memory 5.4 Traversing a Linked List 5.5 Searching a linked list 5.6 Memory Allocation Garbage Collection 5.7 Insertion into a linked list 5.8 Deletion form a linked list 5.9 Header Linked list 5.10 Two-Ways Lists	14. Define linked list, header list and two way list. 15. Explain various operations like insertion, deletion, traversal and searching a linked list and corresponding algorithms. 16. Distinguish between arrays and linked list. 17. Elucidate the concept of Garbage collection.	**5**
6	**Stacks, Queues, Recursion :** 6.1 Introduction 6.2 Stacks 6.3 Array Representation of Stacks 6.4 Arithmetic Expression, Polish Notation 6.5 Quick sort, an application of stacks 6.6 Recursion 6.7 Towers of Hanoi 6.8 Implementation of Recursive Procedures of stacks 6.9 Queues 6.10 Deques 6.11 Priority Queues	18. Define Stacks, Queues, Deques, Priority queues and Recursion. 19. Distinguish between Stack (LIFO) and Queue (FIFO). 20. Apply the knowledge of stack to solve Towers of Hanoi problem. 21. Explain working of Quick sort algorithm taking a suitable example.	**6**

7	**Trees :** 7.1 Introduction 7.2 Binary Tree 7.3 Representation of Binary Tree in memory 7.4 Traversing of Binary Tree 7.5 Traversal Algorithm using stacks 7.6 Header Nodes, threads 7.7 Binary Search Tree 7.8 Searching and Inserting in a Binary Search tree 7.9 Deleting a Binary Search tree 7.10 Heap, Heap-sort 7.11 Path Length, Huffman's Algorithms 7.12 General Tree	22. Define tree, binary tree and various terms related to tree. 23. Explain various operations on trees and corresponding algorithms (tree traversal, search, insertion, deletion). 24. Define heap, path length and explain heap sort algorithm and Huffman's algorithm with the help of examples.	**6**
8	**Graphs and Their Application :** 8.1.Introduction 8.2 Graph Th. Terminology 8.3 Sequential Representation of Graphs, Adjacency matrix, path matrix 8.4 Warshall's Algorithms, shortest path 8.5 Linked Representation of a graph 8.6 Operation of Graph 8.7 Traversing a Graph	25. Define graph and graph theory related terminology. 26. Distinguish between graph and tree. 27. Explain representation of graphs using adjacency matrix and linked list. 28. Discuss various operations of graph.	**6**
9	**Sorting and searching :** 9.1 Introduction 9.2 Sorting 9.3 Inserting Sort 9.4 Selection Sort 9.5 Merging 9.6 Merge-sort 9.7 Radix Sort 9.8 Linear Searching 9.9 Binary Searching 9.10 Interpolation searching 9.11 Hashing	29. Define and distinguish between sorting and searching. 30. Explain various sorting algorithms and find out their running time (best case, average case and worst case). 31. Distinguish between linear and binary search. 32. Explain Hashing	**3**
10	**Introduction to File Organization :** 10.1 Sequential, Index-sequential and	33. Explain various	**2**

	Direct file Organization.	file organisation.	
	Internal Assessment		**3**

Intellectual skill:

- Students will be able calculate the time complexity of a program based on the input data size, data structures and algorithm.

Motor Skill

- Students will be able to handle computer systems

Lab Exercises

I. Implementation different sorting algorithms.
II. Implementation of Stack.
III. Implementation of queues.
IV. Implementation of linked list.
V. Implementation of graph traverses.
VI. Implementation of binary tree traverses.

10: Distribution of Marks :

Unit	Topic/ Sub-topic	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Introduction and Overview	1	2		3
2	Preliminaries	2	2		4
3	String Processing	3		5	8
4	Arrays, Records and Pointers	4	3		7
5	Linked Lists	3		5	8
6	Stacks, Queues, Recursion	3	3	5	11
7	Trees	2	2	5	9
8	Graphs and Their Application	3		5	8
9	Sorting and searching	2		5	7
10	Introduction to File Organization	2	3		5
Total		25	15	30	70

11: Table of Specification:

Unit	Topics (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Introduction and Overview	2	5	✓	✓		
2	Preliminaries	3	7	✓	✓		
3	String Processing	4	10	✓	✓	✓	
4	Arrays, Records and Pointers	5	12	✓	✓		
5	Linked Lists	5	12	✓	✓	✓	
6	Stacks, Queues, Recursion	6	14	✓	✓		
7	Trees	6	14	✓	✓	✓	
8	Graphs and Their Application	6	14	✓		✓	
9	Sorting and searching	3	7	✓	✓	✓	
10	Introduction to File	2	5	✓	✓		
Total		Σ b = 42	100				

K = Knowledge C = Comprehension A =Application HA = Higher Than Application (Analysis, Synthesis, Evaluation)

$$c = \frac{b}{\Sigma b} * 100$$

Detailed Table of Specification:

Unit	Topics	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Introduction and Overview	1			1		2			2					
2	Preliminaries	2			2		2			2					
3	String Processing	1	2		3								5		5
4	Arrays, Records & Pointers	4			4		3			3					
5	Linked Lists	1	2		3								5		5
6	Stacks, Queues, Recursion	3			3		3			3		5			5
7	Trees	2			2		2			2			5		5
8	Graphs & Their Application	3			3								5		5
9	Sorting and searching	2			2								5		5
10	Introduction to File Organization	2			2		3			3					
Total					25					15					30

K=Knowledge C = Comprehension A =Application HA=Higher Than Application T =Total

12: Suggested Implementation Strategies:

1: Practical should be based on algorithms of different data structure.
2: Certain programming concepts should be conducted in the lab.

13: Suggested Learning Resources:

i) Data Structure : SeymolerLipschutz (Schaum Series)
ii) Fundamentals of Computer Algorithms- by Horowitz, E &Sahani, S- Galgotia
iii) Data Structure Theory Applications: Trembly& Sorenson, TMH

4: Course Title - Digital Electronics

2: Course Code – CO- 406

3: Semester- 4th

4: Aim of the Course :

- To study different logic families
- To introduce different logic gates and combination logic design.

5: Course Outcome :

On completion of the course students will be able to :

- Explain the theory of Boolean algebra.
- Simplify Boolean expressions
- Distinguish different logic gates.
- Evaluate different flip flops.
- Perform analysis and design of combinational circuits and sequential circuits.

6: Pre-requisites :

- Basic electronics engineering.

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total hours per week
2	-	3	5

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	35	15	25	25
Pass Marks	17		17	

9: Detailed Course Content :

Unit	Topics/Sub-topics	Intended Learning Outcome	Hours
1	**Boolean Algebra and Logic Gates:** 1.1 Principles of Boolean Algebra: Definition of Boolean constant, variables and function, the rules of Boolean algebra, De-Morgan's theorem. 1.2 Concepts of logic gates: symbol, definition, truth table and logic expression of OR, AND, NOT, NOR, NAND, X-OR, X-NOR gates 1.3 Realization of logic families: TTL and CMOS family	1. Familiarize the principles & rules of Boolean algebra. 2. Simplify Boolean expressions. 3. Conceptualize logic gates. 4. Distinguish different logic gates.	**6**
2	**Combinational Digital System :** 2.1Arithmetic circuits (Adder/Subtractor) 2.2Digital Comparator, Parity Checker/Generator 2.3Decoder/ Demultiplexer, Data Selector/Multiplexer, Encoder, BCD to Seven Segment Decoder	5. Analyze & construct combinational digital system.	**6**
3	**Flip Flops:** 3.1 Latch, R-S, J-K, T, D flip flops, Clocked flip flop, Master slave J-K flip flop	6. Differentiate between different flip flops. 7. Evaluate different flip flops.	**4**
4	**Registers & Counters :** 4.1 Shift Register, Serial in Serial out (SISO), Serial in Parallel out (SIPO), Parallel in Serial out (PISO), Parallel in Parallel out (PIPO) 4.2 Counters: Synchronous, Asynchronous Counter, Ring Counter, Up/Down Counter	8. Define register & counter. 9. Distinguish different registers & counters.	**6**
5	**Memory Devices :** 5.1 Introduction, Classification, Characteristics and Organization of memories 5.2 Semiconductor memory RAM, Dynamic RAM, statics RAM	10. Describe the function, characteristics & structure of different memory systems.	**4**

	5.3 ROM- Types and Application 5.4 RAM-Types and Application		
6	**Display Device :** 6.1 Segment format, LED, LCD display, Dot Matrix Format	11. Describe display devices.	**2**
	Internal Assessment		**2**

Practical

Intellectual skills :

- Interpret the results.
- Verify tables.

Motor skills :

- Use of different instruments.

Lab Exercises :

1. Realization of basic gates
2. Experiment on Adder/ Subtractor
3. Experiment on Multiplexer / Demultiplexer
4. Experiment on Decoder / Encoder
5. Experiment on Seven Segment Display
6. Experiment on Flip Flops
7. Experiment on Registers
8. Experiment on Counters
9. Experiment on Memory ICs

10: Distribution of Marks :

Unit	Topics	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	**Bollean Algebra and Logic Gates**	**2**	**2**	**4**	**8**
2	**Combinational Digital System**	**2**	**2**	**4**	**8**
3	**Flip Flops**	**2**		**4**	**6**
4	**Registers & Counters**	**2**	**3**		**5**

5	**Memory Devices**	**2**		**4**	**6**
6	**Display Device**	**2**			**2**
		12	**7**	**16**	**35**

11: Table of Specification :

Unit	Topics (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	**Boolean Algebra & Logic Gates**	6	22	✓			
2	**Combinational Digital System**	6	22			✓	
3	**Flip Flops**	4	14	✓			
4	**Registers & Counters**	6	21.			✓	
5	**Memory Devices**	4	14	✓			
6	**Display Device**	2	7		✓		
Total		Σ b=28	100				

K = Knowledge C = Comprehension A =Application HA = Higher Than Application (Analysis, Synthesis, Evaluation) $c = \frac{b}{\Sigma b} * 100$

Detailed Table Of Specifications

Unit	Topics	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	**Boolean Algebra & Logic Gates**	2			2	2				2	4				4
2	**Combinational Digital System**			2	2			2		2			4		4
3	**Flip Flops**	2			2						4				4
4	**Registers & Counters**			2	2			3		3			4		4
5	**Memory Devices**	2			2										
6	**Display Device**		2		2										

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

12: Suggested Implementation Strategies :

13: Suggested Learning Resources :

1. Modern Digital Electronics –RP Jain
2. Digital Principles & Application –Malvino& leach
3. Digital Fundamentals – Thomas L. Floyed
4. Digital Electronics- Douglas V. Hall

5: Course Title – Microprocessor and Interfacing

2: Course Code – CO - 403

3: Semester- 4th

4: Aim of the course :

- To give knowledge about the functions and applications of a microprocessor.
- To write and execute assembly language programs.
- To provide knowledge about peripheral chips and interfacing.

5: Course Outcome:

On completion of this course students will be able to :

- Define a microprocessor and its applications.
- Explain the block diagram and pin diagram of a microprocessor.
- Explain the concepts related to execution of an instruction.
- Familiarize with the functions of different peripheral chips.
- Write programs using TASM/NASM.

6: Pre-requisites :

- Knowledge about organisation of a computer.
- Block diagram of a computer and functions of each block.

7: Teaching Scheme:

Teaching Scheme			
L	T	P	Total hours per week
3	-	3	6

8: Examination Scheme:

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	25	25
Pass Marks	33		17	

9: Detailed Course Content:

Unit	Topics/Sub-Topics	Intended Learning Outcome	Hours
1	**Introduction to Microprocessor :** Evolution of Microprocessor, Specific features of Microprocessor, Application in our daily life (a few examples).	12. Define microprocessor 13. Explain the features of a microprocessor. 14. State application of microprocessors.	2
2	**Internal architecture of a microprocessor (using block diagram):** Explanation of each block in brief, Concept of bus structure, Register to register transfer, Communication with I/O and memory (This part can be explained using the specific microprocessor like 8086/8088). Pin details of 8086/8088 CPU and their function in brief.	15. Describe about internal blocks of a microprocessor. 16. Define bus , pin details of 8086/8088 CPU and its function.	8
3	**Addressing modes and Instruction execution:** Addressing mode in general (may be limited to 8086/8088 CPU), Instruction cycles, Instruction set, Timing diagram (may be limited to 8086/8088 CPU). Concept of Assembler and Compilers.	17. Differentiate between Compiler and Assembler . 18. Explain of Addressing modes . 19. Explain the concept of instruction cycles. 20. Explain the instruction set. 21. Draw timing diagrams.	5
4	**Interfacing of Memory and I/O devices:** Concept of address space, address/data bus demultiplexing, address and data bus buffering, address decoding, I/O concept, Memory interfacing concept of I/O mapped I/O and memory mapped I/O. Interrupts- Types of interrupts, Hardware and Software data transfer schemes- Synchronous, asynchronous and interrupt driven, DMA data transfer scheme.	22. Explain about address space, demultiplexing of address and data bus buffering , address decoding. 23. Distinguish between I/O mapped and memory mapped I/O. 24. Explain about Interrupt and its types . 25. Describe various data transfer schemes.	6

5	**Assembly language Programming:** (This part may be limited to the use assembly language of 8086/8088 CPU) **i)** Examples of register to register, register to memory, memory to register, block of data movement from one area of memory to another, merging of two blocks of data, data block exchange. **ii)** Examples of arithmetic addition, subtraction, multiplication and division **iii)** Examples of searching and sorting (simple) iv) Examples using of look up tables v) Use subroutines and delay program.	26. Familiarize with the basics of developing assembly language programs . 27. Write assembly language programs.	**7**
6	**Peripheral chips and their interfacing :** Brief description of 8255, 8253, 8251, 8257, 8237 and 8259. Interfacing of these chips with some standard CPU.	28. Describe the function of different peripheral chips and their interfacing.	**8**
7	**PC interfacing and Intel 386 and 486 processors:** Simple interfacing of Input/output peripherals like LED, 7 segment LED display modules, stepper motor, relays through digital I/O card or through the parallel port, EPROM programming using PC port. Architecture, register organisation and memory organisation of 386 and 486 processors	29. Describe the interfacing of LED , 7 segment LED display, stepper motor , relays through digital I/O card. 30. Explain the organisationof 386 and 486 processor.	**6**
	Internal Assessment		**3**

Practical

Intellectual skills :

- Logical reasoning

Motor skills :

- Proper use of trainer kit

- Handling of computer and peripherals.

Lab Exercises :

I. Acquaintance with the microprocessor trainer kit hardware and the user's commands (Dynalog/Vinyties/ALS)

II. Assembly Language Program development in TASM/NASM:

Data transfer program- register to register, register to memory and vice-versa.

Arithmetic Operation- 8bit addition and subtraction, multibyte addition and subtraction, multiplication using repeated addition, multiplication using shift – add process, signed multiplication, Binary division, BCD division.

III. Array processing- Adding one entry to an array, checking of an ordered list, replacing one or more entries in a list, storing and searching, block movement, block exchange and data insertion.

