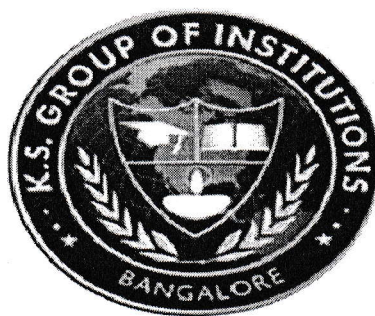


K.S INSTITUTE OF TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING



KSIT
K S INSTITUTE OF TECHNOLOGY

2018 SCHEME & SYLLABUS

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

3rd to 8th Semester BE – Computer Science and Engineering

Scheme of Teaching and Examinations

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2018 – 19)

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examination 2018 – 19
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2018 – 19)

III SEMESTER												
Sl. No	Course and Course Code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BSC	18MAT31	Transform Calculus, Fourier Series And Numerical Techniques	Mathematics	2	2	--	03	40	60	100	3
2	PCC	18CS32	Data Structures and Applications	CS / IS	3	2	--	03	40	60	100	4
3	PCC	18CS33	Analog and Digital Electronics	CS / IS	3	0	--	03	40	60	100	3
4	PCC	18CS34	Computer Organization	CS / IS	3	0	--	03	40	60	100	3
5	PCC	18CS35	Software Engineering	CS / IS	3	0	--	03	40	60	100	3
6	PCC	18CS36	Discrete Mathematical Structures	CS / IS	3	0	--	03	40	60	100	3
7	PCC	18CSL37	Analog and Digital Electronics Laboratory	CS / IS	--	2	2	03	40	60	100	2
8	PCC	18CSL38	Data Structures Laboratory	CS / IS	--	2	2	03	40	60	100	2
9	HSMC	18KVK39	Vyavaharika Kannada (Kannada for communication)/	HSMC	--	2	--	--	100	--	100	1
		18KAK39	Aadalitha Kannada (Kannada for Administration)									
		OR	OR									
		18CPH39	Constitution of India, Professional Ethics and Cyber Law									
TOTAL					17	10	04	24	420	480	900	24
			OR	OR	OR	OR						
			18	08	27	360		540				

Note: BSC: Basic Science, PCC: Professional Core, HSMC: Humanity and Social Science, NCMC: Non-credit mandatory course

18KVK39 Vyavaharika Kannada (Kannada for communication) is for non-Kannada speaking, reading and writing students and **18KAK39** Aadalitha Kannada (Kannada for Administration) is for students who speak, read and write Kannada.

Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

10	NCMC	18MATDIP31	Additional Mathematics - I	Mathematics	02	01	--	03	40	60	100	0
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(a) The mandatory non – credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of BE/B. Tech programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the students have to fulfill the requirements during subsequent semester/s to appear for SEE.

(b) These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree

Courses prescribed to lateral entry B. Sc degree holders admitted to III semester of Engineering programs

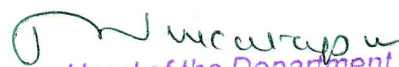
Lateral entrant students from B.Sc. Stream, shall clear the non-credit courses Engineering Graphics and Elements of Civil Engineering and Mechanics of the First Year Engineering Programme. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

AICTE Activity Points to be earned by students admitted to BE/B. Tech/B. Plan day college programme (For more details refer to Chapter 6, AICTE Activity Point Programme, Model Internship Guidelines): Over and above the academic grades, every Day College regular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme. Students transferred from other Universities to fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be spread over the years, anytime during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, minimum hours' requirement should be fulfilled. Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

[Signature]
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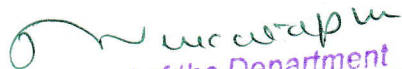
TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES (Effective from the academic year 2018 -2019) SEMESTER – III			
Course Code	18MAT31	CIE Marks	40
Number of Contact Hours/Week	2:2:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18MAT31) will enable students to: <ul style="list-style-type: none"> To have an insight into Fourier series, Fourier transforms, Laplace transforms, Difference equations and Z-transforms. To develop the proficiency in variational calculus and solving ODE's arising in engineering applications, using numerical methods. 			
Module 1			Contact Hours
Laplace Transform: Definition and Laplace transforms of elementary functions (statements only). Laplace transforms of Periodic functions (statement only) and unit-step function – problems. Inverse Laplace Transform: Definition and problems, Convolution theorem to find the inverse Laplace transforms (without Proof) and problems. Solution of linear differential equations using Laplace transforms. RBT: L2, L3			08
Module 2			
Fourier Series: Periodic functions, Dirichlet's condition. Fourier series of periodic functions period 2π and arbitrary period. Half range Fourier series. Practical harmonic analysis. RBT: L1, L2			08
Module 3			
Fourier Transforms: Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms. Problems. Difference Equations and Z-Transforms: Difference equations, basic definition, z-transform-definition, Standard z-transforms, Damping and shifting rules, initial value and final value theorems (without proof) and problems, Inverse z-transform and applications to solve difference equations. RBT: L1, L2			08
Module 4			
Numerical Solutions of Ordinary Differential Equations(ODE's): Numerical solution of ODE's of first order and first degree- Taylor's series method, Modified Euler's method. Runge - Kutta method of fourth order, Milne's and Adam-Bashforth predictor and corrector method (No derivations of formulae)-Problems. RBT: L1, L2			08

Module 5	
Numerical Solution of Second Order ODE's: Runge -Kutta method and Milne's predictor and corrector method. (No derivations of formulae). Calculus of Variations: Variation of function and functional, variational problems, Euler's equation, Geodesics, hanging chain, problems.	08
RBT: L1, L2, L3	
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering. • Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory. • Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems. • Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods. • Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
<ol style="list-style-type: none"> 1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2016 2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017 3. Srimanta Pal et al , Engineering Mathematics, Oxford University Press, 3rd Edition, 2016 	
Reference Books:	
<ol style="list-style-type: none"> 1. C.Ray Wylie, Louis C.Barrett , Advanced Engineering Mathematics, McGraw-Hill Book Co, 6th Edition, 1995 2. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India, 4th Edition 2010 3. B.V.Ramana, Higher Engineering Mathematics, McGraw-Hill, 11th Edition,2010 4. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, 6th Edition, 2014 	
Web links and Video Lectures:	
<ol style="list-style-type: none"> 1. http://nptel.ac.in/courses.php?disciplineID=111 2. http://www.class-central.com/Course/math(MOOCs) 3. http://academicearth.org/ 4. VTU EDUSAT PROGRAMME – 20 	


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ADDITIONAL MATHEMATICS – I (Mandatory Learning Course: Common to All Programmees) (A Bridge course for Lateral Entry students under Diploma quota to BE/B.Tech programmes) (Effective from the academic year 2018 -2019) SEMESTER – III			
Course Code	18MATDIP31	CIE Marks	40
Number of Contact Hours/Week	2:1:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS – 00			
Course Learning Objectives: This course (18MATDIP31) will enable students to:			
<ul style="list-style-type: none"> To provide basic concepts of complex trigonometry, vector algebra, differential and integral calculus. To provide an insight into vector differentiation and first order ODE's. 			
Module 1			Contact Hours
Complex Trigonometry: Complex Numbers: Definitions and properties. Modulus and amplitude of a complex number, Argand's diagram, De-Moivre's theorem (without proof). Vector Algebra: Scalar and vectors. Addition and subtraction and multiplication of vectors- Dot and Cross products, problems. RBT: L2, L2			08
Module 2			
Differential Calculus: Review of successive differentiation-illustrative examples. Maclaurin's series expansions-Illustrative examples. Partial Differentiation: Euler's theorem-problems on first order derivatives only. Total derivatives-differentiation of composite functions. Jacobians of order two-Problems. RBT: L1, L2			08
Module 3			
Vector Differentiation: Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl-simple problems. Solenoidal and irrotational vector fields-Problems. RBT: L1, L2			08
Module 4			
Integral Calculus: Review of elementary integral calculus. Reduction formulae for $\sin^n x$, $\cos^n x$ (with proof) and $\sin^m x \cos^n x$ (without proof) and evaluation of these with standard limits-Examples. Double and triple integrals-Simple examples. RBT: L1, L2			08
Module 5			
Ordinary differential equations (ODE's). Introduction-solutions of first order and first degree differential equations: exact, linear differential equations. Equations reducible to exact and Bernoulli's equation. RBT: L1, L2			08


Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Apply concepts of complex numbers and vector algebra to analyze the problems arising in related area. • Use derivatives and partial derivatives to calculate rate of change of multivariate functions. • Analyze position, velocity and acceleration in two and three dimensions of vector valued functions. • Learn techniques of integration including the evaluation of double and triple integrals. • Identify and solve first order ordinary differential equations. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43 rd Edition, 2015	
Reference Books:	
1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10 th Edition, 2016	
2. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, 6 th Edition, 2014	
3. Rohit Khurana , Engineering Mathematics Vol.I, Cengage Learning, 1 st Edition, 2015.	


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DATA STRUCTURES AND APPLICATION (Effective from the academic year 2018 -2019) SEMESTER – III			
Subject Code	18CS32	CIE Marks	40
Number of Contact Hours/Week	3:2:0	SEE Marks	60
Total Number of Contact Hours	50	Exam Hours	3 Hrs
CREDITS –4			
Course Learning Objectives: This course (18CS32) will enable students to: <ul style="list-style-type: none"> • Explain fundamentals of data structures and their applications essential for programming/problem solving • Illustrate linear representation of data structures: Stack, Queues, Lists, Trees and Graphs • Demonstrate sorting and searching algorithms • Find suitable data structure during application development/Problem Solving 			
Module 1			Contact Hours
Introduction: Data Structures, Classifications (Primitive & Non Primitive), Data structure Operations, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, Dynamically allocated arrays. Array Operations: Traversing, inserting, deleting, searching, and sorting. Multidimensional Arrays, Polynomials and Sparse Matrices. Strings: Basic Terminology, Storing, Operations and Pattern Matching algorithms. Programming Examples. Textbook 1: Chapter 1: 1.2, Chapter 2: 2.2 - 2.7 Text Textbook 2: Chapter 1: 1.1 - 1.4, Chapter 3: 3.1 - 3.3, 3.5, 3.7, Chapter 4: 4.1 - 4.9, 4.14 Reference 3: Chapter 1: 1.4 RBT: L1, L2, L3			10
Module 2			
Stacks: Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. Recursion - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, Ackerman's function. Queues: Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Priority Queues, A Mazing Problem. Multiple Stacks and Queues. Programming Examples. Textbook 1: Chapter 3: 3.1 -3.7 Textbook 2: Chapter 6: 6.1 -6.3, 6.5, 6.7-6.10, 6.12, 6.13 RBT: L1, L2, L3			10
Module 3			
Linked Lists: Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues.			10

Applications of Linked lists – Polynomials, Sparse matrix representation. Programming Examples	
Textbook 1: Chapter 4: 4.1 – 4.6, 4.8 Textbook 2: Chapter 5: 5.1 – 5.10	
RBT: L1, L2, L3	
Module 4	
Trees: Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Additional Binary tree operations. Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression, Programming Examples Textbook 1: Chapter 5: 5.1 – 5.5, 5.7 Textbook 2: Chapter 7: 7.1 – 7.9	10
RBT: L1, L2, L3	
Module 5	
Graphs: Definitions, Terminologies, Matrix and Adjacency List Representation Of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search. Sorting and Searching: Insertion Sort, Radix sort, Address Calculation Sort. Hashing: Hash Table organizations, Hashing Functions, Static and Dynamic Hashing. Files and Their Organization: Data Hierarchy, File Attributes, Text Files and Binary Files, Basic File Operations, File Organizations and Indexing Textbook 1: Chapter 6 : 6.1 – 6.2, Chapter 7: 7.2, Chapter 8 : 8.1-8.3 Textbook 2: Chapter 8 : 8.1 – 8.7, Chapter 9 : 9.1-9.3, 9.7, 9.9 Reference 2: Chapter 16 : 16.1 - 16.7	10
RBT: L1, L2, L3	
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Use different types of data structures, operations and algorithms • Apply searching and sorting operations on files • Use stack, Queue, Lists, Trees and Graphs in problem solving • Implement all data structures in a high-level language for problem solving. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2 nd Ed, Universities Press, 2014. 2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1 st Ed, McGraw Hill, 2014.	
Reference Books:	
1. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2 nd Ed, Cengage Learning, 2014	

2. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
3. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013
4. A M Tenenbaum, Data Structures using C, PHI, 1989
5. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.


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ANALOG AND DIGITAL ELECTRONICS
(Effective from the academic year 2018 -2019)

SEMESTER – III

Subject Code	18CS33	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs

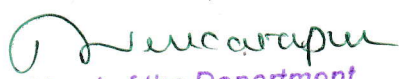
CREDITS –3

Course Learning Objectives: This course (18CS33) will enable students to:

- Explain the use of photoelectronics devices, 555 timer IC, Regulator ICs and uA741 opamp IC
- Make use of simplifying techniques in the design of combinational circuits.
- Illustrate combinational and sequential digital circuits
- Demonstrate the use of flipflops and apply for registers
- Design and test counters, Analog-to-Digital and Digital-to-Analog conversion techniques.