IV. Look-up table- Finding square cubes etc..of a number using look-up table, code conversion using look-up table.

V. Delay program, use of subroutine(use the above programme as a sub routine in a main program)

10: Distribution of Marks:

Unit	Topics	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Introduction to Microprocessor	3	3		6
2	Internal architecture of a microprocessor	4	3	6	13
3	Addressing modes and Instruction Execution	3		5	8
4	Interfacing of Memory and I/O devices	4	3	3	10
5	Assembly language Programming	4	3	4	11
6	Peripheral chips and their interfacing	4	3	7	14
7	PC interfacing and Intel 386 and 486 processors	3		5	8
		25	15	30	70

11: Table of Specification

Unit	Topics (a)	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	**Introduction to Microprocessor**	3			3	3				3					
2	**Internal architecture of Microprocessor**	4			4	3				3	6				6
3	**Addressing modes and instruction Execution**	2	1		3							5			5
4	**Interfacing of memory and I/O devices**	2	2		4		3			3	3				3
5	**Assembly language programming**		2	2	4	3				3			4		4
6	**Peripheral chips and their interfacing.**	4			4	3				3	7				7
7	**PC interfacing and intel 386 and 486 processors.**	2	1		3						2		3		5

K = Knowledge C = Comprehension A =Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation) $c = \frac{b}{\Sigma b} * 100$

Detailed Table of specification :

Unit	Topics (a)	Time allotted in hours (b)	Percentage of weightage (c)	K	C	A	HA
1	**Introduction to Microprocessor**	2	5%	✓			
2	**Internal architecture of Microprocessor**	8	19%	✓			
3	**Addressing modes and instruction Execution**	5	11%	✓	✓		
4	**Interfacing of memory and I/O devices**	6	14%	✓	✓		
5	**Assembly language programming**	7	17%	✓	✓	✓	
6	**Peripheral chips and their interfacing.**	8	19%	✓			
7	**PC interfacing and intel 386 and 486 processors.**	6	15%	✓	✓	✓	
	Total	∑b=42					

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

12: Suggested Implementation Strategies:

1:The subject's theory component is to be taught by using diagrams for explaining the functions.

2: Practical classes are to be conducted relating the theory concepts provided in theory classes.

13: Suggested Learning Resources:

1. Advanced Microprocessor and Interfacing , Badri Ram, TMH
2. Microprocessor Architecture, Programming & Application – R.S. Goankar
3. Introduction to Microprocessor- R. Mathur
4. Microprocessor- Hall

6: Course Title - System Programming

2: Course Code – CO- 402

3: Semester- 4th

4: Aim of the course :

- To learn techniques for development of system software
- To produce software which provides services to the user

5: Course Outcome:

On completion of the course, students will be able to :

- Define system software.
- Distinguish between Assemblers and compilers
- Explain about macro, relocation ,loader and linker
- Explain the steps of compiler construction

6: Pre- Requisites :

- Knowledge of system tools available in computer system
- Knowledge of programming language

7: Teaching Scheme:

Teaching Scheme			
L	T	P	Total hours per week
3	-	-	3

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	-	-
Pass Marks	33		-	

9: Detailed Course Content:

Unit	Topics/Sub-topics	Intended Learning Outcome	Hours
1	**Assembly Language :** 1.1 Introduction to Assembly Language 1.2 Description of functional Characteristics, addressing modes 1.3 Data types and instruction structure 1.4 Registers 1.5 Indexing **1.6** Instruction set description	**1.**Define assembly language. 2 Explain the features of assembly language. 3. Describe addressing modes. 4. State data types of an assembly language. 5. Explain Registers and indexing. 6. Explain about instruction set	**6**
2	**Macros :** 2.1 Recursive macros 2.2 Sub routines 2.3 Stacks, procedures, exception handling	1. Explain recursive macros. 2. Describe about subroutines and procedures. 3. Define stacks , exception handling.	**4**
3	**Assemblers :** 3.1 Overview of assembly assembly processes 3.2 Processing of imperative, declarative and assembler directive statements 3.3 Relocation, linking and loading concepts 3.4 One and Two Pass assembler 3.5 Symbol table organization, program sections, output forms	1. Describe the assembly process. 2. State types of assembly language statements. 3. Define relocation , linking and loading. 4. Describe one and two pass assembler. 5. Design one and two pass assembler.	**8**
4	**Macro Assembler :** 4.1 Macro definitions and parameters 4.2 Macro call Expansion 4.3 Macro definition and macro call within a macro 4.4 Conditional assembly macro processor	1. Define macro. 2. Explain different types of macro 3. Describe macro call.	**6**
5	**Loaders :** 5.1 Review of loading, linking and relocation 5.2 Absolute, dynamic and direct loading schemes 5.3 Program linking schemes and relocation of external references 5.4 Optional features in loaders and linking editors 5.5 Overlay structures and dynamic	1. Explain loading , linking and relocation 2. Discuss the function of loaders. 3. Discuss different loading schemes. 4. Explain linkage editors. 5. Describe overlay structure and dynamic landing.	**6**

	loading		
6	**Compiler Construction :** 6.1 Introduction to Compiler 6.2 Phases and passes, Bootstrapping 6.3 Lexical Analysis 6.4 Syntax analysis 6.5 Bottom Up and Top Down parsers 6.6 Translation 6.7 Code Optimization 6.8 Code Generation	**1**. Define compiler. **2**. Define phases and passes. **3**. Define Bootstrapping. **4**. Define various phases of compiler. **5**. Explain types of parsers.	**12**
	Internal Assessment		**3**

10: Distribution of Marks :

Unit	Topics	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	**Assembly Language**	3	3	3	9
2	**Macros**	2		3	6
3	**Assemblers**	5	3	5	12
4	**Macro-Assembler**	5		5	9
5	**Loaders**	3	3	3	9
6	**Compiler Construction**	7	6	11	25
		25	15	30	70

11: Table Of Specifications

Unit	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Assembly Language	6	14	√		√	
2	Macros	4	10	√			
3	Assemblers	8	19	√	√	√	
4	Macro-Assembler	6	14	√		√	
5	Loaders	6	14	√		√	
6	Compiler Construction	12	29	√	√	√	√
	Total	42	100				

K = Knowledge C = Comprehension A =Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation) $c = \frac{b}{\Sigma b} * 100$

Detailed Table of Specification :

Unit	Topic	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Assembly language	3			3	1		2		3	3				3
2	Macros	2			2						3				3
3	Assemblers	3		2	5		2	1		3	3	2			5
4	Macro-Assembler	3		2	5						3		2		5
5	Loaders	3			3	1		2		3	3				3
6	Compiler Construction	3	2	2	7	2	2	2		6	3	3	3	2	11
	Total				25					15					30

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

12: Suggested Implementation Strategies :

13: Suggested Learning Resources :

1: Systems Programming by DmDhamdhere, Tata McGraw-Hill Education.

2: Systems Programming by Donovan, Tata McGraw-Hill Education.

7: Course Title– Professional Practice - II

2: Course Code – CO- 410

3: Semester- 4th

4: Aim of the Course :

- To introduce to the recent developments in the areas covered in this semester.
- To improve communication skill.

5: Course Outcome :

On completion of the course students will be able to :

- Express themselves in discussions.
- Identify the recent developments in subject related areas.
- Compile reports.
- Explore areas beyond books.

6: Pre-requisites :

- Basic knowledge in the subjects covered in the semester.

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total hours per week
1	-	2	3

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	-	-	25	25
Pass Marks	-		17	

9: Detailed Course Content :

Unit	Exercises/Activities	Hours
1	**Industrial Visits :** Students are to be taken to structured industrial visits and report of the same to be submitted by the individual student, to form part of the team work . Visits to **any two** of the following : • Visit to nearby laboratories of Education Institutions. • Visits to nearby computer centre of refinery. • Visit to project development organizations like NIC,AMTRON. • Visit to nearby computer assembly centre .	**8**
2	**Lectures by professional / Industrial Expert** Lectures to be organized from **any three** of the following areas to give a broader perspective of the subjects covered in the syllabus. • Steps in transaction processing • Data Mining/ Data Warehousing • Server Security and Administration • Computer lab Set-up	**6**
3	**Industrial Assignment** This assignment is proposed to develop interest in the students regarding the practical aspects as well as a study in details on the particular topic decided. Any **two** from the list suggested • List and specifications of components of a computer • Trouble shooting tips for common problems related to hardware and software. • Security measures to Courbet virus attacks • Function and interfacing of peripheral chips • Detailed analysis of design (any programming language) • Details of function of a Data Base Administration (S/W level) • Function and analysis of Flip-Flops, Registers and Counters.	**6**
4	**Student Activities** Any one of the following activities is to be conducted through active participation of students and a report is to be prepared by the student. • Survey for social problems such as: a) Mal nutrition b) unemployment c) Stress d) Cleanliness e) addiction f) pollution • Conduct aptitude, general knowledge test ,IQ test • Training on any one: a) Yoga b) Use of software tools	**4**

5	**Modular Courses** A course module should be designed in the following areas for maximum 10 hrs and minimum batch size of 15 students. Course may be organized internally or with the help of external organizations. • Spoken English • Personality development • Editing software (Ramdhenu) • Tally • DTP and Flax printing	**6**

COURSE STRUCTURE, 5TH SEMESTER

COURSE STRUCTURE OF 5th SEMESTER (Computer Engineering)

Sl No	Code No	Subject	Study Scheme Contact hour/week			Evaluation Scheme									
						Theory					Practical			Total Marks (Theory+Practical)	Credit
			L	T	P	ESE	Sessional(SS)			Pass(ESE+SS)	Practical Test(PT)#	Practical Assessment(PA)@	Pass(PT+PA)		
							TA	HA	Total (TA+HA)						
1	CO-501	Internet & Web Technology	3		3	70	10	20	30	33/100	25	25	17/50	150	4
2	CO-502	Computer Communication & Networking	3	1		70	10	20	30	33/100				100	4
3	CO-503	Database Management Systems	3		3	70	10	20	30	33/100	25	25	17/50	150	4
4	CO-504	Operating System	3		3	70	10	20	30	33/100	25	25	17/50	150	4
5	CO-505	JAVA Programming	2		3	70	10	20	30	33/100	25	25	17/50	150	4
6	CO-510	Professional Practice- III	1		2						25	25	17/50	50	2
			Elective (any one)												
A	CO-506	Visual Programming	1		3	35	5	10	15	17/50	25	25	17/50	100	3
B	CO-507	VLSI & Embedded System	3			70	10	20	30	33/100				100	3
		Total	17 / 19	1	17 / 14									850	25
			35 / 34												

1:Course Title - Computer Communication & Networking

2: Course Code – CO- 502

3: Semester- 5th

4: Aim of the course :

- To understand the different networking basics
- To get theoretical concepts about the various layers of networking

5: Course Outcome :

On completion of the course, students will be able to :

- Explain the fundamental concepts of computer networking.
- Define taxonomy and terminology of the computer networking area.
- Explain the different fundamental concepts in the OSI and TCP-IP model.
- Define the basic functions of each layer of network models.
- State the issues related to the different layers.

6: Pre-requisites :

- Computer fundamentals
- Networking terminologies

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total Hours per week
3	1	-	4

8: Examination Scheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	-	-
Pass Marks	33		-	

9: Detailed Course Content:

Unit	Topics/Sub-topics	Intended Learning Outcome	Hours
1	**Introduction :** 1.1 The uses of Computer Network 1.1.1 Networks Goals 1.1.2 Application of Network 1.2 Network Structures 1.3 Network Architecture 1.3.1 Protocol Hierarchies 1.3.2 Design Issues for the layers 1.4 The O.S.I Reference Model 1.5 Services 1.5.1 OSI Terminology 1.5.2 Connection Oriented and Connection less Services 1.5.3 Service Primitives 1.5.4 The Relationship of Services to protocols 1.6 Example network 1.6.1 Public Networks 1.6.2 ARPANET 1.6.3 Novell Net-ware	1. Define the basic network terminologies: protocols, network layers, services and service primitives. 2. Describe the OSI reference model, public networks, ARPANET and Novell Net-ware.	5
2	**The Physical Layer :** 2.1 Transmission Medium 2.2 Wireless Transmission 2.3 Telephone System 2.4 ISDM 2.5 Transmission and Switching	3.Distinguish the different wired and wireless transmission. 4. Explain the transmission mediums, telephone systems, ISDM and Switching techniques.	6
3	**The Medium Access Sub layer :** 3.1 ALOHA 3.2 CSMA 3.3 Collision Free Protocols 3.4 IEEE Standard 802 for LAN Ethernet, Token Bus, Token Ring 3.5 Bridges	5. Describe the MAC layer and its terminologies: ALOHA, CSMA, Ethernet, Token-Bus, Token-Ring and Bridges	5
4	**The Data Link Layer :** 4.1 Data Link Layer Design Issue 4.2 Error Detection and Correction 4.3 Elementary Data Link Protocols 4.4 Sliding windows protocols	6. Explain the design issues of data link layer: error detection and correction, flow control and related protocols.	4

5	**The Network Layer :** 5.1 Network Layer Design Issues 5.2 Routing Algorithms 5.3 Congestion Control Algorithms	7. Explain the design issues of network layer, routing and congestion control algorithms.	**4**
6	**The Transport Layer:** 6.1 The Transport Services 6.2 Elements of Transport Protocols 6.3 A simple Transport Protocols	8. Explain the design issues of transport layer, transport protocol.	**4**
7	**The Session Layer :** 7.1 Design Issues 7.1.1 Concepts of Data Exchange dialog management, activity management 7.2 Remote Procedure Call 7.2.1 Client server model 7.2.2 Semantics of R.P.C	9. Explain the design issues of session layer, data exchange dialog and RPC.	**4**
8	**The Presentation Layer :** 8.1 Design Issue 8.2 Data compression Techniques 8.3 Elementary idea of cryptography	10. Describe the design issues of presentation layer, data compression techniques and cryptography.	**4**
9	**The Application Layer :** 9.1 Design Issue 9.2 File Services 9.3 E Mail	11. Describe the design issues of application layer, file services, email.	**4**
10	**Concepts of Internet and www, HTML, TCP/IP**	12. Explain the concepts of www, HTML and TCP/IP	**2**
	Internal Assessment		**3**

10: Distribution of Marks :

Unit	Topics	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Introduction	3	3	4	10
2	The Physical Layer	3	3	4	10
3	The Medium Access Sub layer	2	3	3	8
4	The Data Link Layer	3		3	6
5	The Network Layer	3		3	6
6	The Transport Layer	3		3	6
7	The session Layer	2		4	6
8	The Presentation Layer	3		3	6
9	The Application Layer	1	3		4
10	Concepts of internet and www, HTML, TCP/IP	2	3	3	8
		25	15	30	70

11: Table of specification

Unit	Topics (a)	Time allotted in hours (b)	Percentage of weightage (c)	K	C	A	HA
1	Introduction	5	14%	√			
2	The Physical Layer	6	14%	√			
3	The Medium Access Sub-Layer	5	12%		√		
4	The Data Link Layer	4	10%			√	
5	The Network Layer	4	9%			√	
6	The Transport Layer	4	9%	√			
7	The Session Layer	4	9%		√		
8	The Presentation Layer	4	9%	√			
9	The Application Layer	4	9%	√			
10	Concepts of Internet and www, HTML, TCP/IP	2	5%			√	
	Total	∑b=43	100%				

K = Knowledge C = Comprehension A =Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation) $c = \frac{b}{\Sigma b} * 100$

Detailed Table of specification

Unit	Topics (a)	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	**Introduction**	3			3	3				3	4				4
2	**The Physical Layer**	3			3	3				3	4				4
3	**The Medium Access Sub-Layer**		2		2		3			3		3			3
4	**The Data Link Layer**			3	3					0			3		3
5	**The Network Layer**			3	3					0			3		3
6	**The Transport Layer**	3			3					0	3				3
7	**The Session Layer**		2		2					0		4			4
8	**The Presentation Layer**	3			3					0	3				3
9	**The Application Layer**	1			1	3				3					0
10	**Concepts of Internet and www, HTML, TCP/IP**			2	2	3				3			3		3
	Total				**25**	**6**		**6**		**15**					**30**

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

12: Suggested Implementation Strategies:

13: Suggested Learning Resources:

1. Computer Networks- A.S. Tanenbaum, PHI
2. Data Communication & Computer Networks –W.Stallings, PHI
3. Introduction to Digital and data Communication – M.A. Miller
4. Telecommunication & the Computer – James Martin, PHI
5. Data Communication & distributed network- U.D.Black
6. Cabling the complete guide to networking –GrothMcBee

2. Course Title - Database Management Systems

2: Course Code – CO-503

3: Semester- 5th

4: Aim of the Course :

- To learn about the database system management.
- To learn designing of a good database considering various aspects of designing.
- To use DDL, DML and DCL .

5: Course Outcome :

On completion of the course, students will be able to :

- Differentiate between traditional file system and DBMS
- Write queries with different Data Base languages.
- Design data base and normalize data.
- Use security concepts in designing database.
- Differentiate between centralized and distributed database.

6: Pre-requisite :

- Knowledge and concept of files and database.

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total Hours per week
3	-	3	6

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	25	25
Pass Marks	33		17	

9: Detailed Course Content:

Unit	Topics/Sub-topics	Intended Learning Outcome	Hours
1	**Introduction to Database Management System :** 1.1 Database System Environment 1.2 File oriented Approach 1.3 Database Approach 1.4 Users of DBMS 1.5 Intended use of DBMS 1.6 Benefit of using database Approach 1.7 Concepts of Client Server Architecture and distributed system	**1**. Demonstrate the role that database play in an organization. 2. Distinguish between the database approach and traditional approach of programming with data file. 3. Demonstrate different types of DBMS Architectures.	**6**
2	**Database system concept and Application :** 2.1 Data Models, Schemes and instances 2.2 DBMS architecture and Independence 2.3 Database Languages and Interfaces 2.4 The database system environment 2.5 Classification of DBMS	1. Describe the modelling concept of database, Data dependency, Database language and interfaces. 2. Explain the classification of DBMS	**6**
3	**E-R diagram :** 3.1 Defining relations, Entity Set 3.2 E-R Model concept with examples	1. Demonstrate knowledge of relational database concepts, entities/relations and entity relationship diagrams 2. Draw E-R diagrams	**4**
4	**SQL :** 4.1 Data Definition in SQL 4.2 Queries in SQL 4.3 Create, Update, Insert statement in SQL 4.4 Views in SQL 4.5 Specifying additional constraints as assertions 4.6 Specifying indexes	1.Demonstrate knowledge of querying relational database using SQL Commands.	**6**
5	**Functional Dependencies and Normalization for Relational Database:** 5.1 Functional dependencies 5.2 Normal forms based on primary keys 5.3 General definitions of second and third normal forms 5.4 BoyeCodd Normal Form	1. Analyze the status of a relation and demonstrate Normalization in order to avoid anomalies.	**5**
6	**Transaction processing concepts :**	1. Explain database transaction and	**3**

	6.1 Introduction to transaction processing 6.2 Transaction and system Concept 6.3 Desirable properties of transactions 6.4 Schedules and recoverability	its properties . 2. Explain the concept of schedules and its recoverability.	
7	**Concurrency Control Techniques :** 7.1 Basic Concepts; Concepts of Locks; live lock, dead lock, Serializability	1. Demonstrate Concurrency control techniques with special emphasis on locks.	**3**
8	**Security and Integrity :** 1.1 Security and integrity violation 1.2 Authorization 1.3 Authorization and Views 1.4 Granting of Privileges 1.5 Security specification in SQL 1.6 Encryption	1. Discuss briefly database security process and some techniques.	**4**
9	**Distributed databases :** 9.1 Principle of distributed database, data fragmentations, transparency, integrity, allocation of fragments, translation of global query to fragment query, concurrency control- elementary ideas	1. Describe the Basics of distributed database and basics of concurrency control technique of distributed database	**5**
	Internal Assessment		**3**

Practical

Intellectual skills :

- Reasoning and developing queries.
- Problem solving

Motor Skills :

- Proper use of computer and related software.

Lab Exercises :

1. **Introduction to Structured Query Language(SQL)**
   - **1.1** Data Definition Language(DDL)-Create, alter, drop table
   - **1.2** Data Manipulation Language(DML)-select, insert, update, delete
   - **1.3** Data Control Language-Grant, revoke

1.4 Creating and deleting Views, index

2. **Introduction to PL/SQL**
   - **2.1** Block structure, variable and types, looping constructs, Expression and operators, functions
   - **2.2** Cursors variable, cursor fetch, loops
   - **2.3** Procedure, functions, triggers
   - **2.4** Error handling and exceptions
   - **2.5** Composite data-types

3. **DBA function**
   - **3.1** Installation of software (RDBMS)
   - **3.2** Creation of database
   - **3.3** Routine maintenance of database
   - **3.4** Backup & Recovery of database
   - **3.5** Concepts of inet.ora

10: Distribution of Marks :

Unit	Topics	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Introduction to Database Management System	4	3	3	10
2	Database system concept and Application	4	3	3	10
3	E-R diagram	3		3	6
4	SQL	4	3	3	10
5	Functional Dependencies and Normalization fro Relational Database	2	3	3	8
6	Transaction processing concepts	2		3	5
7	Concurrency Control Techniques	2		3	5
8	Security and Integrity		3	4	7
9	Distributed databases	4		5	9
		25	15	30	70

11: Table of Specification :

Unit	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Introduction to Database Management System	6	14	√			
2	Database system concept and Application	6	14	√			
3	E-R diagram	4	10	√		√	
4	SQL	6	14	√		√	
5	Functional Dependencies and Normalization for Relational Database	5	12	√			
6	Transaction processing concepts	3	07	√			
7	Concurrency Control Techniques	3	07	√			
8	Security and Integrity	4	10	√			
9	Distributed databases	5	12	√			
Total		Σ b=42	100				

K = Knowledge C = Comprehension A =Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation) $c = \frac{b}{\Sigma b} * 100$

Detailed Table Of Specifications

Unit	Topic	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Introduction to Database Management System	4			4					3	3				3
2	Database system concept and Application	4			4					3	3				3
3	E-R diagram	3			3						1		2		3
4	SQL	4			4	1		2		3	1		2		3
5	Functional Dependencies and Normalization for Relational Database	2			2	3				3	3				3
6	Transaction processing concepts	2			2						3				3
7	Concurrency Control Techniques	2			2						3				3
8	Security and Integrity					3				3	4				4
9	Distributed databases	4			4						5				5

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

12: Suggested Implementation Strategies :

13: Suggested Learning Resources :

1. Fundaments of Database System- by Elmasri and Navathe
2. Database Management- by CJ Date
3. Principles of Database Systems- by John E. Hopcroft& Jeffrey D. Ullma
4. Developing personal oracle7 Application- by David Lockman
5. Oracle8 DBA handbook- by Kevin Loney

1: Course Title - Internet & Web Technology

2: Course Code –CO- 501

3: Semester- 5th

4: Aim of the Course :

- To Study the techniques to develop web communication services.
- To relate the interface between web servers and their clients
- To know the Web technologies used to support the world wide web

5: Course Outcome :

The students will be able to :

- State internet related technologies .
- Explain various protocols
- Explain the terms related to E-mail, Telnet, IRC, E-commerce
- Create static and dynamic web page using html, javascript, XML, PHP, JSP
- Explain the fundamentals of web hosting

6: Pre-requisites :

- Knowledge about client-server system.
- Basic terminologies used in internet

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total Hours per week
3	-	3	6

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	25	25
Pass Marks	33		17	

9: Detailed Course Content :

Unit	Topics/Sub-topics	Intended Learning Outcome	Hours
1.	**Internet Fundamentals :** 1.1 Motivation for internetworking History and scope of internet Internet protocol and standardization 1.4 Role of ISP & Factors for choosing an ISP 1.5 Internet Service providers in India 1.6 Types of connectivity such as Dial Up, Leased, VSAT etc. 1.7 Internet server and client modules on various operating systems	1. Define Internet. 2. Explain the role of Internet working. 3. Discuss about protocol 4. Explain the role & factors for choosing ISP 5. Discuss various types of ISP 6. Explain various types of connectivity.	**3**
2.	**TCP/ IP :** 2.1 TCP/IP internet layering model 2.2 Reliable stream transport service(TCP) 2.3 Need for stream delivery 2.4 Properties of reliable delivery service 2.5 Providing reliability 2.6 Idea behind slide windows 2.7 Ports connection and end points Segment, stream, sequence number 2.8 TCP segment format,TCP header 2.9 Acknowledgement and retransmission 2.10 Response to congestion 2.11 Establishment of a TCP connection 2.12 Closing TCP connection 2.13 TCP connection reset 2.14 Connectionless data gram delivery (Internet Protocol) 2.15 Concept of unreliable delivery service 2.16 Purpose of internet protocol,IP header 2.17 Routing in an internet 2.18 Direct and Indirect delivery 2.19 Table driven IP routing 2.20 Default routs 2.21 Benefits of TCP/IP 2.22 Subnet Address Extension 2.23 subnet Addressing 2.24 Minimizing network numbers 2.25 Transparent routers 2.26 Flexibility in subnet address assignment 2.27 Implementation of subnet with mask 2.28 Subnet mask representation 2.29User Data gram Protocol 2.30Introduction to UDP 2.31Format of UDP message 2.32Domain Name System Internet addressing 2.33 IP address/domain name address; 2.34Mapping of domain name to address 2.35 Domain name resolution	1. Describe the TCP/IP model 2. Explain the need for stream delivery & Properties of reliable delivery service 3. Discuss reliability of TCP 4. Explain sliding windows 5. Discuss the terminology of TCP/IP such as ports, end points, stream, sequence number 6. Describe TCP segment format ,TCP header. 7. Explain congestion 8. Explain TCP connection establishment, closing connection, connection reset. 9. Discuss Internet protocol 10. Discuss routing in an internet. 11. Explain Direct and Indirect delivery 12. Describe subnet addressing 13. Discuss subnet mask	**10**

3.	**Internet Application and Services :** 3.1 Email 3.2 Email networks 3.3 Email protocols 3.4 Format of an email address 3.5 Email routing 3.6 Email clients, POP3, IMAP 3.7 FTP 3.8 Public domain software 3.9 Types of FTP servers 3.10 FTP clients 3.11 Telnet 3.12 Telnet protocols 3.13 Server domain 3.14 Telnet clients 3.15 Terminal emulation 3.16 Internet Relay Chat 3.17 IRC network and servers 3.18 Channels	1. Define Email 2.Discuss Email protocol 3. Explain the format of an email address 4. Explain Email routing 5. Discuss about FTP 6. Discuss about telnet 7. Explain Terminal emulation 8. Discuss Internet Relay Chat	**4**
4.	**E-Commerce :** 4.1 Introduction to Electronic commerce 4.2 Modes of electronic commerce 4.3 Electronic data interchange 4.4 Migration to OPEN EDI 4.5 Electronic commerce with www/Internet 4.6 Different types of Electronics Payment System-Credit card, Debit card, Smart Card, E-Cash ,E-Wallet	1. Define E- Commerce 2. Explain various modes of E-Commerce 3. Explain EDI 4. Discuss different types of Electronics payment system	5
5.	**Web Publishing and Browsing :** 5.1 Overview, SGML,HTML 5.2 Web hosting 5.3 CGL, Documents Interchange Standards 5.4 Components of Web Publishing, Document management 5.5 Web Page Design, Consideration and Principles 5.6 Search and Meta Search Engines 5.7 WWW, Browser, HTTP, Publishing Tools	1. Discuss SGML, HTML 2. Explain Web hosting 3. Discuss web publishing 4. Discuss about web page Design 5. Explain Search and Meta search engine 6. Discuss about WWW, Browser, HTTP	10
6	**Interactivity Tools :** CGI, XML, ActiveX, VB Script, JAVA Script, Front Page, Adobe Dreamweaver, Flash	1. Discuss about some interactivity tools	10
	Internal Assessment		3

Practical

Intellectual Skills :

- Apply different logics to solve given problem.
- Write program using different implementations for the same problem

Motor Skills :

- Proper handling of Computer Systems.

Lab exercises :

Installation of network components under NT or 95/98/LINUX

- Installation of TCP/IP
- Installation of Intranet
- Configuration of one web server
- Deployment of HTML files in Intranet servers
- Creation of HTML pages, using tags
- Creation of tables and lists using HTML
- Creation of simple forms incorporating GUI components 9(command button, text box, radio button, check box, combo box) in HTML pages
- Frames in HTML
- Practical on different Internet services(WWW, Mail, FTP, Chat)
- Practical on Java script(Basics ,if else conditional statement, loop, function, event handler etc)
- PHP Basics, Web hosting and simple web application development
- JSP Basics

10: **Distribution of Marks :**

Unit	Topics	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Internet Fundamentals	**2**	**1**	**3**	**6**
2	TCP/ IP	**6**	**4**	**6**	**16**
3	Internet Application and Services	**3**	**2**	**4**	**9**
4	E-Commerce	**2**	**1**	**8**	**11**
5	Web Publishing and Browsing	**6**	**3**	**5**	**14**
6	Interactivity Tools	**6**	**4**	**4**	**14**
		25	**15**	**30**	**70**

11: Table of Specification :

Unit	Topic (a)	Time allotted in hours (b)	Percentage of weightage (c)	K	C	A	HA
1	Internet fundamentals	3	7%	✔			
2	TCP/IP	10	24%	✔	✔		
3	Internet Application & Service	4	9%	✔	✔	✔	
4	E-Commerce	5	12%	✔	✔		
5	Web Publishing & Browsing	10	24%	✔	✔	✔	
6	Interactivity Tools	10	24%	✔	✔		
	Total	∑b=42					

K= Knowledge C=Comprehension

A=Application HA=Higher then Application (Analysis, Synthesis, Evaluation)

$c = \frac{b}{\sum b} \times 100\%$

Detailed Table of Specification :

Unit	Topics (a)	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Internet fundamentals	2			2	1				1	3				3
2	TCP/IP	3	3		6	2	2			4	2	4			6
3	Internet Application & Service	3			3		2			2			4		4
4	E-commmerce	2			2	1				1	4	4			8
5	Web Publishing & Browsing	2	2	2	6		3			3		2	3		5
6	Interactivity Tools	3	3		6	2	2			4	4				4
7	Total				25					15					30

K= Knowledge C=Comprehension

A=Application HA=Higher then Application

T=Total

12: Suggested Implementation Strategies :

13: Suggested Learning Resources :

1. Internet working with TCP/IP VOl-1 : Principles Protocol and Architecture by-Douglas E Comer -PHI
2. Internet working with TCP/IP VOL-2 : Design , Implementation and Internals by- Douglas E Comer, David L. Stevens- PHI
3. HTML: the Definitive guide –lby Chuck Musciano& Bui Kennedy
4. Learning PHP, MySQL & JavaScript with jQuery, CSS & HTML5 by Robin Nixon
5. JSP 2.0: The Complete Reference, Second Edition by Phillip Hanna
6. PHP and MySQL Training Guide by Ramesh Bangia

1: Course Title - JAVA Programming

2: **Course Code** – CO- 505

3: **Semester**- 5th

4: **Aim of the course :**

- To Understand the object oriented programming Approach
- To know how the internet works
- To develop gui based offline/online software

5: **Course Outcome** :

On completion of the course, students will be able to :

- Describe the object oriented programming Approach
- Write programs in object oriented programming language JAVA
- Develop software (both offline and online) using the concept of OOPS(java).