Module 1	Contact Hours
<p>Optoelectronic Devices: Photodiodes, Phototransistors, Light Emitting Diodes, Liquid Crystal Displays, and Optocouplers.</p> <p>Wave Shaping Circuits: Integrated Circuit Multivibrators</p> <p>Linear Power Supplies: Linear IC Voltage, Regulated Power Supply Parameters</p> <p>Operational Amplifier Application Circuits: Inverting Amplifier, Non-inverting amplifier, Voltage Follower, Summing Amplifier, Difference Amplifier, Averagor, Integrator, Differentiator, Peak Detector, Absolute Value Circuit, Comparotor, Instrumentation Amplifier, Relaxation Oscillator, Current-to-Voltage and Voltage-to-Current Converter</p> <p>Textbook 1: Chapter7 – 7.4, 7.5, 7.10, 7.11, 7.14; Chapter13 – 13.10; Chapter14 – 14.6, 14.7; Chapter17 – 17.1, 17.2, 17.3, 17.4, 17.5, 17.6, 17.7, 17.8, 17.12, 17.13, 17.14, 17.17, 17.19, 17.20, 17.21</p> <p>RBT: L1, L2</p>	08
Module 2	
<p>Combinational Logic Circuits: Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications, Don't-care Conditions, Product-of-sums Method, Product-of-sums simplifications, Simplification by Quine-McClusky Method</p> <p>Introduction to HDL; HDL Implementation Models.</p> <p>Text book 2: Chapter2 – 2.5; Chapter3 – 3.2 to 3.9, 3.11.</p> <p>RBT: L1, L2</p>	08
Module 3	
<p>Data-Processing Circuits: Multiplexers, Demultiplexers, 1-of-16 Decoder, BCD to Decimal Decoders, Seven Segment Decoders, Encoders, Exclusive-OR Gates, Parity Generators and Checkers, Magnitude Comparator, Programmable Array Logic, Programmable Logic Arrays, HDL Implementation of Data Processing Circuits.</p> <p>Text book 2: Chapter4 – 4.1 to 4.9, 4.11, 4.12, 4.14.</p>	08

RBT: L1, L2, L3	
Module 4	
Flip- Flops: RS Flip-Flops, Gated Flip-Flops, Edge-triggered RS FLIP-FLOP, Edge-triggered D FLIP-FLOPs, Edge-triggered JK FLIP-FLOPs, FLIP-FLOP Timing, JK Master-slave FLIP-FLOP, HDL Implementation of FLIP-FLOP. Registers: Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In - Serial Out, Parallel In - Parallel Out, Universal Shift Register, Applications of Shift Registers. Text book 2: Chapter8 – 8.1 to 8.7, 8.12; Chapter9: 9.1 to 9.6	08
RBT: L1, L2, L3	
Module 5	
Counters: Asynchronous Counters, Decoding Gates, Synchronous Counters, Changing the Counter Modulus, Decade Counters, Counter Design using HDL. D/A Conversion and A/D Conversion: Variable, Resistor Networks, Binary Ladders, D/A Converters, D/A Accuracy and Resolution, A/D Converter-Simultaneous Conversion, A/D Converter-Counter Method, Continuous A/D Conversion Text book 2:- Chapter10 – 10.1 to 10.5, 10.9; Ch 12: 12.1 to 12.7	08
RBT: L1, L2, L3	
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Design and analyze application analog circuits using photodevices, timer IC, power supply and regulator IC and opamp. • Simplify digital circuits using Karnaugh Map , POS and Quine-McClusky Methods • Explain Gates and flipflops and make us in designing different data processing circuits, registers and counters and compare the types. • Develop simple HDL programs • Explain the basic principles of A/D and D/A conversion circuits and develop the same. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
<ol style="list-style-type: none"> 1. Anil K Maini, Varsha Agarwal, Electronic Devices and Circuits, Wiley, 2012. 2. Donald P Leach, Albert Paul Malvino & Goutam Saha, Digital Principles and Applications, 8th Edition, Tata McGraw Hill, 2015. 	
Reference Books:	
<ol style="list-style-type: none"> 1. M. Morris Mani, Digital Design, 4th Edition, Pearson Prentice Hall, 2008. 2. David A. Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 2008 	


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COMPUTER ORGANIZATION (Effective from the academic year 2018 -2019) SEMESTER – III			
Subject Code	18CS34	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS34) will enable students to:			
<ul style="list-style-type: none"> • Explain the basic sub systems of a computer, their organization, structure and operation. • Illustrate the concept of programs as sequences of machine instructions. • Demonstrate different ways of communicating with I/O devices and standard I/O interfaces. • Describe memory hierarchy and concept of virtual memory. • Describe arithmetic and logical operations with integer and floating-point operands. • Illustrate organization of a simple processor, pipelined processor and other computing systems. 			
Module 1			Contact Hours
Basic Structure of Computers: Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. Machine Instructions and Programs: Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions Text book 1: Chapter1 – 1.3, 1.4, 1.6 (1.6.1-1.6.4, 1.6.7), Chapter2 – 2.2 to 2.10 RBT: L1, L2, L3			08
Module 2			
Input/Output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Exceptions, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB. Text book 1: Chapter4 – 4.1, 4.2 (4.2.1 to 4.2.5), 4.4, 4.5, 4.6, 4.7 RBT: L1, L2, L3			08
Module 3			
Memory System: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations, Virtual Memories, Secondary Storage. Text book 1: Chapter5 – 5.1 to 5.7, 5.9 RBT: L1, L2, L3			08
Module 4			
Arithmetic: Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division, Floating-point Numbers and Operations.			08

Text book 1: Chapter6 – 6.1 to 6.7	
RBT: L1, L2, L3	
Module 5	
Basic Processing Unit: Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hard-wired Control, Micro programmed Control. Pipelining, Embedded Systems and Large Computer Systems: Basic Concepts of pipelining, Examples of Embedded Systems, Processor chips for embedded applications, Simple Microcontroller.	08
Text book 1: Chapter7, Chapter8 – 8.1, Chapter9 – 9.1, 9.2, 9.3	
RBT: L1, L2, L3	
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Explain the basic organization of a computer system. • Demonstrate functioning of different sub systems, such as processor, Input/output, and memory. • Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems. • Design and analyse simple arithmetic and logical units. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, Tata McGraw Hill, 2002. (Listed topics only from Chapters 1, 2, 4, 5, 6, 7, 8, 9 and 12)	
Reference Books:	
1. William Stallings: Computer Organization & Architecture, 9 th Edition, Pearson, 2015.	


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SOFTWARE ENGINEERING (Effective from the academic year 2018 -2019) SEMESTER – III			
Subject Code	18CS35	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS35) will enable students to:			
<ul style="list-style-type: none"> Outline software engineering principles and activities involved in building large software programs. Identify ethical and professional issues and explain why they are of concern to software engineers. Describe the process of requirements gathering, requirements classification, requirements specification and requirements validation. Differentiate system models, use UML diagrams and apply design patterns. Discuss the distinctions between validation testing and defect testing. Recognize the importance of software maintenance and describe the intricacies involved in software evolution. Apply estimation techniques, schedule project activities and compute pricing. Identify software quality parameters and quantify software using measurements and metrics. List software quality standards and outline the practices involved. Recognize the need for agile software development, describe agile methods, apply agile practices and plan for agility. 			
Module 1			Contact Hours
Introduction: Software Crisis, Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies. Software Processes: Models: Waterfall Model (Sec 2.1.1), Incremental Model (Sec 2.1.2) and Spiral Model (Sec 2.1.3). Process activities. Requirements Engineering: Requirements Engineering Processes (Chap 4). Requirements Elicitation and Analysis (Sec 4.5). Functional and non-functional requirements (Sec 4.1). The software Requirements Document (Sec 4.2). Requirements Specification (Sec 4.3). Requirements validation (Sec 4.6). Requirements Management (Sec 4.7). RBT: L1, L2, L3			08
Module 2			
System Models: Context models (Sec 5.1). Interaction models (Sec 5.2). Structural models (Sec 5.3). Behavioral models (Sec 5.4). Model-driven engineering (Sec 5.5). Design and Implementation: Introduction to RUP (Sec 2.4), Design Principles (Chap 17). Object-oriented design using the UML (Sec 7.1). Design patterns (Sec 7.2). Implementation issues (Sec 7.3). Open source development (Sec 7.4). RBT: L1, L2, L3			08
Module 3			
Software Testing: Development testing (Sec 8.1), Test-driven development (Sec 8.2), Release testing (Sec 8.3), User testing (Sec 8.4). Test Automation (Page no 42, 70,212, 231,444,695). Software Evolution: Evolution processes (Sec 9.1). Program evolution dynamics (Sec 9.2).			08

Software maintenance (Sec 9.3). Legacy system management (Sec 9.4).	
RBT: L1, L2, L3	
Module 4	
Project Planning: Software pricing (Sec 23.1). Plan-driven development (Sec 23.2). Project scheduling (Sec 23.3). Estimation techniques (Sec 23.5). Quality management: Software quality (Sec 24.1). Reviews and inspections (Sec 24.3). Software measurement and metrics (Sec 24.4). Software standards (Sec 24.2)	08
RBT: L1, L2, L3	
Module 5	
Agile Software Development: Coping with Change (Sec 2.3), The Agile Manifesto: Values and Principles. Agile methods: SCRUM (Ref “The SCRUM Primer, Ver 2.0”) and Extreme Programming (Sec 3.3). Plan-driven and agile development (Sec 3.2). Agile project management (Sec 3.4), Scaling agile methods (Sec 3.5).	08
RBT: L1, L2, L3	
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Design a software system, component, or process to meet desired needs within realistic constraints. • Assess professional and ethical responsibility • Function on multi-disciplinary teams • Use the techniques, skills, and modern engineering tools necessary for engineering practice • Analyze, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
<ol style="list-style-type: none"> 1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012. (Listed topics only from Chapters 1,2,3,4, 5, 7, 8, 9, 23, and 24) 2. The SCRUM Primer, Ver 2.0, http://www.goodagile.com/scruprimer/scruprimer20.pdf 	
Reference Books:	
<ol style="list-style-type: none"> 1. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill. 2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India 	
Web Reference for eBooks on Agile:	
<ol style="list-style-type: none"> 1. http://agilemanifesto.org/ 2. http://www.jamesshore.com/Agile-Book/ 	


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DISCRETE MATHEMATICAL STRUCTURES (Effective from the academic year 2018 -2019) SEMESTER – III			
Subject Code	18CS36	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS36) will enable students to:			
<ul style="list-style-type: none"> • Provide theoretical foundations of computer science to perceive other courses in the programme. • Illustrate applications of discrete structures: logic, relations, functions, set theory and counting. • Describe different mathematical proof techniques, • Illustrate the use of graph theory in computer science 			
Module 1			Contact Hours
Fundamentals of Logic: Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic, Logical Implication – Rules of Inference. Fundamentals of Logic contd.: The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems. Text book 1: Chapter2 RBT: L1, L2, L3			08
Module 2			
Properties of the Integers: The Well Ordering Principle – Mathematical Induction, Recursive Definitions, The division algorithm, The Greatest common divisor. Fundamental Principles of Counting: The Rules of Sum and Product, Permutations, Combinations – The Binomial Theorem, Combinations with Repetition. Text book 1: Chapter4 – 4.1, 4.2, 4.3, 4.4, Chapter1 RBT: L1, L2, L3			08
Module 3			
Relations and Functions: Cartesian Products and Relations, Functions – Plain and One-to-One, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions. Relations: Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions. Text book 1: Chapter5, Chapter7 – 7.1 to 7.4 RBT: L1, L2, L3			08
Module 4			
The Principle of Inclusion and Exclusion: The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements – Nothing is in its Right Place, Rook Polynomials. Recurrence Relations: First Order Linear Recurrence Relation, The Second Order Linear Homogeneous Recurrence Relation with Constant Coefficients. Text book 1: Chapter8 – 8.1 to 8.4, Chapter10 – 10.1, 10.2			08

RBT: L1, L2, L3	
Module 5	
Introduction to Graph Theory: Definitions and Examples, Sub graphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits. Trees: Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Weighted Trees and Prefix Codes Text book 1: Chapter11 – 11.1 to 11.3 Chapter12 – 12.1 to 12.4 RBT: L1, L2, L3	08
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Use propositional and predicate logic in knowledge representation and truth verification. • Demonstrate the application of discrete structures in different fields of computer science. • Solve problems using recurrence relations and generating functions. • Application of different mathematical proofs techniques in proving theorems in the courses. • Compare graphs, trees and their applications. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education. 2004.	
Reference Books:	
1. Basavaraj S Anami and Venakanna S Madalli: Discrete Mathematics – A Concept based approach, Universities Press, 2016 2. Kenneth H. Rosen: Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007. 3. Jayant Ganguly: A Treatise on Discrete Mathematical Structures, Sanguine-Pearson, 2010. 4. D.S. Malik and M.K. Sen: Discrete Mathematical Structures: Theory and Applications, Thomson, 2004. 5. Thomas Koshy: Discrete Mathematics with Applications, Elsevier, 2005, Reprint 2008.	