6: **Pre-requisites :**

- Knowledge of c/c++
- OOPs concepts
- Network concept

7: **Teaching Scheme** :

Teaching Scheme			
L	T	P	Total hours per week
2	-	3	5

8: **ExaminationScheme :**

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	25	25
Pass Marks	33		17	

9: Detailed Course Content :

Unit	Topic/Sub-topic	Intended Learning Outcome	Hours
1	1. **Introduction to object oriented methodology :** 1.1 object oriented approach 1.2 need of object oriented programming	23. Explain object oriented concept. 24. Distinguish between structured oriented and object oriented approach. 25. Define benefits of oop.	**1**
2	**Introduction to Java :** 2.1 Features Of Java 2.2 Java distributions 2.3 Differences between C,C++, Java 2.4 Java Architecture 2.5 JVM Architecture 2.6 Difference between JRE, JDK and JVM 2.7 your First Java Program	26. Explain various features of Java.. 27. Differentiate between c++ and java. 28. Explain java and JVM architecture. 29. Use of IDE . 30. Write a small JAVA program.	**2**
3	**Implementation of java features :** 3.1 Class, object,data types, array,matrix,string,members, access specifiers 3.2 inheritance,types of inheritance, polymorphism, types of polymorphism etc	31. Use of class and objects in Java. 32. Use of array, string handling. 33. Explain inheritance and polymorphism.	**9**
4	**Package :** 4.2 importance of package 4.2 implementation of package 4.3 setting up of classpath for package	34. Define and implement of package .	**2**
5	**Java I/O :** 5.1 different built_in classes for file handling in java 5.2 creation & deletion of directory 5.3 creation of files, copying of files, transferring of files etc	35. Handle the various I/O operations . 36. Create , delete and copy of files and directories.	**4**
6	**Exception Handling :** 6.1 importance of exception handling 6.2 try-catch-finally block	**37.** Handle exceptions in java .	**1**

7	**MultiThreaded Programming :** 7.1 Thread, difference between single threaded and multithreaded programming 7.2 Implementation of multithreaded programming through simple programs	38. Explain thread concept. 39. Differentiate between single and multithreaded program. **40.** Write multithreaded program.	**4**
8	**Network Programming :** 8.1 implementation of TCP/IP and client-server model based simple network programming	41. Write client server program .	**5**
9	**GUI Programming :** 9.1 Basics of AWT and Swing 9.2 Difference between AWT and Swing 9.3 Creation of simple GUI programs such Applet etc.	42. Explain GUI programming concept. 43. Use AWT and Swing in java.	**10**
10	**Database connectivity with JDBC :** 10.1 concept of database connectivity 10.2 JDBC VS ODBC 10.3 Management of database(mysql/oracle) using simple java swing	44. Connect java program with database (Mysql/ Oracle)	**4**
	Internal Assessment		**3**

Intellectual skills :

- Use of programming language constructs in program implementation.
- Apply different logics to solve given problem.
- Write program using different implementations for the same problem
- Debugging

Motor skills:

- Proper handling of Computer System.

Lab Exercises :

1. Implementation of inheritance & polymorphism
2. Implementation of the concept of package and setting up of classpath
3. File handling -creation & deletion of directory, creation of files, copying of files, transferring of files etc
4. Handling of Exception
5. Implementation of Multithreaded programming through simple programs
6. Implementation of the concept of TCP/IP based client-server model

7. Creation of GUI based simple programs
8. Implementation of JDBC through simple programs

10: Distribution of Marks :

Unit	Topic	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Introduction to object oriented methodology	2	-	-	2
2	Introduction to Java	1	2	-	3
3	Implementation of java features	5	5	5	15
4	Package	1	2	-	3
5	Java I/O	2	-	5	7
6	Exception Handling	2	-	-	2
7	Multithreaded Programming	2	-	5	7
8	Network Programming	2	1	5	8
9	GUI Programming	6	5	5	16
10	Database connectivity with JDBC	2	-	5	7
		25	15	30	70

11: Table of Specification :

Unit	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Introduction to object oriented methodology	1	2	✓			
2	Introduction to Java	2	5	✓	✓		
3	Implementation of java features	9	21	✓	✓	✓	
4	Package	2	5	✓	✓		
5	Java I/O :	4	10	✓	✓	✓	
6	Exception Handling	1	2	✓	✓		
7	Multi Threaded Programming	4	10	✓	✓	✓	
8	Network Programming	5	12	✓	✓	✓	
9	GUI Programming	10	23	✓	✓	✓	
10	Database connectivity with JDBC	4	10	✓	✓	✓	
Total		Σ b=42	100				

K = Knowledge C = Comprehension A =Application HA = Higher Than Application (Analysis, Synthesis, Evaluation)

$$c = \frac{b}{\Sigma b} * 100$$

Detailed Table of Specification

Unit	Topic	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	**Implementation of java features**	2			2										
2	**Package**	1			1		2			2					
3	**Java I/O :**	2	3		5	2	3			5		5			5
4	**Exception Handling**	1			1		2			2					
5	**Multi Threaded Programming**	2			2							5			5
6	**Network Programming**	2			2										
7	**GUI Programming**	2			2								5		5
8	**Database connectivity with JDBC**	2			2		1			1			5		5
9	**Implementation of java features**	3	3		6	2	3			5			5		5
10	**Package**	2			2								5		5

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

12: Suggested Implementation Strategies :

Students are to be asked to create database based online/offline simple system on different topics

13: Suggested Learning Resources :

1. **Java: The Complete Reference (Latest Edition)**
2. Java Programming Language*By Ken Arnold, James Gosling, David Holmes*
3. Programming With Java:A Primer 3E by E. Balaguruswamy
4. Different websites providing lecture notes/ppt/pdf on java

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5: Course Title - Operating System

2: Course Code – CO- 504

3: Semester- 5th

4: Aim of the course :

- To learn basic concepts of OS
- To learn all functionalities of OS
- To learn different types of OS.

5: Course Outcome :

On completion of the course students will be able to :

- Explain the functions of an Operating System
- Solve problems related to Process scheduling.
- Solve problems related to page replacement.
- Analyse different OS's w.r.t. the implementation of the functions.

6: Pre-requisite :

- Handling of Windows OS
- Uses of OS and its application

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total Hours per week
3	-	3	6

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	25	25
Pass Marks	33		17	

9: Detailed Course Content:

Unit	Topics/Sub-Topics	Intended Learning Outcomes	Hours
1	**Introduction :** **1.1** Definition and History of OS **1.2** Concepts **1.3** Structure	1. Define Operating System 2. Discuss various functions of operating system. 3. Differentiate betweentime sharing (multitasking) and multiprogramming.	2
2	**Processes :** **2.1** Definition of process and Thread **2.2** Inter-process Communication (IPC) **2.3** Process coordination - synchronisation **2.4** Classical Problem of Synchronization **2.5** Process Scheduling	4. Define process, thread, scheduling, critical section problem, semaphore and monitor. 5. Discuss various features of processes including IPC. 6. Describe the differences among short term, medium term, and long term scheduling. 7. Solve classical problem of synchronisation using semaphore and monitor.	5
3	**Process Scheduling Algorithm :** 3.1 Resident Monitor (Single User) 3.2 Multiuser System 3.3 Time sharing System 3.4 FCFS 3.5 Round Robin fashion / Time Quantum Concept 3.6 Multiple queues 3.7 Priority queues 3.8 Shorted Job First	8. Define resident monitor. 9. List out the scheduling criteria. 10. Explain various CPU scheduling algorithm viz. FCFS, SJF, Round Robin, Priority, and Multiple queue taking suitable example . 11. Differentiate between preemptive and non-preemptive scheduling.	6
4	**Memory Management :** 4.1 Resident Monitor 4.2 Multiple Partition 4.3 Garbage Collection and Compaction 4.4 Page Memory Management 4.5 Page replacement Algorithm 4.6 Swapping 4.7 Segmentation 4.8 Segmented page memory management	12. Define virtual memory, page fault, thrashing, and swapping. 13. Discuss various memory management techniques, including segmentation and paging. 14. Differentiate between (i) Internal and external fragmentation, (ii) Physical address and logical	8

	4.9 Demand page memory management 4.10 Virtual Memory	address, (iii) Paging and segmentation. 15. Explain the concept of demand paging, page replacement algorithms and allocation of frames.	
5	**File System :** 5.1 Concept of file and directories 5.2 File system Implementation 5.3 Security Issues in File 5.4 Protection Mechanism 5.5 Case Studies of UNIX file system	16. Define file. 17. List different file attributes. 18. Explain the basic operations that can be performed on files. 19. Discuss various file access methods. 20. Discuss directory structures and file system protection. 21. Explain various methods of allocating disk space. 22. Compare various approach of free-space management.	5
6	**Input/output :** 6.1 Principles of I/O Hardware 6.2 Principles of I/O Software 6.3 Disk 6.4 Clocks 6.5 Serial and Parallel port Access 6.6 Terminal Access	23. Define disk, clocks, and port 24. Discuss various disk scheduling algorithm. 25. State the principles of I/O Hardware and software	4
7	**Device Management :** 7.1 Techniques of Device Management – Dedicated, shared and Virtual 7.2 Device Allocation Consideration, I/O traffic Control and I/O Schedule ,I/O device handlers 7.3 Spooling	26. Define caching, spooling, and buffering . 27. Explain various steps in DMA transfer . 28. Discuss the basic interrupt mechanism.	4
8	**Deadlocks :** 8.1 Concepts of Deadlock 8.2 Resources 8.3 Deadlock prevention: Ostrich Algorithm, Banker Algorithm and safety Algorithm 8.4 Deadlock Detection and Recovery	29. Define deadlock and safe state. 30. List necessary conditions for occurrences of deadlock. 31. Discuss various methods of handling deadlock. 32. Explain Banker's algorithm.	5
9	**Distributed OS** 9.1 Definition and types of distributed OS 9.2 WorkStation Server Model	33. Defined distributed OS. 34. Discuss advantages and disadvantages of various models of	3

	9.3 The Processor Pool Model 9.4 The Hybrid Model 9.5 Case study: SUN NFS File Server	distributed system. 35. Differentiate between monolithic kernel and micro kernel. 36. Explain major issues in designing distributed OS.	
	Internal Assessment		**3**

Practical

Intellectual Skills :

- Logical reasoning
- Problem solving

Motor skills :

- Proper handling of computer systems and peripherals.

Lab exercises :

I. **Overview Of UNIX/LINUX**
UNIX as an OS, Kernel, Shell and User, UNIX File System, File and Directories, Access Permission, file System Hierarchy

II. **Basic UNIX/LINUX Commands**
Listing of files and directories, copying, Deletion, Renaming, and Comparing files, Creation, Navigation and Removing Directories, Access Permission of files and directories, Editors in UNIX, Status of users, terminals, date and time, Displaying blown-up message, paging and Printing of files, background Jobs.

III. **Advance Feature of UNIX/LINUX**
I-nodes, Trees, Pipes and Filter, Cutting, Pasting and sorting of files, Searching for a pattern in a string

IV. **Programming with the Shell**
System variable and shell variable, Interactive Shell Scripts, Shell Termination, Conditional Statements, Looping statement, Special parameters in Shell Computation and string handling.

10: Distribution of Marks:

Unit	Topic	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	**Introduction**	**2**	**2**		**4**
2	**Processes**	**4**	**4**		**8**
3	**Process Scheduling Algorithm**	**4**		**5**	**9**
4	**Memory Management**	**3**	**5**	**5**	**13**
5	**File System**	**3**		**5**	**8**

6	**Input/output**	**2**		**5**	**7**
7	**Device Management**	**3**	**4**		**7**
8	**Deadlocks**	**3**		**5**	**8**
9	**Distributed OS**	**1**		**5**	**6**
		25	**15**	**30**	**70**

11: Table of Specification

Unit	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	**Introduction**	2	5	✓	✓		
2	**Processes**	5	12	✓	✓		
3	**Process Scheduling Algorithm**	6	14	✓	✓	✓	
4	**Memory Management**	8	18	✓	✓		
5	**File System**	5	12	✓	✓	✓	
6	**Input/output**	4	10	✓		✓	
7	**Device Management**	4	10	✓	✓		
8	**Deadlocks**	5	12	✓	✓	✓	
9	**Distributed OS**	3	7	✓			
Total		Σ b = 42	100				

K=Knowledge C= Comprehension A=Application

HA= Higher Than Application (Analysis,Synthesis,Evaluation)

c= (b/Σ b) x 100

Detailed Table of Specification

Unit	Topic	OBJECTIVE TYPE				SHORT TYPE					DESCRIPTIVE				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	**Introduction**	**2**			**2**		**2**			**2**					
2	**Processes**	**2**	**2**		**4**	**2**	**2**			**4**					
3	**Process Scheduling Algorithm**	**2**	**2**		**4**								**5**		**5**

4	**Memory Management**	**1**	**2**		**3**	**2**	**3**			**5**		**5**			**5**
5	**File System**	**1**	**2**		**3**								**5**		**5**
6	**Input/output**	**2**			**2**								**5**		**5**
7	**Device Management**	**1**	**2**		**3**	**2**	**2**			**4**					
8	**Deadlocks**	**1**	**2**		**3**								**5**		**5**
9	**Distributed OS**	**1**			**1**							**5**			**5**
Total					**25**					**15**					**30**

K=Knowledge C=Comprehension A=ApplicationHA=Higher Than ApplicationT = Total

12: Suggested Implementation Strategies:

13: Suggested Learning Resources:

1. Operating System –Madnick and Donovan- MGH
2. Operating System Concepts –A. Silberschatz and P. Galvin –ADP
3. The UNIX Programming Environment – by Kernighan & Pike –PHI
4. UNIX – concepts & Application – by Sumitabha Das

6: Course Title - Visual Programming

2: Course Code – CO- 506

3: Semester- 5th

4: Aim of the Project:

- to understand the .net framework, vb.net,asp.net etc
- mastering windows forms
- realisation of OOPS using .net

5: Course Outcome :

On completion of the course, students will be able to :

- Explain the .Net architecture.
- Implement Object oriented methodology with VB.net
- Develop programs using ASP.net

6: Pre-requisites :

- Concept of computer programming paradigms
- OOPs concept
- Data structure concept
- Networking concept

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total Hours per week
2		3	5

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	35	15	25	25
Pass Marks	17		17	

Intellectual Skills :

- Students will be able to develop GUI and database based applications for different projects.