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ANALOG AND DIGITAL ELECTRONICS LABORATORY (Effective from the academic year 2018 -2019) SEMESTER – III			
Subject Code	18CPL37	CIE Marks	40
Number of Contact Hours/Week	0:2:2	SEE Marks	60
Total Number of Lab Contact Hours	36	Exam Hours	3 Hrs
Credits – 2			
Course Learning Objectives: This course (18CSL37) will enable students to:			
This laboratory course enable students to get practical experience in design, assembly and evaluation/testing of			
<ul style="list-style-type: none">• Analog components and circuits including Operational Amplifier, Timer, etc.• Combinational logic circuits.• Flip - Flops and their operations• Counters and registers using flip-flops.• Synchronous and Asynchronous sequential circuits.• A/D and D/A converters			
Descriptions (if any):			
<ul style="list-style-type: none">• Simulation packages preferred: Multisim, Modelsim, PSpice or any other relevant.• For Part A (Analog Electronic Circuits) students must trace the wave form on Tracing sheet / Graph sheet and label trace.• Continuous evaluation by the faculty must be carried by including performance of a student in both hardware implementation and simulation (if any) for the given circuit.• A batch not exceeding 4 must be formed for conducting the experiment. For simulation individual student must execute the program.			
Laboratory Programs:			
PART A (Analog Electronic Circuits)			
1.	Design an astable multivibrator circuit for three cases of duty cycle (50%, <50% and >50%) using NE 555 timer IC. Simulate the same for any one duty cycle.		
2.	Using appropriate linear IC regulators, design fixed +5V and -12V regulator circuits. For the rectification design a full wave bridge rectifier circuit. And simulate the same.		
3.	Using ua 741 Opamp, design a 1 kHz Relaxation Oscillator with 50% duty cycle. And simulate the same.		
4.	Using ua 741 opamp, design a window comparator for any given UTP and LTP. And simulate the same.		
5.	Demonstrate the use of LED and photodiode for an alarm system.		
PART B (Digital Electronic Circuits)			
6.	Design and implement Half adder, Full Adder, Half Subtractor, Full Subtractor using basic gates. And implement the same in HDL.		
7.	Given a 4-variable logic expression, simplify it using appropriate technique and realize the simplified logic expression using 8:1 multiplexer IC. And implement the same in HDL.		
8.	Realize a J-K Master / Slave Flip-Flop using NAND gates and verify its truth table. And implement the same in HDL.		
9.	Design and implement a mod-n ($n < 8$) synchronous up counter using J-K Flip-Flop ICs and demonstrate its working.		
10.	Design and implement an asynchronous counter using decade counter IC to count up from 0 to n ($n \leq 9$) and demonstrate on 7-segment display (using IC-7447)		

Laboratory Outcomes: The student should be able to:

- Use appropriate design equations / methods to design the given circuit.
- Examine and verify the design of both analog and digital circuits using simulators.
- Make use of electronic components, ICs, instruments and tools for design and testing of circuits for the given the appropriate inputs.
- Compile a laboratory journal which includes; aim, tool/instruments/software/components used, design equations used and designs, schematics, program listing, procedure followed, relevant theory, results as graphs and tables, interpreting and concluding the findings.

Conduct of Practical Examination:

- All laboratory experiments, excluding the first, are to be included for practical examination.
- Experiment distribution
 - For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity.
 - For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity.
- Change of experiment is allowed only once and marks allotted for procedure part to be made zero.
- Marks Distribution (*Subjected to change in accordance with university regulations*)
 - a) For questions having only one part – Procedure + Execution + Viva-Voce: $15+70+15 = 100$ Marks
 - b) For questions having part A and B
 - i. Part A – Procedure + Execution + Viva = $4 + 21 + 5 = 30$ Marks
 - ii. Part B – Procedure + Execution + Viva = $10 + 49 + 11 = 70$ Marks



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DATA STRUCTURES LABORATORY
(Effective from the academic year 2018 -2019)
SEMESTER – III

Subject Code	18CE/L38	CIE Marks	40
Number of Contact Hours/Week	0:2:2	SEE Marks	60
Total Number of Lab Contact Hours	36	Exam Hours	3 Hrs
Credits – 2			
Course Learning Objectives: This course (18CSL38) will enable students to:			
This laboratory course enable students to get practical experience in design, develop, implement, analyze and evaluation/testing of			
<ul style="list-style-type: none"> Asymptotic performance of algorithms. Linear data structures and their applications such as stacks, queues and lists Non-Linear data structures and their applications such as trees and graphs Sorting and searching algorithms 			
Descriptions (if any):			
<ul style="list-style-type: none"> Implement all the programs in 'C / C++' Programming Language and Linux / Windows as OS. 			
Programs List:			
1.	Design, Develop and Implement a menu driven Program in C for the following array operations. <ol style="list-style-type: none"> Creating an array of N Integer Elements Display of array Elements with Suitable Headings Inserting an Element (ELEM) at a given valid Position (POS) Deleting an Element at a given valid Position (POS) Exit. Support the program with functions for each of the above operations.		
2.	Design, Develop and Implement a Program in C for the following operations on Strings. <ol style="list-style-type: none"> Read a main String (STR), a Pattern String (PAT) and a Replace String (REP) Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Don't use Built-in functions.		
3.	Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) <ol style="list-style-type: none"> Push an Element on to Stack Pop an Element from Stack Demonstrate how Stack can be used to check Palindrome Demonstrate Overflow and Underflow situations on Stack Display the status of Stack Exit Support the program with appropriate functions for each of the above operations		
4.	Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands.		

5.	Design, Develop and Implement a Program in C for the following Stack Applications a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^ b. Solving Tower of Hanoi problem with n disks
6.	Design, Develop and Implement a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations
7.	Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: <i>USN, Name, Branch, Sem, PhNo</i> a. Create a SLL of N Students Data by using <i>front insertion</i> . b. Display the status of SLL and count the number of nodes in it c. Perform Insertion / Deletion at End of SLL d. Perform Insertion / Deletion at Front of SLL (Demonstration of stack) e. Exit
8.	Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: <i>SSN, Name, Dept, Designation, Sal, PhNo</i> a. Create a DLL of N Employees Data by using <i>end insertion</i> . b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue. f. Exit
9.	Design, Develop and Implement a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes a. Represent and Evaluate a Polynomial $P(x,y,z) = 6x^2y^2z - 4yz^5 + 3x^3yz + 2xy^5z - 2xyz^3$ b. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z) Support the program with appropriate functions for each of the above operations
10.	Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers . a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 b. Traverse the BST in Inorder, Preorder and Post Order c. Search the BST for a given element (KEY) and report the appropriate message d. Exit
11.	Design, Develop and Implement a Program in C for the following operations on Graph(G) of Cities a. Create a Graph of N cities using Adjacency Matrix. b. Print all the nodes reachable from a given starting node in a digraph using DFS/BFS method

12.	Given a File of N employee records with a set K of Keys (4-digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table (HT) of m memory locations with L as the set of memory addresses (2-digit) of locations in HT. Let the keys in K and addresses in L are Integers. Design and develop a Program in C that uses Hash function $H: K \rightarrow L$ as $H(K)=K \bmod m$ (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.
Laboratory Outcomes: The student should be able to:	
<ul style="list-style-type: none"> Analyze and Compare various linear and non-linear data structures Code, debug and demonstrate the working nature of different types of data structures and their applications Implement, analyze and evaluate the searching and sorting algorithms Choose the appropriate data structure for solving real world problems 	
Conduct of Practical Examination:	
<ul style="list-style-type: none"> All laboratory experiments, excluding the first, are to be included for practical examination. Experiment distribution <ul style="list-style-type: none"> For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity. For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity. Change of experiment is allowed only once and marks allotted for procedure part to be made zero. Marks Distribution (<i>Subjected to change in accordance with university regulations</i>) <ul style="list-style-type: none"> c) For questions having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks d) For questions having part A and B <ul style="list-style-type: none"> i. Part A – Procedure + Execution + Viva = 4 + 21 + 5 = 30 Marks ii. Part B – Procedure + Execution + Viva = 10 + 49 + 11 = 70 Marks 	


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VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examination 2018 – 19
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2018 – 19)

IV SEMESTER												
Sl. No	Course and Course Code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BSC	18MAT41	Complex Analysis, Probability And Statistical Methods	Mathematics	2	2	--	03	40	60	100	3
2	PCC	18CS42	Design and Analysis of Algorithms	CS / IS	3	2	--	03	40	60	100	4
3	PCC	18CS43	Operating Systems	CS / IS	3	0	--	03	40	60	100	3
4	PCC	18SC44	Microcontroller and Embedded Systems	CS / IS	3	0	--	03	40	60	100	3
5	PCC	18CS45	Object Oriented Concepts	CS / IS	3	0	--	03	40	60	100	3
6	PCC	18CS46	Data Communication	CS / IS	3	0	--	03	40	60	100	3
7	PCC	18CSL47	Design and Analysis of Algorithm Laboratory	CS / IS	--	2	2	03	40	60	100	2
8	PCC	18CSL48	Microcontroller and Embedded Systems Laboratory	CS / IS	--	2	2	03	40	60	100	2
9	HSMC	18KVK49	Vyavaharika Kannada (Kannada for communication)/	HSMC	--	2	--	--	100	--	100	1
		18KAK49	Aadalitha Kannada (Kannada for Administration)									
		OR	OR									
		18CPH49	Constitution of India, Professional Ethics and Cyber Law		1	--	--	02	40	60		
		Examination is by objective type questions										
TOTAL					17	10	04	24	420	480	900	24
					OR	OR		OR	OR	OR		
					18	08		27	360	540		

Note: BSC: Basic Science, PCC: Professional Core, HSMC: Humanity and Social Science, NCMC: Non-credit mandatory course

18KVK49 Vyavaharika Kannada (Kannada for communication) is for non-Kannada speaking, reading and writing students and **18KAK49** Aadalitha Kannada (Kannada for Administration) is for students who speak, read and write Kannada.

Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

10	NCMC	18MATDIP41	Additional Mathematics - II	Mathematics	02	01	--	03	40	60	100	0
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(a) The mandatory non – credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of BE/B.Tech programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the students have to fulfill the requirements during subsequent semester/s to appear for SEE.

(b) These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree

Courses prescribed to lateral entry B. Sc degree holders admitted to III semester of Engineering programs


Lateral entrant students from B.Sc. Stream, shall clear the non-credit courses Engineering Graphics and Elements of Civil Engineering and Mechanics of the First Year Engineering Programme. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

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COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS (Effective from the academic year 2018 -2019) SEMESTER – IV			
Course Code	18MAT41	CIE Marks	40
Number of Contact Hours/Week	2:2:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18MAT41) will enable students to: <ul style="list-style-type: none"> To provide an insight into applications of complex variables, conformal mapping and special functions arising in potential theory, quantum mechanics, heat conduction and field theory. To develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, design engineering and microwave engineering. 			
Module 1			Contact Hours
Calculus of complex functions: Review of function of a complex variable, limits, continuity, and differentiability. Analytic functions: Cauchy-Riemann equations in cartesian and polar forms and consequences. Construction of analytic functions : Milne-Thomson method-Problems. RBT: L1, L2			08
Module 2			
Conformal transformations: Introduction. Discussion of transformations: $w=z^2$, $w=e^z$, $w = z + \frac{1}{z}$, ($z \neq 0$). Bilinear transformations- Problems. Complex integration: Line integral of a complex function-Cauchy's theorem and Cauchy's integral formula and problems. RBT: L1, L2			08
Module 3			
Probability Distributions: Review of basic probability theory. Random variables (discrete and continuous), probability mass/density functions. Binomial, Poisson, exponential and normal distributions- problems (No derivation for mean and standard deviation)-Illustrative examples. RBT: L1, L2, L3			08
Module 4			
Curve Fitting: Curve fitting by the method of least squares- fitting the curves of the form- $y = ax + b$, $y = ax^b$ & $y = ax^2 + bx + c$. Statistical Methods: Correlation and regression-Karl Pearson's coefficient of correlation and rank correlation-problems. Regression analysis- lines of regression –problems. RBT: L1, L2, L3			08

Module 5	
Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation and covariance. Sampling Theory: Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of hypothesis for means, student's t-distribution, Chi-square distribution as a test of goodness of fit. RBT:L2, L3, L4	08
Course Outcomes: The student will be able to : <ul style="list-style-type: none"> • Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory. • Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing. • Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field. • Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data. • Construct joint probability distributions and demonstrate the validity of testing the hypothesis. 	
Question Paper Pattern: <ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks: <ol style="list-style-type: none"> 1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2016 2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017 3. Srimanta Pal et al , Engineering Mathematics, Oxford University Press, 3rd Edition, 2016 	
Reference Books: <ol style="list-style-type: none"> 1. C.Ray Wylie, Louis C.Barrett , Advanced Engineering Mathematics, McGraw-Hill Book Co, 6th Edition, 1995 2. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India, 4th Edition 2010 3. B.V.Ramana, Higher Engineering Mathematics, McGraw-Hill, 11th Edition, 2010 4. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, 6th Edition, 2014 	
Web links and Video Lectures: <ol style="list-style-type: none"> 1. http://nptel.ac.in/courses.php?disciplineID=111 2. http://www.class-central.com/Course/math(MOOCs) 3. http://academicearth.org/ 4. VTU EDUSAT PROGRAMME – 20 	