9: Detailed Course Content :

Unit	Topics/Sub-topics	Intended Learning Outcome	Hours
1	**Introduction to .NET** .NET framework, MSIL, CLR, CLS, Name Spaces, Assemblies The Common Language Implementation | Assemblies | Metadata and Intermediate Language| Garbage Collection | Versioning and Side-by-Side Execution | The End to DLL Hell | Managed execution | COM InterOp	45. Explain .NET Framework. 46. Define various terms used in .NET environment .	**5**
		47.	
2	**VB .NET** Language features | Creating .NET Projects | NameSpaces | Data Structure and Language Highlights | Classes and Inheritance | Structured Error Handling | Exploring the Base class Library | Compatibility with VB6 | The .NET Type System | Threads | C#	48. Create a .NET project . 49. Explain class , inheritance , various data structures used . 50. Describe the concept of error handling .	**3**
3	**Introduction to Windows Forms** Benefits of Windows Forms | Windows Forms compared to the classic VB 'Ruby' Forms mode | .NET Events | Visual Inheritance | Code-free re-sizing | Using Activex Controls	51. Define the benefits of forms. 52. Use ActiveX controls .	**3**
4	**Introduction to ADO.NET** Benefits of ADO.NET | ADO.NET compared to classic ADO | DataSets | Managed Providers | Data Binding, DataSets and XML | Typed Datasets	53. Explain the benefits of ADO.NET. 54. Explain the concepts of Data binding, XML etc.	**3**

5	**Data types and Base Class Libraries** Understanding .NET Data Types | Exploring Assemblies and NameSpaces | String Manipulation | Files and I/O | Collections | The Microsoft Visual Basic NameSpace	55. Explain string manipulation. 56. Work with file and I/O.	**4**
6	**Object Oriented Programming with VB.NET** Creating Classes in VB.NET | Overloading | Constructors | Inheritance | Controlling scope and visibility | Dispose and Finalization | Debugging and Error Handling	57. Create classes in VB.NET. 58. Use the concepts of overloading, constructors and inheritance. 59. Debug a program. 60. Handling error in programs.	**5**
7	**Visual Inheritance** Apply Inheritance Techniques to Forms | Creating base Forms | Programming derived Forms	61. Apply inheritance to forms. 62. Create base and derived forms.	**3**
8	**ASP.NET** Introduction to ASP.NET, working with Controls, Using Rich server Controls Accessing Data, Overview of ADO.NET | Connecting to Data | Executing Commands | Working with data | Choosing an ADO.NET provider | Configuration Overview | Using the website Administration Tool | Programming Configuration Files | Encrypting Configuration Sections	63. Use Rich server controls. 64. Use Website Administration tools.	**2**
	Internal Assessment		**2**

Practical

Intellectual Skills :

- Logical reasoning
- Problem solving
- GUI Application Designing.

Motor skills :

- Proper handling and designing of computer database management systems .

Lab exercises :

I. **Getting Started -**
   a. Getting started with VB.NET, Visual Basic .NET Forms, Add Controls using the Toolbox, Adding a Textbox to the Form, Saving your work, Create a New Project, variable, Add a coding button to the Form, Writing first .NET code, String Variables

II. **Conditional Logic and loops –**
   a. If Statement, Select Case Statements, The Conditional Operators, Introduction to Loops in VB .NET, for loop, do loop, program using loops.

III. **Adding menus to Forms -**
   a. Add a menu to a VB .NET Form, add code to a Menu, add a Sub Menu to a Form, VB .NET menu Project, Cut, Copy, Paste and Undo menus, Show and Hide Controls, Insert Images into a Picture Box, Add a Checkbox to a VB .NET form, Writing code for Checkboxes, Add Option Buttons to a VB .NET form.

IV. **Debugging Code -**
   a. Error Handling and Debugging in VB .NET, Design Time Errors, Run Time Errors, Try ... Catch in VB .NET, Logic Errors, Breakpoints and Debugging tools.

V. **Arrays and String manipulation** -
   a. Array, assigning values to array, String variable type, Use Trim Method, difference between char and char(), use the InStr Method, use the Substring Method, Equals, Replace and Insert Methods, use Split and Join in VB .NET

VI. **Functions , Subs and Events-**
   a. Introduction to Functions and Subs, Create own Subs in VB .NET, ByVal and ByRef in VB .NET, Create a Function in VB.NET, Click Event, MouseDown Event, KeyDown Event, Form Load Event.

VII. Classes , Objects, Inheritance -

a. Introduction to Classes and Objects, Create own Classes in VB .NET, How to Create Methods in Classes, Create Properties in Classes, inheritance.

VIII. VB .NET and Databases –

a. VB.NET Express and Databases, the Database Wizard in VB NET Express, Write own VB .NET database code, Learn about DataSets and Data Adaptors, Display the Data in the DataSet, Navigate a Database with VB .NET, Add, Update and Delete Records,

IX. VB.NET and Forms –

a. Anchor and Dock Controls on a Form, Add a Toolbar to a Form, Creating Multiple Forms in VB .NET, Modal and Non Modal Forms, Getting at Values on Other Forms.

10: Distribution of Marks :

Unit	Topics	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Introduction to .NET	2	-	-	2
2	VB .NET	1	2		3
3	Introduction to Windows Forms	3	2		5
4	Introduction to ADO.NET	3	2		5
5	Data types and Base Class Libraries			5	5
6	Object Oriented Programming with VB.NET			5	5
7	Visual Inheritance	3	2		5
8	ASP.NET			5	5
		12	08	15	35

11: Table Of Specifications

Unit	Topics (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Introduction to .NET	5	18	✓			
2	VB .NET	3	11	✓	✓		
3	Introduction to Windows Forms	3	11	✓	✓	✓	
4	Introduction to ADO.NET	3	11	✓	✓		
5	Data types and Base Class Libraries	4	13	✓	✓	✓	
6	Object Oriented Programming with VB.NET	5	18	✓	✓	✓	

7	**Visual Inheritance**	3	11	✓	✓		
8	**ASP.NET**	2	7	✓	✓	✓	
Total		Σ b=28	100				

K = Knowledge C = Comprehension A =Application HA = Higher Than Application (Analysis, Synthesis, Evaluation)

$$c = \frac{b}{\Sigma b} * 100$$

Detailed Table Of Specifications

Unit	Topic	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	**Introduction to .NET**	2			2										
2	**VB .NET**	1			1	2				2					
3	**Introduction to Windows Forms**	2	1		3		2			2					
4	**Introduction to ADO.NET**	2	1		3		2			2					
5	**Data types and Base Class Libraries**											5			5
6	**Object Oriented Programming with VB.NET**											5			5
7	**Visual Inheritance**	2	1		3		2			2					
8	**ASP.NET**											5			5

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

12: Suggested Implementation Strategies :

Students are to be asked to create forms and connection with database based online/offline simple system on different topics.

13: Suggested Learning Resources :

1. Bradley, Julie C. And Anita C. Millspaugh. PROGRAMMING VISUAL BASIC 2008 Edition 7th Edition, Boston, MA: McGraw-Hill/Irwin,
2. Professional VB.NET 3.0, Wrox publication by Bill, Billy Tim, Kent and Bill Sheldon.
3. ASP.NET complete reference, publication Tata McHill
4. Introducing Microsoft Visual Basic 2005 for Developers, Microsoft publications
5. Professional ASP.NET 2.0, Wrox Publication.

7: Course Title - VLSI & Embedded System

2: Course Code – CO- 507

3: Semester- 5th

4: Aim of the Course:

- To learn the technology of VLSI
- To understand embedded systems

5: Course Outcome:

On completion of the course, Students will be able to :

- Describecutting edge technology in VLSI design and embedded systems
- Explain architecture principles leading to VLSI design.
- Develop solutions with good scientific and engineering knowledge so as to comprehend, analyze, and design.

6: Pre-requisites :

- Fundamentals of digital electronics.

7: Teaching Scheme:

Teaching Scheme			
L	T	P	Total hours per week
3	-	-	3

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	-	-
Pass Marks	33		-	

9: Detailed Course Content:

Unit	Topics/Sub topics	Intended Learning Outcome	Hours
1	**VLSI Design** 1.1 Introduction to VLSI, design styles and parameters, popular technologies. 1.2 Logic implementation with NMOS, CMOS, & PLA. 1.3 Passvs transistor logic, transit time, clocking, scaling, PLA minimization & folding. 1.4 Testing & testability issues. 1.5 Physical design Algorithms: partitioning, floor, planning &placement, routing,compaction, gate arrays, EPGAs . 1.6 Data structure for layout design magic 1.7 Design rule checking, symbolic layout, complexity of layout algorithms	65. Define VLSI and its design styles and related technologies 66. Conceptualise the implementation with NMOS, CMOS & PLA. 67. Distinguish between Pass, transistor logic, transit time, clocking, scaling, PLA minimization and folding. 68. Define Testing and know the idea of testability. 69. State the data structure of Layout design and its rule of design	**26**
2	**Embedded Systems** 2.1 Introduction to embedded systems, architecture of embedded systems, design mythologies. 2.2 Real time issues- modelling, specification, communication, scheduling, protocols etc. 2.3 Hardware and Software partitioning, approaches to software and code generation, operating issues, memory and low power issues, validations approach, distributed embedded system.	70. Define embedded system its architecture and design issues. 71. Explain the issues of modelling specification, communication, scheduling protocols. 72. Implementation of hardware and software partitioning, software code generation, issues of operations, memory and low power issue. 73. Explain concept of distributed embedded system.	**16**
	Internal Assessment		**3**

10: Distribution of Marks:

Chapter No.	Chapter Title	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	**VLSI Design**	**15**	**9**	**18**	**42**
2	**Embedded Systems**	**10**	**6**	**12**	**28**
		25	**15**	**30**	**70**

11: Table of Specification :

Unit	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	**VLSI Design**	26	62	✓			
2	**Embedded System**	16	38	✓		✓	
Total		Σ b=42	100				

K = Knowledge C = ComprehensionA = Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation) c = $b/\sum b * 100$

Detailed table of Specification :

Unit	Topic	Objective				Short					Essay				
		K	C	A	T	K	C	A	Ha	T	K	C	A	Ha	T
1	**VLSI**	15			15	9				9	18				18
2	**Embedded system**	6		4	10	3		3		6	7		5		12
					25					15					30

K =Knowledge, C =Comprehension , A =Application, HA =Higher Than Application, T = Total

12: Suggested Implementation Strategies:

13: Suggested Learning Resources:

1. Introduction to VLSI System- by C. Mead & L. Conway- Addition Wesley
2. Introduction to VLSI Design- by Fabricus – Prentice Hall
3. Layout Design & Verification by T. Ohtsuki – North Holland
4. Algorithms for VLSI physical design automation by N. Sherwani

5. An Introduction to VLSI Physical Design- By M. Sarafzadeh& C.K Wong-MHI
6. Hardware Software Co design of embedded Systems- by FalfNiemannkluwer Academic
7. Design principles of Distributed Embedded Application –by Hermann Kopez- Kluwer Academic
8. Real time Design by Levi & Agarwal – MH

8: Course Title – Professional Practice - III

2: Course Code – CO- 510

3: Semester- 5th

4: Aim of the Course :

- To introduce to the recent developments in the areas covered in this semester.
- To improve communication skill.

5: Course Outcome :

On completion of the course students will be able to :

- Express themselves in discussions.
- Identify the recent developments in relevant areas.
- Collect information
- Write reports

6: Pre-requisites :

- Basic knowledge in the subjects covered in the semester.

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total hours per week
1	-	2	3

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	-	-	25	25
Pass Marks	-		17	

9: Detailed Course Content :

1.	**Industrial Visits :** Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the team work. The industrial visits may be arranged in the following areas/ industries: • TV centre/Film making studio/industry • Visit to higher learning institutions • Visit to organization having super computer set-up.	**8**
2.	**Lectures by professional / Industrial Expert lectures to be organized from any three of the following areas:** • Soft Skills (interview technique, personality development) • Digital marketing (Payment Gateway, Smart System) • Scope of Computer Maintenance in Medical Science • Environmental awareness • CCNA	**6**
3.	**Information Search** Information Search can be done through manufacture's catalogue ,websites ,magazines ,books etc. and submit a report any one topic. Following topics are suggested: • Browsers • Search Engine • Motherboard • Peripherals • Sensors • Transmission Media • Operating systems • Cloud computing	**6**
4.	**Seminar** Students are to present seminar on topics related to the subjects of third and fourth semester. Each student shall submit a report of at least 10 pages. Mini Project / Activities: (any one) • Distributed Database • Peripheral chip interfacing • Phases of compiler design • Flip Flops, Registers & counters. • Firewalls.	**10**

COURSE STRUCTURE, 6TH SEMESTER

COURSE STRUCTURE OF 6th SEMESTER (Computer Engineering)

Sl No	Code No.	Subject	Study Scheme (Contact hours/week)			Evaluation Scheme									
						Theory					Practical			Total Marks(Theory+Practical)	Credit
			L	T	P	ESE	Sessional (SS)			Pass(ESE+SS)	Practical Test (PT) #	Practical Assessment(PA) @	Pass (PT+PA)		
							TA	HA	Total (TA+HA)						
1	Hu-601	Industrial Management & Entrepreneurship	3			70	10	20	30	33/100				100	3
2	CO-601	Mobile Computing	3	1	3	70	10	20	30	33/100	25	25	17/50	150	5
3	CO-602	Crytography and Network Security	3		3	70	10	20	30	33/100	25	25	17/50	150	4
4	CO-603	Software Engineering	3			70	10	20	30	33/100				100	3
5	CO-611	Project & Seminar		1	6						100	50	50/150	150	3
6	CO-612	General Viva		2							50		17/50	50	2
7	CO-610	Professional Practice- IV	1		2						25	25	17/50	50	2
8			Elective (Any One)												
A	CO-604	Parallel Processing	3			70	10	20	30	33/100				100	3
B	CO-605	Graph Theory & Combinatorics	3			70	10	20	30	33/100				100	3
C	CO-606	Artificial Intelligence	3			70	10	20	30	33/100				100	3
		Total	17	3	14									850	25
			34												

1.Course Title :Industrial Management and Entrepreneurship

1. Course Code: **Hu – 601**
2. Semester: **VI**
3. **Aim of the Course:**
    1. To acquaint the students with managerial activities
    2. To provide introductory knowledge of Cost Accounting
    3. To introduce students with industrial legislation
    4. To explain the scope for self-employment
    5. To compare and contrast different forms of business organization
    6. To identify the opportunities to start a small scale industry
4. **Course Outcomes**:

    On completion of the course on IME, students will be able to

    - CO_1 = explain managerial activities.
    - CO_2 = describe leadership qualities and decision making process.
    - CO_3 = state the elements of costs.
    - CO_4 = explain important industrial laws.
    - CO_5 = define different forms of business organisations
    - CO_6 = identify entrepreneurial abilities for self employment through small scale industries.