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ADDITIONAL MATHEMATICS – II (Mandatory Learning Course: Common to All Programmees) (A Bridge course for Lateral Entry students under Diploma quota to BE/B.Tech programmes) (Effective from the academic year 2018 -2019) SEMESTER – IV			
Course Code	18MATDIP41	CIE Marks	40
Number of Contact Hours/Week	2:1:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS – 0			
Course Learning Objectives: This course (18MATDIP41) will enable students to:			
<ul style="list-style-type: none"> To provide essential concepts of linear algebra, second & higher order differential equations along with methods to solve them. To provide an insight into elementary probability theory and numerical methods. 			
Module 1			Contact Hours
Linear Algebra: Introduction - rank of matrix by elementary row operations - Echelon form. Consistency of system of linear equations - Gauss elimination method. Eigen values and eigen vectors of a square matrix. Problems. RBT: L2, L2			08
Module 2			
Numerical Methods: Finite differences. Interpolation/extrapolation using Newton's forward and backward difference formulae (Statements only)-problems. Solution of polynomial and transcendental equations – Newton-Raphson and Regula-Falsi methods (only formulae)- Illustrative examples. Numerical integration: Simpson's one third rule and Weddle's rule (without proof) Problems. RBT: L1, L2, L3			08
Module 3			
Higher order ODE's: Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators. [Particular Integral restricted to $R(x) = e^{ax}, \sin ax / \cos ax$ for $f(D)y = R(x)$] RBT: L1, L2			08
Module 4			
Partial Differential Equations(PDE's):- Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. RBT: L1, L2			08
Module 5			
Probability: Introduction. Sample space and events. Axioms of probability. Addition & multiplication theorems. Conditional probability, Bayes's theorem, problems. RBT: L1, L2			08
Course Outcomes: The student will be able to :			

- Solve systems of linear equations using matrix algebra.
- Apply the knowledge of numerical methods in modelling and solving engineering problems.
- Make use of analytical methods to solve higher order differential equations.
- Classify partial differential equations and solve them by exact methods.
- Apply elementary probability theory and solve related problems.

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2015

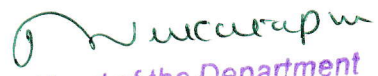
Reference Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2016
2. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, 6th Edition, 2014
3. Rohit Khurana , Engineering Mathematics Vol.I, Cengage Learning, 1st Edition, 2015.

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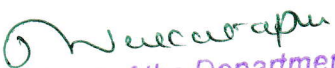
DESIGN AND ANALYSIS OF ALGORITHMS (Effective from the academic year 2018 -2019) SEMESTER – IV			
Subject Code	18CS42	CIE Marks	40
Number of Contact Hours/Week	3:2:0	SEE Marks	60
Total Number of Contact Hours	50	Exam Hours	3 Hrs
CREDITS –4			
Course Learning Objectives: This course (18CS42) will enable students to:			
<ul style="list-style-type: none"> • Explain various computational problem solving techniques. • Apply appropriate method to solve a given problem. • Describe various methods of algorithm analysis. 			
Module 1			Contact Hours
Introduction: What is an Algorithm? (T2:1.1), Algorithm Specification (T2:1.2), Analysis Framework (T1:2.1), Performance Analysis: Space complexity, Time complexity (T2:1.3). Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), and Little-oh notation (o), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples (T1:2.2, 2.3, 2.4). Important Problem Types: Sorting, Searching, String processing, Graph Problems, Combinatorial Problems. Fundamental Data Structures: Stacks, Queues, Graphs, Trees, Sets and Dictionaries. (T1:1.3,1.4). RBT: L1, L2, L3			10
Module 2			
Divide and Conquer: General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum (T2:3.1, 3.3, 3.4), Merge sort, Quick sort (T1:4.1, 4.2), Strassen's matrix multiplication (T2:3.8), Advantages and Disadvantages of divide and conquer. Decrease and Conquer Approach: Topological Sort. (T1:5.3). RBT: L1, L2, L3			10
Module 3			
Greedy Method: General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines (T2:4.1, 4.3, 4.5). Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm (T1:9.1, 9.2). Single source shortest paths: Dijkstra's Algorithm (T1:9.3). Optimal Tree problem: Huffman Trees and Codes (T1:9.4). Transform and Conquer Approach: Heaps and Heap Sort (T1:6.4). RBT: L1, L2, L3			10
Module 4			
Dynamic Programming: General method with Examples, Multistage Graphs (T2:5.1, 5.2). Transitive Closure: Warshall's Algorithm, All Pairs Shortest Paths: Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem ((T1:8.2, 8.3, 8.4), Bellman-Ford Algorithm (T2:5.4), Travelling Sales Person problem (T2:5.9), Reliability design (T2:5.8). RBT: L1, L2, L3			10
Module 5			
Backtracking: General method (T2:7.1), N-Queens problem (T1:12.1), Sum of subsets problem (T1:12.1), Graph coloring (T2:7.4), Hamiltonian cycles (T2:7.5). Branch and Bound: Assignment Problem, Travelling Sales Person problem (T1:12.2), 0/1 Knapsack problem (T2:8.2, T1:12.2): LC Branch and Bound solution (T2:8.2), FIFO Branch and			10

Bound solution (T2:8.2). NP-Complete and NP-Hard problems: Basic concepts, non-deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes (T2:11.1).	
RBT: L1, L2, L3	
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Describe computational solution to well known problems like searching, sorting etc. • Estimate the computational complexity of different algorithms. • Devise an algorithm using appropriate design strategies for problem solving. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
<ol style="list-style-type: none"> 1. Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009. Pearson. 2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press 	
Reference Books:	
<ol style="list-style-type: none"> 1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI. 2. Design and Analysis of Algorithms , S. Sridhar, Oxford (Higher Education). 	


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OPERATING SYSTEMS (Effective from the academic year 2018 -2019) SEMESTER – IV			
Subject Code	18CS43	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS43) will enable students to:			
<ul style="list-style-type: none"> • Introduce concepts and terminology used in OS • Explain threading and multithreaded systems • Illustrate process synchronization and concept of Deadlock • Introduce Memory and Virtual memory management, File system and storage techniques 			
Module 1			Contact Hours
Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot. Process Management Process concept; Process scheduling; Operations on processes; Inter process communication			08
Module 2			
Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling. Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.			08
Module 3			
Deadlocks : Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.			08
Module 4			
Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. File System, Implementation of File System: File system: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection: Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.			08
Module 5			
Secondary Storage Structures, Protection: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability- Based systems. Case Study: The Linux Operating System: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory Management; File systems, Input and output; Inter-process communication.			08

Course Outcomes: The student will be able to :
<ul style="list-style-type: none"> • Demonstrate need for OS and different types of OS • Apply suitable techniques for management of different resources • Use processor, memory, storage and file system commands • Realize the different concepts of OS in platform of usage through case studies
Question Paper Pattern:
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module.
Textbooks:
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 7 th edition, Wiley-India, 2006
Reference Books:
<ol style="list-style-type: none"> 1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition 2. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013. 3. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014. 4. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.


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MICROCONTROLLER AND EMBEDDED SYSTEMS (Effective from the academic year 2018 -2019) SEMESTER – IV			
Subject Code	18CS44	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –4			
Course Learning Objectives: This course (18CS44) will enable students to:			
<ul style="list-style-type: none"> • Differentiate between microprocessors and microcontrollers. • Explain the architecture of ARM processor with its instruction set. • Identify the applicability of the embedded system • Comprehend the real time operating system used for the embedded system 			
Module 1			Contact Hours
Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software, ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table , Core Extensions			08
Text book 1:Chapter1 - 1.1 to 1.4, Chapter2 - 2.1 to 2.5			
RBT: L1, L2			
Module 2			
Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software, ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table , Core Extensions			08
Text book 1:Chapter1 - 1.1 to 1.4, Chapter2 - 2.1 to 2.5			
Module 3			
Embedded System Components: Embedded Vs General computing system, Classification of Embedded systems, Major applications and purpose of ES. Core of an Embedded System including all types of processor/controller, Memory, Sensors, Actuators, LED, 7 segment LED display, stepper motor, Keyboard, Push button switch, Communication Interface (onboard and external types), Embedded firmware, Other system components.			08
Text book 2: All the Topics from Chapter1 and Chapter2			
Module 4			
Embedded System Design Concepts: Characteristics and Quality Attributes of Embedded Systems, Operational and non-operational quality attributes, Embedded Systems-Application and Domain specific, Hardware Software Co-Design and Program Modeling, embedded firmware design and development			08
Text book 2: Chapter-3, Chapter-4, Chapter-7 (Sections 7.1, 7.2 only), Chapter-9 (Sections 9.1, 9.2, 9.3.1, 9.3.2 only)			
Module 5			
RTOS and IDE for Embedded System Design: Operating System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread preemption, Preemptive Task scheduling techniques, Task			08

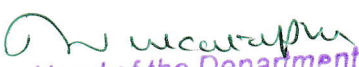
<p>Communication, Task synchronization issues – Racing and Deadlock, Concept of Binary and counting semaphores (Mutex example without any program), How to choose an RTOS, Integration and testing of Embedded hardware and firmware, Embedded system Development Environment – Block diagram (excluding Keil), Disassembler/decompiler, simulator, emulator and debugging techniques</p>	
<p>Text book 2: Chapter-10 (Sections 10.1, 10.2, 10.3, 10.5.2 , 10.7, 10.8.1.1, 10.8.1.2, 10.8.2.2, 10.10 only), Chapter 12, Chapter-13 (block diagram before 13.1, 13.3, 13.4, 13.5, 13.6 only)</p>	
<p>Course Outcomes: The student will be able to :</p>	
<ul style="list-style-type: none"> • Describe the architectural features and instructions of ARM microcontroller • Apply the knowledge gained for Programming ARM for different applications. • Interface external devices and I/O with ARM microcontroller. • Interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system. • Develop the hardware /software co-design and firmware design approaches. • Demonstrate the need of real time operating system for embedded system applications 	
<p>Question Paper Pattern:</p>	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
<p>Textbooks:</p>	
<ol style="list-style-type: none"> 1. Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developers guide, Elsevier, Morgan Kaufman publishers, 2008. 2. Shibu K V, “Introduction to Embedded Systems”, Tata McGraw Hill Education, Private Limited, 2nd Edition. 	
<p>Reference Books:</p>	
<ol style="list-style-type: none"> 1. The Insider’s Guide to the ARM7 Based Microcontrollers, Hitex Ltd.,1st edition, 2005 2. Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson, 2015 3. Raj Kamal, Embedded System, Tata McGraw-Hill Publishers, 2nd Edition, 2008 4. Ragunandan, An Introduction to ARM System Design, Cengage Publication 	


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OBJECT ORIENTED CONCEPTS (Effective from the academic year 2018 -2019) SEMESTER – IV			
Subject Code	18CS45	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS45) will enable students to:			
<ul style="list-style-type: none"> • Learn fundamental features of object oriented language and JAVA • Set up Java JDK environment to create, debug and run simple Java programs. • Create multi-threaded programs and event handling mechanisms. • Introduce event driven Graphical User Interface (GUI) programming using applets and swings. 			
Module 1			Contact Hours
Introduction to Object Oriented Concepts: A Review of structures, Procedure–Oriented Programming system, Object Oriented Programming System, Comparison of Object Oriented Language with C, Console I/O, variables and reference variables, Function Prototyping, Function Overloading. Class and Objects: Introduction, member functions and data, objects and functions, objects and arrays, Namespaces, Nested classes, Constructors, Destructors. Text book 1: Ch 1: 1.1 to 1.9 Ch 2: 2.1 to 2.6 Ch 4: 4.1 to 4.2			08
Module 2			
Introduction to Java: Java's magic: the Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. Data types, variables and arrays, Operators, Control Statements. Text book 2: Ch:1 Ch: 2 Ch:3 Ch:4 Ch:5			08
Module 3			
Classes, Inheritance, Exceptions, Packages and Interfaces: Classes: Classes fundamentals; Declaring objects; Constructors, this keyword, garbage collection. Inheritance: inheritance basics, using super, creating multi level hierarchy, method overriding. Exception handling: Exception handling in Java. Packages, Access Protection, Importing Packages, Interfaces. Text book 2: Ch:6 Ch: 8 Ch:9 Ch:10			08
Module 4			
Multi Threaded Programming, Event Handling: Multi Threaded Programming: What are threads? How to make the classes threadable ; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, read-write problem, producer consumer problems. Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes. Text book 2: Ch 11: Ch: 22			08
Module 5			
The Applet Class: Introduction, Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); ApletContext and showDocument(); The AudioClip Interface; The AppletStub Interface;Output to the Console. Swings: Swings: The origins of Swing; Two key			08