5. **Teaching Scheme (in hours)**

Lecture	Tutorial	Practical	Total
42 hrs	**3 hrs**	**--**	**45 hrs**

6. **Examination Scheme:**

Theory				Practical				Total Marks
Examination Full Marks	Sessional Full Marks	Total Marks	Pass Marks	Examination		Sessional		
70	30	100	33	--	--	--	--	100

7. **Detailed Course Content**:

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
				42 hrs
1.0	**Introduction to Management :**	i) Meaning and Concept ii) Functions of Management iii) Principles of Management	i) Explain functions and principles of management	3
2.0	**Leadership Decision Making & Communication :**	i) Definition of Leader ii) Functions of a leader iii) Decision making – Definition iv) Decision making process v) Communication – definition, importance & types	i) Develop leadership qualities ii) Demonstrate decision making abilities	4
3.0	**Introduction to Cost :**	i) Definition and classification of Cost ii) Elements of Cost iii) Break Even Analysis	i) State elements of costs ii) Explain Break Even Analysis	3

4.0	**Human Resource Management:**	i) Meaning of manpower planning ii) Recruitment and Selection procedure iii) Payment of wages – factors determining the wage iv) Methods of payment of wages – Time rate and Piece rate v) Labour Turnover – definition, its causes, impact and remedy	i) State selection procedure of employees ii) Distinguish Time rate and Piece rate system of wage payments iii) Explain causes and impact of labour turnover	5
5.0	**Industrial Legislation :**	i) Need of Industrial legislation ii) Indian Factories Act – 1948 – Definition of Factory, main provisions regarding health, Safety and Welfare of Workers iii) Industrial Dispute Act – 1947 – Definition of Industrial dispute, Machineries for settlement of Industrial dispute in India	i) Identify the needs and importance of industrial laws	5
6.0	**Production Management :**	i) Meaning of Production ii) Production Management – definition, objectives, functions and scope iii) Inventory Management, Basic idea	i) State the objectives and functions of Production management	3
7.0	**Marketing Management:**	i) Meaning and functions of marketing ii) e- Commerce iii) Channels of distribution iv) Wholesale and retail trade	i) state the functions of wholesalers and retailers	2

8.0	**Entrepreneur and Entrepreneurship:**	i) Definition of Entrepreneur and Entrepreneurship ii) Qualities required by an entrepreneur iii) Functions of an entrepreneur iv) Entrepreneurial motivation	i) State the qualities and functions of an entrepreneur	3
9.0	**Forms of Business Organization:**	i) Sole Trader – meaning, main features, merits and demerits ii) Partnership – definition, features, merits and demerits iii) Joint Stock Company – Definition, types, features, merits and demerits	i) Differentiate different forms of Business organization ii) compare and contrast features, merits and demerits of different business organizations.	5
10.0	**Micro and Small Enterprises:**	i) Definition of Micro & Small enterprises ii) Meaning and characteristics of Micro and Small enterprise iii) Scope of SSI with reference to self-employment iv) Procedure to start SSI – idea generation, SWOT analysis v) Selection of site for factories	i) Define micro and small enterprises ii) Explain the procedure to start a small enterprise	4
11.0	**Support to Entrepreneurs**	a) Institutional support: i) Introduction ii) Sources of information and required application forms to set up SSIs iii) Institutional support of various National & State level organizations – DICC, NSIC, IIE, MSME - DI, Industrial Estates	i) identify the supporting agencies to entrepreneurs ii) Explain the role of financial support	5

			organizations	
		b) Financial support: i) Role of Commercial banks, RRB, IDBI, ICICI, SIDBI, NEDFi, and State Financial Corporations ii) Special incentives and subsidies for Entrepreneurship Development in the North East		
	Class Test			3 hrs
	Total			**45 hrs**

(9) TABLE OF SPECIFICATIONS for Industrial Management & Entrepreneurship

Sl. No	Topic (a)	**Time allotted in hours (b)**	**Percentage Weightage (c)**	**Knowledge**	**Compre-hension**	**Application**	**HA**
1	Introduction to Management	3	7	2	3	0	0
2	Leadership & Decision Making	4	9.5	3	4	0	0
3	Introduction to Cost	3	7	3	2	0	0
4	Human Resource Management	5	12	6	2	0	0
5	Industrial Legislation	5	12	4	4	0	0
6	Production Management	3	7	3	2	0	0
7	Marketing	2	5	4	0	0	0

	Management						
8	Entrepreneur & Entrepreneurship	3	7	3	2	0	0
9	Forms of Business Organization	5	12	3	5	0	0
10	Micro & Small Enterprises	4	9.5	4	3	0	0
11	Support to Entrepreneurs	5	12	4	4	0	0
Total		**42**	**100**	**39**	**31**	**0**	**70**

K = Knowledge C = Comprehension A = Application HA = Higher Than Application (Analysis, Synthesis, Evaluation) $C = \frac{b}{\sum b} \times 100$

10.Distribution of Marks:

DETAILED TABLE OF SPECIFICATIONS FOR IME

Sl. No	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE					Grand Total
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T	
1	Management	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**3**	**0**	**0**	**3**	5
2	Leader &Decision	**1**	**0**	**0**	**1**	**2**	**1**	**0**	**0**	**3**	**0**	**3**	**0**	**0**	**3**	7
3	Cost	**1**	**1**	**0**	**2**	**2**	**1**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	5
4	HRM	**2**	**1**	**0**	**3**	**1**	**1**	**0**	**0**	**2**	**3**	**0**	**0**	**0**	**3**	8
5	Laws	**3**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**0**	**0**	**5**	8
6	Product Manage	**2**	**1**	**0**	**3**	**1**	**1**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	5
7	Market	**2**	**0**	**0**	**2**	**2**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	4
8	Entrepreneurship	**1**	**1**	**0**	**2**	**2**	**1**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	5

9	Forms of BO	**2**	**1**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**0**	**0**	**5**	8
10	MSME	**2**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**3**	**0**	**0**	**5**	7
11	Support to Entp.	**3**	**0**	**0**	**3**	**1**	**0**	**0**	**0**	**1**	**0**	**4**	**0**	**0**	**4**	8
	Total	**20**	**5**	**0**	**25**	**12**	**5**	**0**	**0**	**17**	**7**	**21**	**0**	**0**	**28**	**70**

K = Knowledge C = Comprehension A = Application

HA = Higher Than Application Higher than Application (Analysis, Synthesis, Evaluation) Total

10. Suggested implementation Strategies: Modified syllabus may be implemented with effect from January, 2020 (Starting with the present batch (2018) of 2nd Semester students)

11. Suggested learning Resource:

a. **Book list** :

Sl. No.	**Title of Book**	**Name of Author(s)**	**Publisher**
1	Industrial Management	S.C. Jain H.S. Bawa	DhanpatRai& Co. (P) Ltd. New Delhi-110006
2	Business Organisation and Entrepreneurship Development	S.S. Sarkar R.K. Sharma Sashi K. Gupta	Kalyani Publishers, New Delhi-110002
3	Entrepreneurial Development	S. S. Khanka	S. Chand & Co. Ltd. New Delhi-110055

4	Business Methods	R.K. Sharma Shashi K Gupta	Kalyani Publishers, New Delhi
5	Entrepreneurship Development and Management	Dr. R.K. Singhal	S.K. Kataria& Sons, New Delhi-110002
6	Business Administration & Management	Dr. S. C. Saksena	SahityaBhawan, Agra

b. List of Journals
c. Manuals
d. Others

Xxxxxxxxxxxxxxxxxxxx

2: Course Title- Mobile Computing

2: Course Code – CO-601

3: Semester- 6th

4: Aim of the Course :

- To learn fundamentals of mobile computing and communication
- To learn Android programming .

5: Course Outcome :

On completion of the course, students will be able to :

- Explain the basics of mobile computing.
- Analyse various modes of mobile communication.
- Explain the design basics in Android programming.
- Design simple Android applications.

6: Pre-requisites :

- Fundamental idea of mobile communication

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total hours per week
3	1	3	7

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	25	25
Pass Marks	33		17	

9: Detailed Course Content :

Unit	Topic/Sub-topic	Intended Learning Outcome (ILO)	Hours
1	**Introduction to Mobile Computing** 1.1 Concept of Mobile Communication 1.2 Different generations of wireless technology 1.3 Basics of cell, cluster and frequency reuse concept 1.4 Noise and its effects on mobile 1.5 Understanding GSM and CDMA 1.6 Basics of GSM architecture and services like voice call, SMS, MMS, LBS,VAS 1.7 Different modes used for Mobile Communication	• Explain the basics of the various technologies used in mobile communication • Differentiate between the technologies. • Identify the features and areas of implementation of the different technologies.	**10**
2	**Architecture and Design of Mobile Computing** 2.1 Architecture of Mobile Computing (3tier) 2.2 Design considerations for mobile computing 2.3 Characteristics of Mobile Communication 2.4 Application of Mobile Communication 2.5 Security Concern Related to Mobile Computing 2.6 Middleware and Gateway required for mobile Computing 2.7 Making Existing Application Mobile Enable	• Explain the architecture of mobile computing. • Determine the basic characteristics and considerations in mobile computing. • Describe the various components in mobile computing.	**10**
3	**Mobile Communication** 3.1 Mobile IP 3.2 Basic Mobile Computing Protocol 3.3 Mobile Communication via Satellite • Low orbit satellite • Medium orbit satellite • Geo stationary satellite 3.4 Satellite phones	• Define the basics of mobile communication. • Explain the process of satellite communication in the context of mobile communication.	**6**
4	**Introduction to Android** 4.1 Overview of Android	• Use the various utilities provided in android.	**8**

	4.2 What does Android run On – Android Internals? 4.3 Android for mobile apps development 4.4 Environment setup for Android apps Development 4.5 Framework - Android- SDK, Eclipse 4.6 Emulators – What is an Emulator / Android AVD 4.7 Android Emulation – Creation and set up 4.8 First Android Application	• Explain the basic structure of an android application. • Develop simple applications in android.	
5	**AndroidActivities andGUI DesignConcept** 5.1 Design criteria for Android Application : Hardware Design Consideration, Design Demands For Android application, Intent, Activity, Activity Lifecycle and Manifest 5.2 Creating Application and new Activities 5.3 Simple UI - Layouts and Layout properties : Introduction to Android UI Design, Introducing Layouts 5.4 XML Introduction to GUI objects viz.: Push Button , Text / Labels ,Edit Text, Toggle Button , Padding	• Define the basic principles of designing Android application. • Explain the concepts related to UI design. • Develop basic knowledge on GUI objects. • Apply the concepts in developing applications.	**8**
	Internal Assessment		**3**

Interpersonal Skills :

- Design applications
- Develop applications

Motor Skills :

- Proper handling of hardware.

Practical Exercises :

I. Installation and setup of java development kit(JDK),setup android SDK, setup eclipse IDE, setup android development tools (ADT) plugins, create android virtual device.
II. Create “Hello World” application. That will display “Hello World” in the middle of the screen using TextView Widget in the red color.
III. Create application for demonstration of android activity life cycle.
IV. Create Registration page to demonstration of Basic widgets available in android.

V. Create sample application with login module.(Check username and password) On successful login, Change TextView "Login Successful". And on failing login, alert user using Toast "Login fail".

VI. Create login application where you will have to validate username and passwords Till the username and password is not validated, login button should remain disabled.

VII. Create and Login application as above. Validate login data and display Error to user using setError () method.

VIII. Create an application for demonstration of Relative and Table Layout in android.

IX. Create an application for demonstration of Scroll view in android.

X. Create an application for demonstration of Explicitly Starting New Activity using Intent.:

XI. Create an application that will pass two number using TextView to the next screen , and on the next screen display sum of that number.

XII. Create spinner with strings taken from resource folder(res >> value folder). On changing spinner value, change background of screen.

10: Distribution of Marks :

Unit	Topic	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Introduction to Mobile Computing	6	3	7	16
2	Architecture and Design of Mobile Computing	6	3	7	16
3	Mobile Communication	3	3	4	10
4	Introduction to Android	5	3	5	13
5	Android Activities and GUI Design Concept	5	3	7	15
		25	15	30	70

11: Table of Specification:

Unit	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Introduction to Mobile Computing	10	24	√	√		
2	Architecture and Design of Mobile Computing	10	24	√	√	√	
3	Mobile Communication	06	14	√	√		
4	Introduction to Android	08	19	√	√	√	
5	Android Activities and GUI Design Concept	08	19	√	√	√	
Total		42	100				

K = Knowledge C = Comprehension A = Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation) c = $b/\sum b * 100$

Detailed table of Specification

Unit	Topic	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	**Introduction to Mobile Computing**	6			6		3			3	2	5			7
2	**Architecture and Design of Mobile Computing**	4	2		6	3				3		2	5		7
3	**Mobile Communication**	3			3		3			3		4			4
4	**Introduction to Android**	5			5		3						5		5
5	**Android Activities and GUI Design Concept**	5			5		3			3			7		10

K =Knowledge, C =Comprehension , A =Application, HA =Higher Than Application, T = Total

12: Suggested Implementation Strategies :

i) Concepts should be introduced in classroom input sessions and by giving demonstrationthrough projector.

ii) More focus should be given on practical work which will be carried out in laboratorysessions. If possible some theory sessions may be conducted in labs so that theory andpractice can go hand in hand.

iii) Group Discussion and presentation of related websites should be arranged.

iv) Students should be encouraged to use their creativity during practical sessions and letthem struggle to learn on their own with faculty present to help the students when they are stuck.

13: Suggested Learning Resources :

1: Building Android Apps ,IN EASY STEPS, McGraw-Hill Education.

2: Professional Android 2 Application Development, Reto Meier, Wiley India Pvt Ltd.

3: Beginning Android, Mark L Murphy, Wiley India Pvt Ltd.

4: Pro Android ,Sayed Y Hashimi and SatyaKomatineni, Wiley India Pvt Ltd.

3: Course Title - Cryptography and Network Security

2: Course Code –CO-602

3: Semester- 6th

4. Aim:

- Understand the basic concept of Cryptography and Network Security, their mathematical models, various types of ciphers,DES,AES, Message Authentication, Digital Signature,Encrypt and decrypt messages using block ciphers.
- Network security,virus,worms and firewall.
- Identify and classify computer and security threats and develop a security model to prevent, detect and recover from attacks

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

- Explain concepts related to applied cryptography, including plaintext, ciphertext, symmetric cryptography, asymmetric cryptography, and digital signatures.
- Explain the theory behind the security of different cryptographic algorithms.
- Explain common network vulnerabilities and attacks, defence mechanisms against network attacks, and cryptographic protection mechanisms.
- Outline the requirements and mechanisms for identification and authentication.Identify the possible threats to each mechanism and ways to protect against these.

6: Pre-requisite:

- Knowledge on computer system security issues
- Basic idea of security software.

7: Teaching Scheme:

Teaching Scheme			
L	T	P	Total Hours per week
3	-	3	6

8: ExaminationScheme:

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	25	25
Pass Marks	33		17	

9: Detailed Course Content:

Unit	Topics/Sub-Topics	Intended Learning Outcomes	Hours
1	**Introduction:** 1.1 The need for security 1.2 Principles of Security – confidentiality, integrity, authentication, non-repudiation, access control and availability 1.3 Types of Attacks – passive and active attacks, Programs that attack-Virus,worm, Trojan horse, Applets and ActiveX control, Cookies, Specific Attacks–Spoofing and Sniffing(snooping), Phishing, Pharming.	37. Explain the need for security. 38. Define the principles/goals of security. 39. Discuss different types of attack. 40. Explain the working principles of virus, worms, Trojan horse and Cookies. 41. Discuss the concepts of phishing and pharming.	**4**
2	**Cryptography: Concept and Techniques** 2.1 Introduction 2.2 Plain Text and Cipher Text 2.3 Substitution Technique – Caesar Cipher, Mono-alphabetic Cipher,Homophonic Substitution Cipher, Polygram Substitution Cipher, Polyalphabetic Substitution Cipher, Playfair Cipher, Hill Cipher. 2.4 Transposition technique – Rail Fence Technique, Simple columnar Transposition Technique, Vernam Cipher. 2.5 Encryption and Decryption. 2.6 Symmetric and Asymmetric Key Cryptography. 2.7 Steganography.	42. Define the terms - cryptography, cryptographic system(cipher), cryptology, cryptanalysis, plain text and cipher text, encryption, decryption, steganography, symmetric key cryptography and asymmetric key cryptography. 43. Discuss the two categories of traditional ciphers: Substitution ciphers and transposition ciphers. 44. Explain the	**7**

		categories of cryptanalysis used to break the symmetric cipher.	
3	**Symmetric Key Algorithm:** 3.1 Introduction 3.2 Algorithm types and modes (ECB,CBC,CFB,OFB,CTR) 3.3 An overview of Symmetric Key Cryptography 3.4 Data Encryption Standard (DES) 3.5 Advanced Encryption Standards (AES)	45. Define basic structure of DES/AES. 46. Explain the concept of algorithm types– stream and block ciphers. 47. Discuss five modes of operation designed to be used with modern block ciphers. 48. Discuss the basic principles and main features of AES and DES.	**10**
4	**Asymmetric Key Algorithm:** 4.1 Introduction 4.2 Brief history of Asymmetric Key Cryptography 4.3 An overview of Asymmetric Key Cryptography 4.4 The RSA algorithm 4.5 Symmetric and Asymmetric Key Cryptography together. 4.6 Digital Signature, Message Digest, MD5, Secure Hash Algorithm(SHA), Hash-based Message Authentication Code(HMAC)	49. Distinguish between symmetric key and asymmetric key cryptography. 50. Discuss RSA algorithm 51. Define message authentication, message digest, message integrity, MAC and HMAC. 52. Explain the concept of digital signature and some of its applications. 53. Discuss the structure of SHA-512	**12**
5	**Authentication**	54. Explain the need	**5**

	5.1 Authentication Basics 5.2 Password 5.3 Authentication Tokens 5.4 Public Key infrastructures 5.5 Certification authorities and key distribution centres 5.6 Kerberos	for a Key distribution centre (KDC) and certification authorities (CA). 55. Introduce the idea of a Public Key Infrastructure (PKI) and explain some of its duties. 56. Describe Kerberos as a KDC and an authentication protocol.	
6	**Firewall** 6.1 Introduction 6.2 Firewall Characteristics 6.3 Capabilities and limitations of firewalls 6.4 Types of Firewall 6.5 Firewall Configuration 6.6 Trusted system 6.7 Virtual Private Networks	57. Define firewall, trusted system and Virtual Private Network (VPN). 58. Discuss different types of Firewall stating their strengths and limitations. 59. Explain various configurations of firewall.	**4**
	Internal Assessment		**3**

Intellectual Skill:

- will be able compare and realize different cryptological algorithms andanalyse the network security thread.

Motor Skill

- Handle computer systems

Lab Exercises :

I. Write a program that can encrypt and decrypt using the general Caesar cipher.
II. Write a Java program to perform encryption and decryption using the following algorithms:
    - Caesar Cipher
    - Rail Fence Technique
    - Simple Transposition Technique

III. Implement the Playfair cipher in the Java programming language

IV. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as on of the parties (Alice) and the JavaScript application as the other party (Bob)

V. Consider a plain text message I AM A HACKER. Encrypt it with the help of the following algorithm:
   (a) Replace each alphabet with its equivalent 7-bit ASCII code.
   (b) Add a 0 bit as the leftmost bit to make each of the above bit patterns 8 position long.
   (c) Swap the first four bits with the last four bits for each alphabet
   (d) Write the hexadecimal equivalent of every four bits

   Write a C program to perform the task of the above exercise.

VI. Write a C program to implement the DES algorithm logic.

VII. Write a C program that calculates the message digest of a text using the MD5 algorithm.

VIII. Write a JAVA program to implement the RSA algorithm.

IX. Many programming languages allow the generation of random numbers. However, these numbers are not really random – in fact, they are predictable. Write a C program that generates a series of 10 random numbers. Repeat the same program execution many times and see how the random numbers are repeated(i.e. they are not random).

X. Write a program in Java which performs a digital signature on a given text.

XI. Study at least one real-life firewall product. Study its features with reference to the theory.

XII. Try to download a free home firewall. Which of its features are annoying at times? Why?

10: Distribution of Marks :

Unit	Topic/ Sub-Topic	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Introduction	**3**	**1**	**5**	**9**
2	Cryptography: Concept and Techniques	**4**	**2**	**5**	**11**
3	Symmetric Key Algorithm	**5**	**4**	**5**	**14**
4	Asymmetric Key Algorithm	**7**	**4**	**5**	**16**
5	Authentication	**4**	**2**	**5**	**11**
6	Firewall	**2**	**2**	**5**	**9**
		25	**15**	**30**	**70**

11: Table of Specification

Unit	Topic/ Sub-Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Introduction	4	9	✓	✓	✓	
2	Cryptography: Concept and	7	17	✓	✓		

3	Symmetric Key Algorithm	10	24	✓	✓		✓
4	Asymmetric Key Algorithm	12	29	✓	✓		✓
5	Authentication	5	12	✓	✓	✓	
6	Firewall	4	9	✓	✓		
Total		Σ b = 42	100				

K =Knowledge C=Comprehension A=Application

HA= Higher Than Application(Analysis,Synthesis,Evaluation) c= (b/Σ b)x 100

Detailed Table of Specification

Unit	Topic/ Sub-Topic	Objective									Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Introduction	1	2		3	1				1		5			5
2	Cryptography: Concept	2	2		4		2			2			5		5
3	Symmetric Key Algorithm	2	3		5	1	3			4				5	5
4	Asymmetric Key	3	4		7	1	3			4				5	5
5	Authentication	2	2		4		2			2			5		5
6	Firewall	2			2		2			2		5			5
Total					25					15					30

K =Knowledge C=Comprehension A=ApplicationHA=Higher Than Application(Ana, Sys, Eva)

12: Suggested Implementation Strategies :

13: Suggested Learning Resources :

- Cryptography and Network Security – by AtulKahate, Tata McGraw Hill
- Cryptography and NetworkSecurity(Principles and Practices) – by William Stallings, PHI

4: Course Title – Software Engineering

2: Course Code –CO- 603

3: Semester- 6th

4: Aim of the course :

- To learn about the various software development models
- To learn about the concepts in software project management.

5: Course Outcome :

On completion of this course, students will be able to :

- Analyse the importance of software engineering
- Demonstrate the steps of software development process.
- Design software using structured analysis tools.
- Explain the basics of software testing
- Estimate effort and size of a software project.

6: **Pre-requisite :**

- Basic concept of a software.

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total Hours per week
3	-	-	3

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	-	-
Pass Marks	33		-	

9: Detailed Course Content :

Unit	Topics/Sub-topics	Intended Learning Outcome	Hours
1	**Introduction to Software Engineering** 1.1 The evolving role of software 1.2 Software crisis problems and causes 1.3 Software Engineering paradigm 1.4 Classic Life cycle 1.5 Prototyping life cycle 1.6 Spiral model 1.7 Generic view of software engineering	1. State the role of software engineering. 2. Explain the various software development process models	**4**
2	**Software requirement analysis** 2.1 Requirement Analysis fundamentals 2.2 Structured Analysis: Basic notation and its extension 2.3 Object oriented analysis and data modelling (ERD), process modelling	3. State the procedure of requirement analysis. 4. List the contents of specification document. 5. Explain the fundamental concepts in object oriented analysis. 6. Prepare ER-diagrams.	**6**
3.	**Software Design** 3.1 Evolution of software design and characteristics of a good design 3.2 Design Fundamentals: Abstraction, refinement, modularity and software architecture 3.3 Flow oriented design and object oriented design	7. State the important design considerations. 8. Distinguish between flow oriented and object oriented design.	**5**
4.	**Quality Assurance** 4.1 Software quality factor 4.2 Software quality assurance 4.3 SQA activities 4.4 Software reliability, errors and faults 4.5 Software reliability model	9. Define quality related concepts. 10. Discuss the procedure to implement quality assurance. 11. Identify the software reliability metrics.	**3**

5.	**Verification and Validation** 5.1 Introduction to concepts in software testing 5.2 Software testing strategies 5.3 Techniques of black-box and white-box testing	12. Define the basic concepts in software testing. 13. Differentiate between black box and white box testing. 14. Explain a few software testing strategies.	**8**
6.	**Software Evaluation and Documentation** 6.1 Software Evaluation Criteria 6.2 Need and Characteristics of a good document 6.3 Internal and External documentation	15. State the criteria for evaluating a software. 16. Explain the role of documentation in software engineering.	**4**
7.	**Software Project Management** 7.1 Basic concept of software project management process, objectives, scope, estimation, COCOMO model. 7.2 Project Planning. 7.3 Project scheduling, Gantt Chart, pert chart. 7.4 Managing people, project stuffing, group working, working environment. 7.5 Project monitoring, milestone, method of project monitoring. 7.6 Risk Analysis, tracking and control, version management.	17. State the objectives of project management. 18. Describe the project planning activities. 19. Estimate project duration and cost. 20. Explain the project monitoring activities. 21. Describe the risk analysis process.	**12**
	Internal Assessment		**3**

10: Distribution of Marks :

Chapter No.	Chapter Title	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	**Introduction to Software Engineering**	**2**	**2**	**4**	**8**
2	**Software requirement analysis**	**3**	**2**	**5**	**10**
3	**Software Design**	**2**	**2**	**4**	**8**
4	**Quality Assurance**	**1**	**2**	**3**	**6**
5	**Verification and Validation**	**5**	**3**	**4**	**12**
6	**Software Evaluation& Documentation**	**3**	**2**	**3**	**8**
7	**Software Project Management.**	**9**	**2**	**7**	**18**
	TOTAL	**25**	**15**	**30**	**70**

11: Table of Specification:

Unit	Topic (a)	Time allotted in hours (b)	Percentage of weightage (c)	K	C	A	HA
1	**Introduction to Software Engineering**	4	10%	✓			
2	**Software requirement analysis**	6	14%	✓	✓	✓	
3	**Software Design**	5	12%	✓	✓	✓	
4	**Quality Assurance**	3	7%	✓	✓		
5	**Verification and Validation**	8	19%	✓	✓	✓	
6	**Software Evaluation & Documentation**	4	10%	✓			
7	**Software Project Management.**	12	28%	✓			
	Total	∑b=42	100%				

K = Knowledge C = Comprehension A = Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation) c = $b/\sum b * 100$

Detailed Table of specification

Unit	Topic (a)	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	**Introduction to Software Engineering**	2			2	2				2	4				4
2	**Software requirement analysis**			3	3		2			2	5				5
3	**Software Design**	2			2		2			2			4		4
4	**Quality Assurance**	1			1		2			2	3				3
5	**Verification and Validation**	3	1	1	5		3			3			4		4
6	**Software Evaluation & Documentation**	3			3	2				2	3				3
7	**Software Project Management.**	9			9	2				2	7				7
					25					15					30

K =Knowledge, C =Comprehension , A =Application, HA =Higher Than Application, T = Total

12: Suggested Implementation Strategies :

i) Concepts in the topics are to be discussed in the light of software development.

ii) The topics relevant to project work are to be discussed in the light of project.

iii) The principles of software development are to be implemented while developing the project.

13: Suggested Learning Resources :

1. Software Engineering Beginners Approach by –Pressman –TMH
2. Software Engineering –by PankajJalote
3. Fundamentals of Software Engg –Carlo Ghezzi, Mehdi Jazayeri, & Dino Mandrioli –PHI
4. Software Engineering –by Sommerville

5: Course Title- Parallel Processing

2: Course Code –CO-604

3: Semester- 6th

4: Aim of the course:

- To learn about parallel computing architecture
- To learn about vector processing
- To understand subject related algorithms

5: Course Outcome:

On completion of the course, students will be able to :

- State the scope, design and model of parallelism
- Explain the parallel computing architecture.
- Define the parallel algorithms.
- Analyse model and performance of parallel programs.