<p>Swings: Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; JLabel and ImageIcon; JTextField; The Swing Buttons; JTabbedPane; JScrollPane; JList; JComboBox; JTable.</p> <p>Text book 2: Ch 22: Ch: 29 Ch: 30</p> <p>RBT: L1, L2, L3</p>	
<p>Course Outcomes: The student will be able to :</p> <ul style="list-style-type: none"> • Explain the object-oriented concepts and JAVA. • Develop computer programs to solve real world problems in Java. • Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using swings. 	
<p>Question Paper Pattern:</p> <ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
<p>Textbooks:</p> <ol style="list-style-type: none"> 1. Sourav Sahay, Object Oriented Programming with C++ , 2nd Ed, Oxford University Press, 2006 2. Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007. 	
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Mahesh Bhavde and Sunil Patekar, "Programming with Java", First Edition, Pearson Education, 2008, ISBN: 9788131720806 2. Herbert Schildt, The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003. 3. Stanley B. Lippmann, Josee Lajore, C++ Primer, 4th Edition, Pearson Education, 2005. 4. Rajkumar Buyya, S Thamarasi selvi, Xingchen Chu, Object oriented Programming with Java, Tata McGraw Hill Education Private Limited. 5. Richard A Johnson, Introduction to Java Programming and OOAD, CENGAGE Learning. 6. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies. 	
<p>Mandatory Note: Every institute shall organize bridge course on C++, either in the vacation or in the beginning of even semester for a minimum period of ten days (2hrs/day). Maintain a copy of the report for verification during LIC visit.</p>	
<p>Faculty can utilize open source tools to make teaching and learning more interactive.</p>	

Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; JLabel and ImageIcon; JTextField;The Swing Buttons; JTabbedPane; JScrollPane; JList; JComboBox; JTable.	
Text book 2: Ch 21: Ch: 29 Ch: 30	
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Explain the object-oriented concepts and JAVA. • Develop computer programs to solve real world problems in Java. • Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using Applets and swings. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
<ol style="list-style-type: none"> 1. Sourav Sahay, Object Oriented Programming with C++ , 2nd Ed, Oxford University Press,2006 (Chapters 1, 2, 4) 2. Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007. (Chapters 1, 2, 3, 4, 5, 6, 8, 9,10, 11, 21, 22, 29, 30) 	
Reference Books:	
<ol style="list-style-type: none"> 1. Mahesh Bhavne and Sunil Patekar, "Programming with Java", First Edition, Pearson Education,2008, ISBN:9788131720806 2. Herbert Schildt, The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003. 3. Stanley B.Lippmann, Josee Lajore, C++ Primer, 4th Edition, Pearson Education, 2005. 4. Rajkumar Buyya,S Thamarasi selvi, xingchen chu, Object oriented Programming with java, Tata McGraw Hill education private limited. 5. Richard A Johnson, Introduction to Java Programming and OOAD, CENGAGE Learning. 6. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies. 	
Note: Every institute shall organize a bridge organize on C++ either in the vacation or in the beginning of even semester.	


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DATA COMMUNICATION (Effective from the academic year 2018 -2019) SEMESTER – IV			
Subject Code	18CS46	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS46) will enable students to:			
<ul style="list-style-type: none"> Comprehend the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data. Explain with the basics of data communication and various types of computer networks; Illustrate TCP/IP protocol suite and switching criteria. Demonstrate Medium Access Control protocols for reliable and noisy channels. Expose wireless and wired LANs. 			
Module 1			Contact Hours
Introduction: Data Communications, Networks, Network Types, Internet History, Standards and Administration, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, Introduction to Physical Layer-1: Data and Signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance.			08
Module 2			
Digital Transmission: Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding). Physical Layer-2: Analog to digital conversion (only PCM), Transmission Modes, Analog Transmission: Digital to analog conversion,			08
Module 3			
Bandwidth Utilization: Multiplexing and Spread Spectrum, Switching: Introduction, Circuit Switched Networks and Packet switching. Error Detection and Correction: Introduction, Block coding, Cyclic codes, Checksum, Forward error correction,			08
Module 4			
Data link control: DLC services, Data link layer protocols, HDLC, and Point to Point protocol (Framing, Transition phases only). Media Access control: Random Access, Controlled Access and Channelization,			08
Module 5			
Wired LANs Ethernet: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet, Wireless LANs: Introduction, IEEE 802.11 Project and Bluetooth. Other wireless Networks: WIMAX, Cellular Telephony, Satellite networks			08
Course Outcomes: The student will be able to :			
<ul style="list-style-type: none"> Explain the various components of data communication. Explain the fundamentals of digital communication and switching. Compare and contrast data link layer protocols. Summarize IEEE 802.xx standards 			
Question Paper Pattern:			
<ul style="list-style-type: none"> The question paper will have ten questions. Each full Question consisting of 20 marks There will be 2 full questions (with a maximum of four sub questions) from each module. 			

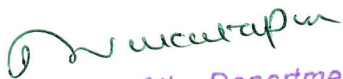
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Behrouz A. Forouzan, Data Communications and Networking 5E, 5th Edition, Tata McGraw-Hill, 2013. (Chapters 1.1 to 1.5, 2.1 to 2.3, 3.1, 3.3 to 3.6, 4.1 to 4.3, 5.1, 6.1, 6.2, 8.1 to 8.3, 10.1 to 10.5, 11.1 to 11.4, 12.1 to 12.3, 13.1 to 13.5, 15.1 to 15.3, 16.1 to 16.3)

Reference Books:

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.


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DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY


(Effective from the academic year 2018 -2019)

SEMESTER – IV

Subject Code	18CSL47	CIE Marks	40
Number of Contact Hours/Week	0:2:2	SEE Marks	60
Total Number of Lab Contact Hours	36	Exam Hours	3 Hrs
Credits – 2			
Course Learning Objectives: This course (18CSL47) will enable students to:			
<ul style="list-style-type: none"> Design and implement various algorithms in JAVA Employ various design strategies for problem solving. Measure and compare the performance of different algorithms. 			
Descriptions (if any):			
<ul style="list-style-type: none"> Design, develop, and implement the specified algorithms for the following problems using Java language under LINUX /Windows environment. Netbeans / Eclipse IDE tool can be used for development and demonstration. 			
Programs List:			
1.			
a.	Create a Java class called <i>Student</i> with the following details as variables within it. (i) USN (ii) Name (iii) Branch (iv) Phone Write a Java program to create <i>nStudent</i> objects and print the USN, Name, Branch, and Phone of these objects with suitable headings.		
b.	Write a Java program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.		
2.			
a.	Design a superclass called <i>Staff</i> with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely <i>Teaching</i> (domain, publications), <i>Technical</i> (skills), and <i>Contract</i> (period). Write a Java program to read and display at least 3 <i>staff</i> objects of all three categories.		
b.	Write a Java class called <i>Customer</i> to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as <name, dd/mm/yyyy> and display as <name, dd, mm, yyyy> using StringTokenizer class considering the delimiter character as “/”.		
3.			
a.	Write a Java program to read two integers <i>a</i> and <i>b</i> . Compute <i>a/b</i> and print, when <i>b</i> is not zero. Raise an exception when <i>b</i> is equal to zero.		
b.	Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.		
4.	Sort a given set of <i>n</i> integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of <i>n</i> > 5000 and record the time taken to sort.		

	Plot a graph of the time taken versus <i>n</i> on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
5.	Sort a given set of <i>n</i> integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of $n > 5000$, and record the time taken to sort. Plot a graph of the time taken versus <i>n</i> on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
6.	Implement in Java, the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.
7.	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm . Write the program in Java.
8.	Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm . Use Union-Find algorithms in your program
9.	Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm .
10.	Write Java programs to (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm . (b) Implement Travelling Sales Person problem using Dynamic programming.
11.	Design and implement in Java to find a subset of a given set $S = \{S_1, S_2, \dots, S_n\}$ of <i>n</i> positive integers whose SUM is equal to a given positive integer <i>d</i> . For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$, there are two solutions $\{1, 2, 6\}$ and $\{1, 8\}$. Display a suitable message, if the given problem instance doesn't have a solution.
12.	Design and implement in Java to find all Hamiltonian Cycles in a connected undirected Graph G of <i>n</i> vertices using backtracking principle.
Laboratory Outcomes: The student should be able to:	
<ul style="list-style-type: none"> • Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.) • Implement a variety of algorithms such as sorting, graph related, combinatorial, etc., in a high level language. • Analyze and compare the performance of algorithms using language features. • Apply and implement learned algorithm design techniques and data structures to solve real-world problems. 	
Conduct of Practical Examination:	
<ul style="list-style-type: none"> • All laboratory experiments, excluding the first, are to be included for practical examination. • Experiment distribution <ul style="list-style-type: none"> ○ For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity. 	

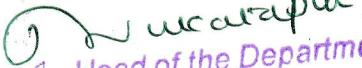
- For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity.
- Change of experiment is allowed only once and marks allotted for procedure part to be made zero.
- Marks Distribution (*Subjected to change in accordance with university regulations*)
 - e) For questions having only one part – Procedure + Execution + Viva-Voce: $15+70+15 = 100$ Marks
 - f) For questions having part A and B
 - i. Part A – Procedure + Execution + Viva = $4 + 21 + 5 = 30$ Marks
 - ii. Part B – Procedure + Execution + Viva = $10 + 49 + 11 = 70$ Marks


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MICROCONTROLLER AND EMBEDDED SYSTEMS LABORATORY (Effective from the academic year 2018 -2019) SEMESTER – IV			
Subject Code	18CSL48	CIE Marks	40
Number of Contact Hours/Week	0:2:2	SEE Marks	60
Total Number of Lab Contact Hours	36	Exam Hours	3 Hrs
Credits – 2			
Course Learning Objectives: This course (18CSL48) will enable students to:			
<ul style="list-style-type: none">Develop and test Assembly Language Program (ALP) using ARM7TDMI/LPC2148Conduct the experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.			
Descriptions (if any):			
•			
Programs List:			
PART A Conduct the following experiments by writing Assembly Language Program (ALP) using ARM7TDMI/LPC2148 using an evaluation board/simulator and the required software tool.			
1.	Write an ALP to multiply two 16 bit binary numbers.		
2.	Write an ALP to find the sum of first 10 integer numbers.		
3.	Write an ALP to find factorial of a number.		
4.	Write an ALP to add an array of 16 bit numbers and store the 32 bit result in internal RAM		
5.	Write an ALP to find the square of a number (1 to 10) using look-up table.		
6.	Write an ALP to find the largest/smallest number in an array of 32 numbers .		
7.	Write an ALP to arrange a series of 32 bit numbers in ascending/descending order.		
8.	Write an ALP to count the number of ones and zeros in two consecutive memory locations.		
PART –B Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.			
9.	Display “Hello World” message using Internal UART.		
10.	Interface and Control a DC Motor.		
11.	Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.		
12.	Determine Digital output for a given Analog input using Internal ADC of ARM controller.		
13.	Interface a DAC and generate Triangular and Square waveforms.		
14.	Interface a 4x4 keyboard and display the key code on an LCD.		
15.	Demonstrate the use of an external interrupt to toggle an LED On/Off.		
16.	Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between		
Laboratory Outcomes: The student should be able to:			
<ul style="list-style-type: none">Develop and test Assembly Language Program (ALP) using ARM7TDMI/LPC2148Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.			
Conduct of Practical Examination:			
<ul style="list-style-type: none">All laboratory experiments, excluding the first, are to be included for practical examination.Experiment distribution<ul style="list-style-type: none">For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity.For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity.Change of experiment is allowed only once and marks allotted for procedure part to be made			

zero.

- Marks Distribution (*Subjected to change in accordance with university regulations*)
 - g) For questions having only one part – Procedure + Execution + Viva-Voce: $15+70+15 = 100$ Marks
 - h) For questions having part A and B
 - i. Part A – Procedure + Execution + Viva = $4 + 21 + 5 = 30$ Marks
 - ii. Part B – Procedure + Execution + Viva = $10 + 49 + 11 = 70$ Marks


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VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examination 2018 – 19
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2018 – 19)

V SEMESTER

V SEMESTER												
Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	HSMC	18CS51	Management and Entrepreneurship for IT Industry	HSMC	2	2	--	03	40	60	100	3
2	PCC	18CS52	Computer Networks and Security	CS / IS	3	2	--	03	40	60	100	4
3	PCC	18CS53	Database Management System	CS / IS	3	2	--	03	40	60	100	4
4	PCC	18CS54	Automata theory and Computability	CS / IS	3	--	--	03	40	60	100	3
5	PCC	18CS55	Application Development using Python	CS / IS	3	--	--	03	40	60	100	3
6	PCC	18CS56	Unix Programming	CS / IS	3	--	--	03	40	60	100	3
7	PCC	18CSL57	Computer Network Laboratory	CS / IS	--	2	2	03	40	60	100	2
8	PCC	18CSL58	DBMS Laboratory with mini project	CS / IS	--	2	2	03	40	60	100	2
9	HSMC	18CIV59	Environmental Studies	Civil/ Environmental	1	--	--	02	40	60	100	1
				[Paper setting: Civil Engineering Board]								
TOTAL					18	10	4	26	360	540	900	25

Note: PCC: Professional Core, HSMC: Humanity and Social Science.