6: Pre-requisites :

- Knowledge of distributed computing

7: Teaching Scheme:

Teaching Scheme			
L	T	P	C
3	-	-	3

8: Examination Scheme:

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	-	-
Pass Marks	33		-	

9: Detailed Course Content:

Unit	Topics/Sub-topics	Intended Learning Outcome	Hours
1	**Introduction to Parallel Processing :** 1.1 Evolution of Computer System 1.2 Parallelism in Uniprocessor System 1.3 Parallel Computer Structure 1.4 Architectural Classification Scheme 1.5 Parallel Processing Application	31. Familiarize with the different types of computer. 32. Explain about Parallel processing application.	10
2	**Memory System Design :** 2.1 Hierarchical Memory Structure 2.1.1 Memory Hierarchy 2.1.2 Addressing Scheme for Main Memory 2.2 Virtual Memory System 2.2.1 The Concept of Virtual Memory 2.2.2 Paged Memory System 2.2.3 Segmented Memory System 2.3 Cache Memories and Management 2.3.1 Characteristics of Cache Memories 2.3.2 Cache Memory Organisation	33. Explain about memory hierarchy. 34. Explain of addressing scheme of memory. 35. Define the concept of virtual memory such as paged and segmented memory system. 36. Explain characteristics of cache memory and its organization.	8
3	**Principles of Pipelining and Vector Processing :** 3.1 Pipelining: An Overlapped Parallelism 3.1.1 Principles of Linear Pipelining 3.1.2 Classification of Pipeline Processor 3.2 Instruction and Arithmetic Pipelines 3.2.1 Design of Pipelined	37. Describe overlapped parallelism. 38. Explain about linear pipelining and classification different types of pipeline processor. 39. Designing of instruction and arithmetic pipeline.	10

	Instruction Units 3.2.2 Arithmetic Pipelines Design Examples 3.3 Vector Processing Requirements 3.2.1 Characteristic of Vector Processing 3.2.2 Pipelined Vector Processing Methods	40. Describe vector processing ,its characteristic and pipelined processing.	
4	**Structures and Algorithms for Array Processors :** 4.1 SIMD Array Processor 4.1.1 SIMD Computer Organisation 4.1.2 Inner-PE Communication 4.2 SIMD Interconnection Network 4.2.1 Static versus Dynamic Networks 4.2.2 Mesh-Connected Illiac Network 4.2.3 Cube Interconnection Network 4.2.4 Barrel Shifter and Data Manipulator 4.2.5 Shuffle-Exchange and Omega Networks 4.3 Parallel Algorithms for Array Processors 4.3.1 SIMD Matrix Multiplication 4.3.2 Parallel sorting on Array Processor	41. Explain about different structures of array processor. 42. Describe about SIMD computer , inner –PE communication. 43. Explain about different SIMD interconnection networks. 44. Identify the difference of static and dynamic networks. 45. Explain about different networks. 46. Explain about parallel algorithms , SIMD multiplication, sorting on Array processor.	**6**
	Internal Assessment		**3**

10: Distribution of Marks :

Unit	Topics	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Introduction to Parallel Processing Structures and	5	3	5	13
2	Memory System Design	5	6	8	19
3	Principles of Pipelining and Vector Processing	8	3	8	19
4	Algorithms for Array Processors	7	3	9	19
		25	15	30	70

11: Table of Specification :

Unit	Topic (a)	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Introduction to Parallel Processing.	5			5	3				3	5				5
2	Memory System Design		5		5		6			6		8			8
3	Principles of Pipelining and Vector Processing.	8			8	3				3	8				8
4	Structures and Algorithms for Array Processors.			7	7			3		3			9		9

K = Knowledge C = Comprehension A =Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation) $c = \frac{b}{\Sigma b} * 100$

Detailed Table of specification :

Units	Topics (a)	Time allotted in hours (b)	Percentage of weightage (c)	K	C	A	HA
1	Introduction to Parallel Processing.	10	24%	✓			
2	Memory System Design	12	28%		✓		
3	Principles of Pipelining and Vector Processing.	10	24%	✓			
4	Structures and Algorithms for Array Processors.	10	24%			✓	
	Total	∑b=42					

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

12: Suggested Implementation Strategies :

13: Suggested Learning Resources :

1. Computer Architecture and Parallel Processing–by Kai Hwang and F. A. Briggs - McGrawHill
2. Advanced Computer Architecture – by Kai Hwang -
3. Computer Architecture &Organisation – by Hayes - McGrawHill

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6: Course Title - ARTIFICIAL INTELLIGENCE

2: Course Code – CO – 606 (Elective)

3: Semester- 6th

4: Aim of the Course :

- To learn basics of AI
- To learn different forms of knowledge representation and search techniques
- To understand design of Expert Systems

5: Course Outcome :

On completion of the course, students will be able to :

- Explain the basics of Intelligent systems
- Develop basic idea on expert systems
- Write small programs in Prolog

6: Pre-requisites :

- Fundamental knowledge about software systems.

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total hours per week
3	--	--	3

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	-	-
Pass Marks	33		-	

9: Detailed Course Content :

Unit	Topic/Sub-topic	Intended Learning Outcome (ILO)	Hours
1	**Introduction to Artificial Intelligence** 1.1 History and progress of AI 1.2 Simulation and AI 1.3 Intelligent Systems	1. State the history and evolution of AI 2. Familiarise the human intelligence components	5

		that are simulated in AI systems.	
		a.	
2	**Knowledge representation** 2.1 Introduction 2.2 Propositional Calculus 2.3 Predicate Calculus 2.4 Rule based knowledge representation 2.5Knowledge representation issues.	**3.** State the various ways of representing information of the real world. **4.** Define the knowledge representation issues **5.** Apply the knowledge representation basics in solving simple real life problems.	**8**
		a.	
3	**Heuristic Search** 3.1 Problem solving technique 3.2 Heuristic Search 3.3 Techniques for heuristic search	**6.** Define the concept of heuristic search in context of AI **7.** Explain few search techniques **8.** Apply the search technique and develop very simple programs.	**4**
		a.	
4	**Learning** 4.1 Definition and mechanisms of learning 4.2 Candidate Elimination Algorithm 4.3 Discovery, Analogy, Formal Learning Theory 4.4 Neural net learning and Genetic learning.	**9.** Define the various mechanism of learning in AI. **10.** Identify the differences in various learning theory **11.** Differentiate between neural net and genetic learning.	**10**
		a.	
5	**Expert Systems** 5.1 Introduction and general concepts of ES 5.2 Elements and Applications of ES 5.3 Production systems 5.4 Markov and Rete Algorithm	**12.** Identify the various components of expert systems. **13.** Explain the functions of the components of expert systems **14.** Define the basic concept of production systems.	**10**
		a.	
6	**Basics of Prolog** 6.1 Introduction to Prolog programming 6.2 Terminologies and variables 6.3 Control structures. 6.4 Matching, cuts and recursion.	**15.** Write simple programs in Prolog	**5**

	Internal Assessment		**3**

10: Distribution of Marks :

Unit	Topic	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	**Introduction to Artificial Intelligence**	**4**		**4**	**8**
2	**Knowledge representation**	**5**	**3**	**6**	**14**
3	**Heuristic Search**	**1**	**2**	**3**	**6**
4	**Learning**	**6**	**4**	**6**	**16**
5	**Expert Systems**	**6**	**4**	**6**	**16**
6	**Basics of Prolog**	**3**	**2**	**5**	**10**
		25	**15**	**30**	**70**

11: Table of Specification :

Unit	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	**Introduction to Artificial Intelligence**	5	12	√			
2	**Knowledge representation**	8	19	√	√	√	
3	**Heuristic Search**	4	9	√	√	√	
4	**Learning**	10	24	√	√		
5	**Expert Systems**	10	24	√	√		
6	**Basics of Prolog**	5	12	√	√	√	
Total		42	100				

K = Knowledge C = Comprehension A = Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation) c = $b/\sum b * 100$

Unit	Topic	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	**Introduction to Artificial Intelligence**	4			4						4				4
2	**Knowledge representation**	3	2		5		3			3		2	4		6
3	**Heuristic Search**		1		1	2				2			3		3
4	**Learning**	4	2		6	1	3			4	2	4			6
5	**Expert Systems**	3	3		6	3	1			4	4	2			6
6	**Basics of Prolog**	2	1		3		2			2			5		5

K =Knowledge, C =Comprehension , A =Application, HA =Higher Than Application, T = Total

12: Suggested Implementation Strategies :

1: Students are to be given exercises to develop logical thinking.

2: Though there are no assigned practical classes, demonstration of prolog programming can be done in the lab to get better concepts in programming.

13: Suggested Learning Resources :

1: Artificial Intelligence by Elaine Rich, Kevin Knight, andShivshankarB. Nair, 3rd edition, McGraw-Hill Publishing

2: Expert Systems by Joseph C. Giarratano and Gary D. Riley, 4th edition

3: Artificial Intelligence by SarojKaushik, Cengage Learning.

4: An Introduction to Logic Programming Through Prolog, J. M. Spivey, Prentice Hall.

7: Course Title - Graph Theory & Combinatorics

2: Course Code –CO- 605

3: Semester- 6th

4: Aim of the Course:

- To learn fundamental concepts related to graph and its evaluation.
- To understand different types of graph and their applications.
- To learn related theorems and their applications.

5: Course Outcome :

On completion of the course, students will be able to :

- Define the relevant vocabulary from graph theory and combinatorics
- Explain important theorems in the subject
- Solve problems related to theorems

6: Pre-requisites :

- Knowledge about subject related terms.

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total hours per week
3	-	-	3

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	-	-
Pass Marks	33		-	

9: Detailed Course Content :

Unit	Topics/Sub-topics	Intended Learning Outcome	Hours
1	**1.0 Basic Concepts**	1. 1.Define precise and accurate definitions of	**6**

	1.1 Graphs & sub graphs 1.2 Isomorphism & Degrees 1.3 Walks & connected graphs 1.4 Cycles in graphs 1.5 Cut vertices & cut edges 1.6 Matrix representation of graphs	objects in graph theory 2. 2. Use mathematical definitions to identify and construct examples.	
2	**Evaluation of Graphs** 2.1 Eulerian graphs 2.2 Hamiltonian Graphs 2.3 Weighted Graphs	3. 1. Determine different types of Graph, its underlying mathematical concepts	**5**
3	**Bipartite Graphs** 3.1 Bipartite Graphs 3.2 Perfect matching –the marriage problem 3.3 Trees 3.4 Spanning Trees	4. 1. Model real world problem using different types of graphs.	**6**
4	**Planner Graphs** 4.1 Definitions 4.2 Euler Formula 4.3 Characterization of planner graphs – Kuratowaski's Theorem (without proof) 4.4 Colouring of planner graphs (vertex colouring only)	5. 1. Solve real world problem using colouring concept of graph theory	**5**
5	**Directed Graphs** 5.1 Representation 5.2 Connectivity in Digraphs 5.3 Strong Orientation of Graphs 5.4 Eulerian Digraphs 5.5 Tournaments	6. 1. Solve real world problem using concept of connectivity , orientations, Tournaments of graph	**6**
6	**Graphs Algorithms** 6.1 Depth-First & Breadth-First Algorithms 6.2 Shortest path Algorithms 6.3 Minimal Spanning Trees	7. 1. Implement standard algorithms of graph theory to evaluate reliability of networks.	**6**
7	**Combinatorics**	8. Formulate and analyze real world problems in	**8**

	7.1 Counting Principles **7.1.1** Sum & product rules 7.1.2 Counting Functions 7.1.3 Binomial & multinomial theorems 7.1.4 Inclusion & exclusion principles 7.1.5 MarriageProblem Revisited **7.2 Ramsey Theory** 7.2.1 The Pigeonhole Principles 7.2.2 Ramsey's theorem(without proof) 7.2.3 Examples of Ramsey's theorem **7.3 Difference Equation** 7.3.1 Difference operator 7.3.2 Linear difference equations 7.3.3 First order Linear Equations 7.3.4 Linear equation with constant Coefficient 7.3.5 Systems of Difference Equations **7.4 Block Design & Error Correcting Codes**	framework of combinatorial optimization and graph models. 9. 2. Manipulate techniques in coding theory for error minimization	
	Internal Assessment		**3**

10: Distribution of Marks :

Unit	Topics	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Basic Concepts	**4**	**3**	**3**	**10**
2	Evaluation of Graphs	**3**	**2**	**3**	**8**
3	Bipartite Graphs	**4**	**2**	**4**	**10**
4	Planner Graphs	**2**	**3**	**3**	**8**
5	Directed Graphs	**4**	**3**	**3**	**10**
6	Graphs Algorithms	**4**		**6**	**10**
7	Combinatorics	**4**	**2**	**8**	**14**
		25	**15**	**30**	**70**

11: Table of Specification :

Unit	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	**Basic Concepts**	6	14	√		√	
2	**Evaluation of Graphs**	5	12	√		√	
3	**Bipartite Graphs**	6	14	√		√	
4	**Planner Graphs**	5	12	√		√	
5	**Directed Graphs**	6	14	√		√	
6	**Graphs Algorithms**	6	14	√		√	
7	**Combinatorics**	8	20	√		√	
Total		Σ b=42	100				

K = Knowledge C = Comprehension A = Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation)

$$c = \frac{b}{\Sigma b} \times 100$$

Detailed Table Of Specifications

Unit	Topic	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	**Basic Concepts**	4			4	1		2		3			3		3
2	**Evaluation of Graphs**			3	3			2		2			3		3
3	**Bipartite Graphs**	4			4			2		2	2		2		4

4	**Planner Graphs**	2			2	1		2		3	1		2		3
5	**Directed Graphs**	4			4	1		2		3			3		3
6	**Graphs Algorithms**	4			4						2		4		6
7	**Combinatorics**	4			4	2				2	4		4		8

K = Knowledge C = Comprehension A =Application HA = Higher than Application T = Total

12: Suggested Implementation Strategies :

13: Suggested Learning Resources :

1. Graph Theory & Application by –N Deo –Prentice Hall
2. Graph Theory by –F. Harary -Narosa Publishing House
3. Introduction Combinatorial Mathematics –by C.L Liu
4. Discrete Mathematics for Computer Scientists –by J.K Truss –Addison -Wesley

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8: Course Title – Professional Practice - IV

2: Course Code – CO- 610

3: Semester- 6th

4: Aim of the Course :

- To introduce to the recent developments in the areas covered in this semester.
- To improve communication skill.

5: Course Outcome :

On completion of the course students will be able to :

- Express themselves in discussions.
- Identify the recent developments in relevant areas.
- Develop report writing skill.
- Develop analytical skill

6: Pre-requisites :

- Basic knowledge in the subjects covered in the semester.

7: Teaching Scheme :

Teaching Scheme			
L	T	P	Total hours per week
1	-	2	3

8: ExaminationScheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	-	-	25	25
Pass Marks	-		17	

9: Detailed Course Content :

Unit	Exercises/Activities	Hours
1	**Industrial Visits** : Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the team work. The industrial visits may be arranged in the following areas/ industries. Any two visits may be considered • Software Development centre • Computer Maintenance centre • Educational organization using advanced technology • Data warehouse • Industry related to computer related advance technology.	4
2	**Guest Lectures** Experts/ Professionals from Field/Industry are to be invited for talks on the listed topics and similar areas. A brief report is to be submitted on the guest lectures by each student as a part of assignment (Any two) • Hacking • Human Resource Management (HRM) • Entrepreneurship • AI • Mobile Computing • Internet of Things • Enterprise Resource Planning (ERP)	4
3	**Group Discussion**: Students are to form groups of five to seven students and discuss on a chosen topic listed below. A brief report on the same is to be prepared and submitted by each student including the points discussed during the discussion providing a concluding remark. Any two topics for group discussions may be selected by faculty members from the suggested topics – • APP development • Recent development in Computer Architecture • Big Data • Human Computer Interaction • Image Processing	4
4	**Seminar** Seminar topic should be related to the subjects from third, fourth or fifth semester subjects or from guest lectures. Students shall submit a	4

	report of at least 10 pages and deliver a seminar (presentation time – 10 minutes for a group of 2 students)	
5	**Mini Project: (In A Group Of 4-5 Students)** A mini project on the listed area is encouraged to develop confidence in building software systems. The mini projects should exhibit the basic functionalities of the system selected for project. • Web page development • Very small information system • Use of different programming languages. • Very small multimedia projects	**10**
6	**Student Activities** The students in groups of will perform **any two** of the following activities (other similar activities may be considered) and write a report on the activity performed. • Social service • Interview of successful entrepreneurs in the field of Information Technology • Survey on recent emphasis by govt. aided scheme in the area of Information Technology • Survey of Computer virus of nearby areas.	**4**

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