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

(Signature)
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MANAGEMENT AND ENTREPRENEURSHIP FOR IT INDUSTRY (Effective from the academic year 2018 -2019) SEMESTER – V			
Subject Code	18CS51	CIE Marks	40
Number of Contact Hours/Week	2:2:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS – 03			
Course Learning Objectives: This course (18CS51) will enable students to:			
<ul style="list-style-type: none"> • Explain the principles of management, organization and entrepreneur. • Discuss on planning, staffing, ERP and their importance • Infer the importance of intellectual property rights and relate the institutional support 			
Module – 1			Contact Hours
Introduction - Meaning, nature and characteristics of management, scope and Functional areas of management, goals of management, levels of management, brief overview of evolution of management theories,. Planning- Nature, importance, types of plans, steps in planning, Organizing- nature and purpose, types of Organization, Staffing- meaning, process of recruitment and selection			08
Module – 2			
Directing and controlling- meaning and nature of directing, leadership styles, motivation Theories, Communication- Meaning and importance, Coordination- meaning and importance, Controlling- meaning, steps in controlling, methods of establishing control.			08
Module – 3			
Entrepreneur – meaning of entrepreneur, characteristics of entrepreneurs, classification and types of entrepreneurs, various stages in entrepreneurial process, role of entrepreneurs in economic development, entrepreneurship in India and barriers to entrepreneurship. Identification of business opportunities, market feasibility study, technical feasibility study, financial feasibility study and social feasibility study.			08
Module – 4			
Preparation of project and ERP - meaning of project, project identification, project selection, project report, need and significance of project report, contents, formulation, guidelines by planning commission for project report, Enterprise Resource Planning: Meaning and Importance- ERP and Functional areas of Management – Marketing / Sales- Supply Chain Management – Finance and Accounting – Human Resources – Types of reports and methods of report generation			08
Module – 5			
Micro and Small Enterprises: Definition of micro and small enterprises, characteristics and advantages of micro and small enterprises, steps in establishing micro and small enterprises, Government of India industrial policy 2007 on micro and small enterprises, case study (Microsoft), Case study(Captain G R Gopinath),case study (N R Narayana Murthy & Infosys), Institutional support: MSME-DI, NSIC, SIDBI, KIADB, KSSIDC, TECSOK, KSFC, DIC and District level single window agency, Introduction to IPR.			08
Course outcomes: The students should be able to:			
<ul style="list-style-type: none"> • Define management, organization, entrepreneur, planning, staffing, ERP and outline their importance in entrepreneurship • Utilize the resources available effectively through ERP • Make use of IPRs and institutional support in entrepreneurship 			

Question Paper Pattern:


- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Principles of Management -P. C. Tripathi, P. N. Reddy; Tata McGraw Hill, 4th / 6th Edition, 2010.
2. Dynamics of Entrepreneurial Development & Management -Vasant Desai Himalaya Publishing House.
3. Entrepreneurship Development -Small Business Enterprises -Poornima M Charantimath Pearson Education – 2006.
4. Management and Entrepreneurship - Kanishka Bedi- Oxford University Press-2017

Reference Books:


1. Management Fundamentals -Concepts, Application, Skill Development Robert Lusier – Thomson.
2. Entrepreneurship Development -S S Khanka -S Chand & Co.
3. Management -Stephen Robbins -Pearson Education /PHI -17th Edition, 2003


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COMPUTER NETWORKS
(Effective from the academic year 2018 -2019)
SEMESTER – V


Subject Code	18CS52	CIE Marks	40
Number of Contact Hours/Week	3:2:0	SEE Marks	60
Total Number of Contact Hours	50	Exam Hours	3 Hrs
CREDITS –4			
Course Learning Objectives: This course (18CS52) will enable students to:			
<ul style="list-style-type: none"> • Demonstration of application layer protocols • Discuss transport layer services and understand UDP and TCP protocols • Explain routers, IP and Routing Algorithms in network layer • Disseminate the Wireless and Mobile Networks covering IEEE 802.11 Standard • Illustrate concepts of Multimedia Networking, Security and Network Management 			
Module 1			Contact Hours
Application Layer: Principles of Network Applications: Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, User-Server Interaction: Cookies, Web Caching, The Conditional GET, File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Comparison with HTTP, Mail Message Format, Mail Access Protocols, DNS; The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages, Peer-to-Peer Applications: P2P File Distribution, Distributed Hash Tables, Socket Programming: creating Network Applications: Socket Programming with UDP, Socket Programming with TCP. T1: Chap 2			10
Module 2			
Transport Layer : Introduction and Transport-Layer Services: Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing: Connectionless Transport: UDP,UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer: Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N, Selective repeat, Connection-Oriented Transport TCP: The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control: The Causes and the Costs of Congestion, Approaches to Congestion Control, Network-assisted congestion-control example, ATM ABR Congestion control, TCP Congestion Control: Fairness. T1: Chap 3			10
Module 3			
The Network layer: What's Inside a Router?: Input Processing, Switching, Output Processing, Where Does Queuing Occur? Routing control plane, IPv6,A Brief foray into IP Security, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet, Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter/AS Routing: BGP, Broadcast Routing Algorithms and Multicast. T1: Chap 4: 4.3-4.7			10
Module 4			

Wireless and Mobile Networks: Cellular Internet Access: An Overview of Cellular Network Architecture, 3G Cellular Data Networks: Extending the Internet to Cellular subscribers, On to 4G:LTE,Mobility management: Principles, Addressing, Routing to a mobile node, Mobile IP, Managing mobility in cellular Networks, Routing calls to a Mobile user, Handoffs in GSM, Wireless and Mobility: Impact on Higher-layer protocols. T1: Chap: 6 : 6.4-6.8	10
Module 5	
Multimedia Networking: Properties of video, properties of Audio, Types of multimedia Network Applications, Streaming stored video: UDP Streaming, HTTP Streaming, Adaptive streaming and DASH, content distribution Networks, case studies: : Netflix, You Tube and Kankan. Network Support for Multimedia: Dimensioning Best-Effort Networks, Providing Multiple Classes of Service, Diffserv, Per-Connection Quality-of-Service (QoS) Guarantees: Resource Reservation and Call Admission T1: Chap: 7: 7.1,7.2,7.5	10
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Explain principles of application layer protocols • Recognize transport layer services and infer UDP and TCP protocols • Classify routers, IP and Routing Algorithms in network layer • Understand the Wireless and Mobile Networks covering IEEE 802.11 Standard • Describe Multimedia Networking and Network Management 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
1. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson,2017 .	
Reference Books:	
1. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition 2. Larry L Peterson and Bruce S Davie, Computer Networks, fifth edition, ELSEVIER 3. Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson 4. Mayank Dave, Computer Networks, Second edition, Cengage Learning	


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DATABASE MANAGEMENT SYSTEM (Effective from the academic year 2018 -2019) SEMESTER – V			
Subject Code	18CS53	CIE Marks	40
Number of Contact Hours/Week	3:2:0	SEE Marks	60
Total Number of Contact Hours	50	Exam Hours	3 Hrs
CREDITS –4			
Course Learning Objectives: This course (18CS53) will enable students to: <ul style="list-style-type: none"> • Provide a strong foundation in database concepts, technology, and practice. • Practice SQL programming through a variety of database problems. • Demonstrate the use of concurrency and transactions in database • Design and build database applications for real world problems. 			
Module 1			Contact Hours
Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. Overview of Database Languages and Architectures: Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment. Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, examples, Specialization and Generalization. Textbook 1: Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.10			10
Module 2			
Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations. Relational Algebra: Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra. Mapping Conceptual Design into a Logical Design: Relational Database Design using ER-to-Relational mapping. SQL: SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL. Textbook 1: Ch4.1 to 4.5, 5.1 to 5.3, 6.1 to 6.5, 8.1; Textbook 2: 3.5			10
Module 3			
SQL : Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL. Database Application Development: Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Case study: The internet Bookshop. Internet Applications: The three-Tier application architecture, The presentation layer, The Middle Tier Textbook 1: Ch7.1 to 7.4; Textbook 2: 6.1 to 6.6, 7.5 to 7.7.			10
Module 4			
Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. Normalization Algorithms: Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational Designs, Further discussion of Multivalued dependencies and 4NF, Other dependencies and Normal Forms			10

Textbook 1: Ch14.1 to 14.7, 15.1 to 15.6	
Module 5	
Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL. Concurrency Control in Databases: Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking. Introduction to Database Recovery Protocols: Recovery Concepts, NO-UNDO/REDO recovery based on Deferred update, Recovery techniques based on immediate update, Shadow paging, Database backup and recovery from catastrophic failures Textbook 1: 20.1 to 20.6, 21.1 to 21.7, 22.1 to 22.4, 22.7.	10
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS. Use Structured Query Language (SQL) for database manipulation. Design and build simple database systems Develop application to interact with databases. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> The question paper will have ten questions. Each full Question consisting of 20 marks There will be 2 full questions (with a maximum of four sub questions) from each module. Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
<ol style="list-style-type: none"> Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill 	
Reference Books:	
<ol style="list-style-type: none"> Silberschatz Korth and Sudharshan, Database System Concepts, 6th Edition, Mc-GrawHill, 2013. Coronel, Morris, and Rob, Database Principles Fundamentals of Design, Implementation and Management, Cengage Learning 2012. 	


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AUTOMATA THEORY AND COMPUTABILITY (Effective from the academic year 2018 -2019) SEMESTER – V			
Subject Code	18CS54	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS54) will enable students to:			
<ul style="list-style-type: none"> • Introduce core concepts in Automata and Theory of Computation • Identify different Formal language Classes and their Relationships • Design Grammars and Recognizers for different formal languages • Prove or disprove theorems in automata theory using their properties • Determine the decidability and intractability of Computational problems 			
Module 1			Contact Hours
Why study the Theory of Computation, Languages and Strings: Strings, Languages. A Language Hierarchy, Computation, Finite State Machines (FSM): Deterministic FSM, Regular languages, Designing FSM, Nondeterministic FSMs, From FSMs to Operational Systems, Simulators for FSMs, Minimizing FSMs, Canonical form of Regular languages, Finite State Transducers, Bidirectional Transducers. Textbook 1: Ch 1,2, 3,4, 5.1 to 5.10			08
Module 2			
Regular Expressions (RE): what is a RE?, Kleene's theorem, Applications of REs, Manipulating and Simplifying REs. Regular Grammars: Definition, Regular Grammars and Regular languages. Regular Languages (RL) and Non-regular Languages: How many RLs, To show that a language is regular, Closure properties of RLs, to show some languages are not RLs. Textbook 1: Ch 6, 7, 8: 6.1 to 6.4, 7.1, 7.2, 8.1 to 8.4			08
Module 3			
Context-Free Grammars(CFG): Introduction to Rewrite Systems and Grammars, CFGs and languages, designing CFGs, simplifying CFGs, proving that a Grammar is correct, Derivation and Parse trees, Ambiguity, Normal Forms. Pushdown Automata (PDA): Definition of non-deterministic PDA, Deterministic and Non-deterministic PDAs, Non-determinism and Halting, alternative equivalent definitions of a PDA, alternatives that are not equivalent to PDA. Textbook 1: Ch 11, 12: 11.1 to 11.8, 12.1, 12.2, 12.4, 12.5, 12.6			08
Module 4			
Context-Free and Non-Context-Free Languages: Where do the Context-Free Languages(CFL) fit, Showing a language is context-free, Pumping theorem for CFL, Important closure properties of CFLs, Deterministic CFLs. Algorithms and Decision Procedures for CFLs: Decidable questions, Un-decidable questions. Turing Machine: Turing machine model, Representation, Language acceptability by TM, design of TM, Techniques for TM construction. Textbook 1: Ch 13: 13.1 to 13.5, Ch 14: 14.1, 14.2, Textbook 2: Ch 9.1 to 9.6			08
Module 5			
Variants of Turing Machines (TM), The model of Linear Bounded automata: Decidability: Definition of an algorithm, decidability, decidable languages, Undecidable languages, halting problem of TM, Post correspondence problem. Complexity: Growth rate of functions, the classes of P and NP, Quantum Computation: quantum computers, Church-Turing thesis.			08

Textbook 2: Ch 9.7 to 9.8, 10.1 to 10.7, 12.1, 12.2, 12.8, 12.8.1, 12.8.2	
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation • Learn how to translate between different models of Computation (e.g., Deterministic and Non-deterministic and Software models). • Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers. • Develop skills in formal reasoning and reduction of a problem to a formal model, with an emphasis on semantic precision and conciseness. • Classify a problem with respect to different models of Computation. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
<ol style="list-style-type: none"> 1. Elaine Rich, Automata, Computability and Complexity, 1st Edition, Pearson education, 2012/2013 2. K L P Mishra, N Chandrasekaran , 3rd Edition, Theory of Computer Science, PHI, 2012. 	
Reference Books:	
<ol style="list-style-type: none"> 1. John E Hopcroft, Rajeev Motwani, Jeffery D Ullman, Introduction to Automata Theory, Languages, and Computation, 3rd Edition, Pearson Education, 2013 2. Michael Sipser : Introduction to the Theory of Computation, 3rd edition, Cengage learning, 2013 3. John C Martin, Introduction to Languages and The Theory of Computation, 3rd Edition, Tata McGraw –Hill Publishing Company Limited, 2013 4. Peter Linz, “An Introduction to Formal Languages and Automata”, 3rd Edition, Narosa Publishers, 1998 5. Basavaraj S. Anami, Karibasappa K G, Formal Languages and Automata theory, Wiley India, 2012 6. C K Nagpal, Formal Languages and Automata Theory, Oxford University press, 2012. 	



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RAPID APPLICATION DEVELOPMENT USING PYTHON [(Effective from the academic year 2018 -2019) SEMESTER – V			
Subject Code	18CS55	IA Marks	40
Number of Lecture Hours/Week	03	Exam Marks	60
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03			
Course Objectives: This course (18CS55) will enable students to <ul style="list-style-type: none"> • Learn the syntax and semantics of Python programming language. • Illustrate the process of retrieving substrings and employ regular expressions for text processing. • Implement Object Oriented Programming concepts in Python. • Appraise the need for working with various documents like Excel, PDF, Word and Others. • Identify the modules for manipulating images and for sending emails using Python. 			
Module – 1			Teaching Hours
Python Basics, Flow Control, Functions, Lists, Dictionaries and Structuring Data.			8 Hours
Module – 2			8 Hours
Manipulating Strings, Pattern Matching with Regular Expressions, Reading and Writing Files, Organizing files, Debugging, Case study: data structure selection.			
Module – 3			8 Hours
Classes and Objects, Classes and Functions, Classes and Methods, Inheritance.			
Module – 4			8 Hours
Web Scraping, Working with Excel Spreadsheets, Working with PDF and Word Documents, Working with CSV Files and JSON Data.			
Module – 5			8 Hours
Keeping Time, Scheduling Tasks, and Launching Programs, Sending Email and Text Messages, Manipulating Images, Controlling the Keyboard and Mouse with GUI Automation.			
Course Outcomes: After studying this course, students will be able to <ul style="list-style-type: none"> • Demonstrate proficiency in creating functions and handling of lists and dictionaries. • Discover commonly used operations involving strings and regular expressions. • Interpret the concepts of Object-Oriented Programming as used in Python. • Determine the need for scraping websites and working with CSV, JSON and other file formats. • Make use of modules for manipulating the images, keeping track of time and for sending emails using Python. 			
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.			
Text Books: <ol style="list-style-type: none"> 1. Al Sweigart, “Automate the Boring Stuff with Python”, 1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/) (Chapters 1 to 18) 2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at http://greenteapress.com/thinkpython2/thinkpython2.pdf) 			

(Chapters 13, 15, 16, 17, 18) (Download pdf/html files from the above links)


Reference Books:

1. Gowrishankar S, Veena A, **"Introduction to Python Programming"**, 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372
2. Jake VanderPlas, **"Python Data Science Handbook: Essential Tools for Working with Data"**, 1st Edition, O'Reilly Media, 2016. ISBN-13: 978-1491912058
3. Charles Dierbach, **"Introduction to Computer Science Using Python"**, 1st Edition, Wiley India Pvt Ltd, 2015. ISBN-13: 978-8126556014
4. Wesley J Chun, **"Core Python Applications Programming"**, 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365


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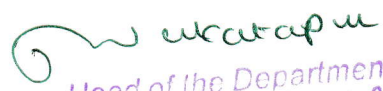
UNIX PROGRAMMING (Effective from the academic year 2018 -2019) SEMESTER – V			
Subject Code	18CS56	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –4			
Course Objectives: This course (18CS56) will enable students to			
<ul style="list-style-type: none"> • Interpret the features of UNIX and basic commands. • Demonstrate different UNIX files and permissions • Implement shell programs. • Explain UNIX process, IPC and signals. 			
Module 1			Contact Hours
Introduction: Unix Components/Architecture. Features of Unix. The UNIX Environment and UNIX Structure, Posix and Single Unix specification. General features of Unix commands/ command structure. Command arguments and options. Basic Unix commands such as echo, printf, ls, who, date, passwd, cal, Combining commands. Meaning of Internal and external commands. The type command: knowing the type of a command and locating it. The root login. Becoming the super user: su command. Unix files: Naming files. Basic file types/categories. Organization of files. Hidden files. Standard directories. Parent child relationship. The home directory and the HOME variable. Reaching required files- the PATH variable, manipulating the PATH, Relative and absolute pathnames. Directory commands – pwd, cd, mkdir, rmdir commands. The dot (.) and double dots (..) notations to represent present and parent directories and their usage in relative path names. File related commands – cat, mv, rm, cp, wc and od commands.			08
Module 2			
File attributes and permissions: The ls command with options. Changing file permissions: the relative and absolute permissions changing methods. Recursively changing file permissions. Directory permissions. The shells interpretive cycle: Wild cards. Removing the special meanings of wild cards. Three standard files and redirection. Connecting commands: Pipe. Basic and Extended regular expressions. The grep, egrep. Typical examples involving different regular expressions. Shell programming: Ordinary and environment variables. The .profile. Read and readonly commands. Command line arguments. exit and exit status of a command. Logical operators for conditional execution. The test command and its shortcut. The if, while, for and case control statements. The set and shift commands and handling positional parameters. The here (<<) document and trap command. Simple shell program examples.			08
Module 3			
UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs. UNIX Processes and Process Control: The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes. Process Control: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions			08

Module 4	
Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times, I/O Redirection. Overview of IPC Methods , Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores. Shared Memory , Client-Server Properties, Stream Pipes, Passing File Descriptors, An Open Server-Version 1, Client-Server Connection Functions.	08
Module 5	
Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.1b Timers. Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model.	08
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Explain Unix Architecture, File system and use of Basic Commands • Illustrate Shell Programming and to write Shell Scripts • Categorize, compare and make use of Unix System Calls • Build an application/service over a Unix system. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
<ol style="list-style-type: none"> 1. Sumitabha Das., Unix Concepts and Applications., 4th Edition., Tata McGraw Hill (Chapter 1,2,3,4,5,6,8,13,14) 2. W. Richard Stevens: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education, 2005 (Chapter 3,7,8,10,13,15) 3. Unix System Programming Using C++ - Terrence Chan, PHI, 1999. (Chapter 7,8,9,10) 	
Reference Books:	
<ol style="list-style-type: none"> 1. M.G. Venkatesh Murthy: UNIX & Shell Programming, Pearson Education. 2. Richard Blum , Christine Bresnahan : Linux Command Line and Shell Scripting Bible, 2nd Edition, Wiley, 2014. 	


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COMPUTER NETWORK LABORATORY (Effective from the academic year 2018 -2019) SEMESTER – V			
Subject Code	18CSL57	CIE Marks	40
Number of Contact Hours/Week	0:2:2	SEE Marks	60
Total Number of Lab Contact Hours	36	Exam Hours	3 Hrs
Credits – 2			
Course Learning Objectives: This course (18CSL57) will enable students to:			
<ul style="list-style-type: none">• Demonstrate operation of network and its management commands• Simulate and demonstrate the performance of GSM and CDMA• Implement data link layer and transport layer protocols.			
Descriptions (if any):			
<ul style="list-style-type: none">• For the experiments below modify the topology and parameters set for the experiment and take multiple rounds of reading and analyze the results available in log files. Plot necessary graphs and conclude. Use NS2/NS3.			
Programs List:			
PART A			
1.	Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped.		
2.	Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.		
3.	Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.		
4.	Implement simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.		
5.	Implement and study the performance of GSM on NS2/NS3 (Using MAC layer) or equivalent environment.		
6.	Implement and study the performance of CDMA on NS2/NS3 (Using stack called Call net) or equivalent environment		
PART B (Implement the following in Java)			
7.	Write a program for error detecting code using CRC-CCITT (16- bits).		
8.	Write a program to find the shortest path between vertices using bellman-ford algorithm.		
9.	Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.		
10.	Write a program on datagram socket for client/server to display the messages on client side, typed at the server side.		
11.	Write a program for simple RSA algorithm to encrypt and decrypt the data.		
12.	Write a program for congestion control using leaky bucket algorithm.		
Laboratory Outcomes: The student should be able to:			
<ul style="list-style-type: none">• Analyze and Compare various networking protocols.• Demonstrate the working of different concepts of networking.• Implement, analyze and evaluate networking protocols in NS2 / NS3 and JAVA programming language			
Conduct of Practical Examination:			
<ul style="list-style-type: none">• All laboratory experiments, excluding the first, are to be included for practical examination.• Experiment distribution			

- For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity.
- For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity.
- Change of experiment is allowed only once and marks allotted for procedure part to be made zero.
- Marks Distribution (*Subjected to change in accordance with university regulations*)
 - i) For questions having only one part – Procedure + Execution + Viva-Voce: $15+70+15 = 100$ Marks
 - j) For questions having part A and B
 - i. Part A – Procedure + Execution + Viva = $4 + 21 + 5 = 30$ Marks
 - ii. Part B – Procedure + Execution + Viva = $10 + 49 + 11 = 70$ Marks


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DBMS LABORATORY WITH MINI PROJECT

(Effective from the academic year 2018 -2019)

SEMESTER – V

Subject Code	18CSL58	CIE Marks	40
Number of Contact Hours/Week	0:2:2	SEE Marks	60
Total Number of Lab Contact Hours	36	Exam Hours	3 Hrs

Credits – 2**Course Learning Objectives:** This course (18CSL58) will enable students to:

- Foundation knowledge in database concepts, technology and practice to groom students into well-informed database application developers.
- Strong practice in SQL programming through a variety of database problems.
- Develop database applications using front-end tools and back-end DBMS.

Descriptions (if any):**PART-A: SQL Programming (Max. Exam Mks. 50)**

- Design, develop, and implement the specified queries for the following problems using Oracle, MySQL, MS SQL Server, or any other DBMS under LINUX/Windows environment.
- Create Schema and insert at least 5 records for each table. Add appropriate database constraints.

PART-B: Mini Project (Max. Exam Mks. 30)


- Use Java, C#, PHP, Python, or any other similar front-end tool. All applications must be demonstrated on desktop/laptop as a stand-alone or web based application (Mobile apps on Android/IOS are not permitted.)

Programs List:**PART A**

1.	<p>Consider the following schema for a Library Database:</p> <p>BOOK(Book_id, Title, Publisher_Name, Pub_Year)</p> <p>BOOK_AUTHORS(Book_id, Author_Name)</p> <p>PUBLISHER(Name, Address, Phone)</p> <p>BOOK_COPIES(Book_id, Branch_id, No-of Copies)</p> <p>BOOK_LENDING(Book_id, Branch_id, Card_No, Date_Out, Due_Date)</p> <p>LIBRARY_BRANCH(Branch_id, Branch_Name, Address)</p> <p>Write SQL queries to</p> <ol style="list-style-type: none">1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc.2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.5. Create a view of all books and its number of copies that are currently available in the Library.
2.	<p>Consider the following schema for Order Database:</p> <p>SALESMAN(Salesman_id, Name, City, Commission)</p> <p>CUSTOMER(Customer_id, Cust_Name, City, Grade, Salesman_id)</p> <p>ORDERS(Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)</p> <p>Write SQL queries to</p> <ol style="list-style-type: none">1. Count the customers with grades above Bangalore's average.2. Find the name and numbers of all salesman who had more than one customer.

	<ol style="list-style-type: none"> List all the salesman and indicate those who have and don't have customers in their cities (Use UNION operation.) Create a view that finds the salesman who has the customer with the highest order of a day. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.
3.	<p>Consider the schema for Movie Database: ACTOR(<u>Act_id</u>, Act_Name, Act_Gender) DIRECTOR(<u>Dir_id</u>, Dir_Name, Dir_Phone) MOVIES(<u>Mov_id</u>, Mov_Title, Mov_Year, Mov_Lang, Dir_id) MOVIE_CAST(<u>Act_id</u>, <u>Mov_id</u>, Role) RATING(<u>Mov_id</u>, Rev_Stars)</p> <p>Write SQL queries to</p> <ol style="list-style-type: none"> List the titles of all movies directed by 'Hitchcock'. Find the movie names where one or more actors acted in two or more movies. List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN operation). Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title. Update rating of all movies directed by 'Steven Spielberg' to 5.
4.	<p>Consider the schema for College Database: STUDENT(<u>USN</u>, SName, Address, Phone, Gender) SEMSEC(<u>SSID</u>, Sem, Sec) CLASS(<u>USN</u>, SSID) SUBJECT(<u>Subcode</u>, Title, Sem, Credits) IAMARKS(<u>USN</u>, <u>Subcode</u>, <u>SSID</u>, Test1, Test2, Test3, FinalIA)</p> <p>Write SQL queries to</p> <ol style="list-style-type: none"> List all the student details studying in fourth semester 'C' section. Compute the total number of male and female students in each semester and in each section. Create a view of Test1 marks of student USN '1BI15CS101' in all subjects. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students. Categorize students based on the following criterion: If FinalIA = 17 to 20 then CAT = 'Outstanding' If FinalIA = 12 to 16 then CAT = 'Average' If FinalIA < 12 then CAT = 'Weak' Give these details only for 8th semester A, B, and C section students.
5.	<p>Consider the schema for Company Database: EMPLOYEE(<u>SSN</u>, Name, Address, Sex, Salary, SuperSSN, DNo) DEPARTMENT(<u>DNo</u>, DName, MgrSSN, MgrStartDate) DLOCATION(<u>DNo</u>, DLoc) PROJECT(<u>PNo</u>, PName, PLocation, DNo) WORKS_ON(<u>SSN</u>, <u>PNo</u>, Hours)</p> <p>Write SQL queries to</p> <ol style="list-style-type: none"> Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise.

	3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department 4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator). 5. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.
PART B: Mini Project	
•	For any problem selected
•	Make sure that the application should have five or more tables
•	Indicative areas include; health care
Laboratory Outcomes: The student should be able to:	
<ul style="list-style-type: none"> • Create, Update and query on the database. • Demonstrate the working of different concepts of DBMS • Implement, analyze and evaluate the project developed for an application. 	
Conduct of Practical Examination:	
<ul style="list-style-type: none"> • All laboratory experiments, excluding the first, are to be included for practical examination. • Experiment distribution <ul style="list-style-type: none"> ○ For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity. ○ For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity. • Change of experiment is allowed only once and marks allotted for procedure part to be made zero. • Marks Distribution (<i>Subjected to change in accordance with university regulations</i>) <ul style="list-style-type: none"> k) For questions having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks l) For questions having part A and B <ul style="list-style-type: none"> i. Part A – Procedure + Execution + Viva = 4 + 21 + 5 = 30 Marks ii. Part B – Procedure + Execution + Viva = 10 + 49 + 11 = 70 Marks 	


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VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examination 2018 – 19
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2018 – 19)

VI SEMESTER

VI SEMESTER												
Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	PCC	18CS61	System Software and Compilers	CS / IS	3	2	--	03	40	60	100	4
2	PCC	18CS62	Computer Graphics and Visualization	CS / IS	3	2	--	03	40	60	100	4
3	PCC	18CS63	Web Technology and its applications	CS / IS	3	2	--	03	40	60	100	4
4	PEC	18CS64X	Professional Elective -1	CS / IS	3	--	--	03	40	60	100	3
5	OEC	18CS65X	Open Elective –A	CS / IS	3	--	--	03	40	60	100	3
6	PCC	18CSL66	System Software Laboratory	CS / IS	--	2	2	03	40	60	100	2
7	PCC	18CSL67	Computer Graphics Laboratory with mini project	CS / IS	--	2	2	03	40	60	100	2
8	MP	18CSMP68	Mobile Application Development	CS / IS	--	--	2	03	40	60	100	2
9	INT	--	Internship	(To be carried out during the intervening vacations of VI and VII semesters)				--	--	--	--	--
TOTAL					15	10	6	24	320	480	800	24

Note: PCC: Professional core, PEC: Professional Elective, OE: Open Elective, MP: Mini-project, INT: Internship.

Professional Elective -1

Course code under 18XX64X	Course Title
18CS641	Data Mining and Data Warehousing
18CS642	Object Oriented Modelling and Design
18CS643	Cloud Computing and its Applications
18CS644	Advanced JAVA and J2EE
18CS645	System Modelling and Simulation

Open Elective –A (18CS65x are not to be opted by CSE / ISE Programs)

18CS651	Mobile Application Development
18CS652	Introduction to Data Structures and Algorithms
18CS653	Programming in JAVA
18CS654	Introduction to Operating System

Students can select any one of the open electives offered by any Department (Please refer to the list of open electives under 18CS65X).

Selection of an open elective is not allowed provided,

- The candidate has studied the same course during the previous semesters of the programme.
- The syllabus content of open elective is similar to that of Departmental core courses or professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the programme.

Registration to electives shall be documented under the guidance of Programme Coordinator/ Adviser/Mentor.

Mini-project work: Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 4 students.

CIE procedure for Mini-project:

- (i) **Single discipline:** The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the Mini-project work, shall be based on the evaluation of project report, project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.
- (ii) **Interdisciplinary:** Continuous Internal Evaluation shall be group wise at the college level with the participation of all the guides of the college. The CIE marks awarded for the Mini-project, shall be based on the evaluation of project report, project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

SEE for Mini-project:

- (i) **Single discipline:** Contribution to the Mini-project and the performance of each group member shall be assessed individually in the semester end examination (SEE) conducted at the department.
- (ii) **Interdisciplinary:** Contribution to the Mini-project and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted separately at the departments to which the student/s belong to.

Internship: All the students admitted to III year of BE/B. Tech shall have to undergo mandatory internship of 4 weeks during the vacation of VI and VII semesters and /or VII and VIII semesters. A University examination shall be conducted during VIII semester and the prescribed credit shall be included in VIII semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

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SYSTEM SOFTWARE AND COMPILER (Effective from the academic year 2018 -2019) SEMESTER – VI			
Subject Code	18CS61	CIE Marks	40
Number of Contact Hours/Week	3:2:0	SEE Marks	60
Total Number of Contact Hours	50	Exam Hours	3 Hrs
CREDITS –4			
Course Learning Objectives: This course (18CS61) will enable students to:			
<ul style="list-style-type: none">Define System Software such as Assemblers, Loaders, Linkers and MacroprocessorsFamiliarize with source file, object file and executable file structures and librariesDescribe the front-end and back-end phases of compiler and their importance to students			
Module 1			Contact Hours
Introduction to System Software, Machine Architecture of SIC and SIC/XE. Assemblers: Basic assembler functions, machine dependent assembler features, machine independent assembler features, assembler design options. Macroprocessors: Basic macro processor functions, Text book 1: Chapter 1: 1.1,1.2,1.3.1,1.3.2, Chapter2 : 2.1-2.4,Chapter4: 4.1.1,4.1.2			10
Module 2			
Loaders and Linkers: Basic Loader Functions, Machine Dependent Loader Features, Machine Independent Loader Features, Loader Design Options, Implementation Examples. Text book 1 : Chapter 3 ,3.1 -3.5			10
Module 3			
Introduction: Language Processors, The structure of a compiler, The evaluation of programming languages, The science of building compiler, Applications of compiler technology, Programming language basics Lexical Analysis: The role of lexical analyzer, Input buffering, Specifications of token, recognition of tokens, lexical analyzer generator, Finite automate. Text book 2:Chapter 1 1.1-1.6 Chapter 3 3.1 – 3.6			10
Module 4			
Syntax Analysis: Introduction, Role Of Parsers, Context Free Grammars, Writing a grammar, Top Down Parsers, Bottom-Up Parsers, Operator-Precedence Parsing Text book 2: Chapter 4 4.1 4.2 4.3 4.4 4.5 4.6 Text book 1 : 5.1.3			10
Module 5			
Syntax Directed Translation, Intermediate code generation, Code generation Text book 2: Chapter 5.1, 5.2, 5.3, 6.1, 6.2, 8.1, 8.2			10
Course Outcomes: The student will be able to :			
<ul style="list-style-type: none">Explain system software such as assemblers, loaders, linkers and macroprocessorsDesign and develop lexical analyzers, parsers and code generatorsUtilize lex and yacc tools for implementing different concepts of system software			
Question Paper Pattern:			
<ul style="list-style-type: none">The question paper will have ten questions.Each full Question consisting of 20 marksThere will be 2 full questions (with a maximum of four sub questions) from each module.Each full question will have sub questions covering all the topics under a module.The students will have to answer 5 full questions, selecting one full question from each module.			
Textbooks:			
1. System Software by Leland. L. Beck, D Manjula, 3 rd edition, 2012			

2. Compilers-Principles, Techniques and Tools by Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman. Pearson, 2nd edition, 2007


Reference Books:

1. Systems programming – Srimanta Pal , Oxford university press, 2016
2. System programming and Compiler Design, K C Loudon, Cengage Learning
3. System software and operating system by D. M. Dhamdhare TMG
4. Compiler Design, K Muneeswaran, Oxford University Press 2013.

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COMUTER GRAPHICS AND VISUALIZATION (Effective from the academic year 2018 -2019) SEMESTER – VI			
Subject Code	18CS62	CIE Marks	40
Number of Contact Hours/Week	3:2:0	SEE Marks	60
Total Number of Contact Hours	50	Exam Hours	3 Hrs
CREDITS –4			
Course Learning Objectives: This course (18CS62) will enable students to:			
<ul style="list-style-type: none"> • Explain hardware, software and OpenGL Graphics Primitives. • Illustrate interactive computer graphic using the OpenGL. • Design and implementation of algorithms for 2D graphics Primitives and attributes. • Demonstrate Geometric transformations, viewing on both 2D and 3D objects. • Infer the representation of curves, surfaces, Color and Illumination models 			
Module 1			Contact Hours
Overview: Computer Graphics and OpenGL: Computer Graphics:Basics of computer graphics, Application of Computer Graphics, Video Display Devices: Random Scan and Raster Scan displays, color CRT monitors, Flat panel displays. Raster-scan systems: video controller, raster scan Display processor, graphics workstations and viewing systems, Input devices, graphics networks, graphics on the internet, graphics software. OpenGL: Introduction to OpenGL ,coordinate reference frames, specifying two-dimensional world coordinate reference frames in OpenGL, OpenGL point functions, OpenGL line functions, point attributes, line attributes, curve attributes, OpenGL point attribute functions, OpenGL line attribute functions, Line drawing algorithms(DDA, Bresenham's), circle generation algorithms (Bresenham's). Text-1:Chapter -1: 1-1 to 1-9,2-1 to 2-9 (Excluding 2-5),3-1 to 3-5,3-9,3-20			10
Module 2			
Fill area Primitives, 2D Geometric Transformations and 2D viewing: Fill area Primitives: Polygon fill-areas, OpenGL polygon fill area functions, fill area attributes, general scan line polygon fill algorithm, OpenGL fill-area attribute functions. 2DGeometric Transformations: Basic 2D Geometric Transformations, matrix representations and homogeneous coordinates. Inverse transformations, 2DComposite transformations, other 2D transformations, raster methods for geometric transformations, OpenGL raster transformations, OpenGL geometric transformations function, 2D viewing: 2D viewing pipeline, OpenGL 2D viewing functions. Text-1:Chapter 3-14 to 3-16,4-9,4-10,4-14,5-1 to 5-7,5-17,6-1,6-4			10
Module 3			
Clipping,3D Geometric Transformations, Color and Illumination Models: Clipping: clipping window, normalization and viewport transformations, clipping algorithms,2D point clipping, 2D line clipping algorithms: cohen-sutherland line clipping only -polygon fill area clipping: Sutherland-Hodgeman polygon clipping algorithm only.3DGeometric Transformations: 3D translation, rotation, scaling, composite 3D transformations, other 3D transformations, affine transformations, OpenGL geometric transformations functions. Color Models: Properties of light, color models, RGB and CMY color models. Illumination Models: Light sources, basic illumination models-Ambient light, diffuse reflection, specular and phong model, Corresponding openGL functions. Text-1:Chapter :6-2 to 6-08 (Excluding 6-4),5-9 to 5-17(Excluding 5-15),12-1,12-2,12-4,12-6,10-1,10-3			10
Module 4			
3D Viewing and Visible Surface Detection: 3DViewing:3D viewing concepts, 3D viewing			10

<p>pipeline, 3D viewing coordinate parameters , Transformation from world to viewing coordinates, Projection transformation, orthogonal projections, perspective projections, The viewport transformation and 3D screen coordinates. OpenGL 3D viewing functions. Visible Surface Detection Methods: Classification of visible surface Detection algorithms, back face detection, depth buffer method and OpenGL visibility detection functions.</p> <p>Text-1:Chapter: 7-1 to 7-10(Excluding 7-7), 9-1 to 9-3, 9-14</p>	
<p>Module 5</p>	
<p>Input& interaction, Curves and Computer Animation: Input and Interaction: Input devices, clients and servers, Display Lists, Display Lists and Modelling, Programming Event Driven Input, Menus Picking, Building Interactive Models, Animating Interactive programs, Design of Interactive programs, Logic operations .Curved surfaces, quadric surfaces, OpenGL Quadric-Surface and Cubic-Surface Functions, Bezier Spline Curves, Bezier surfaces, OpenGL curve functions. Corresponding openGL functions.</p> <p>Text-1:Chapter :8-3 to 8-6 (Excluding 8-5),8-9,8-10,8-11,3-8,8-18,13-11,3-2,13-3,13-4,13-10</p> <p>Text-2:Chapter 3: 3-1 to 3.11: Input& interaction</p>	10
<p>Course Outcomes: The student will be able to :</p>	
<ul style="list-style-type: none"> • Design and implement algorithms for 2D graphics primitives and attributes. • Illustrate Geometric transformations on both 2D and 3D objects. • Apply concepts of clipping and visible surface detection in 2D and 3D viewing, and Illumination Models. 	
<p>Decide suitable hardware and software for developing graphics packages using OpenGL.</p>	
<p>Question Paper Pattern:</p>	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
<p>Textbooks:</p>	
<ol style="list-style-type: none"> 1. Donald Hearn & Pauline Baker: Computer Graphics with OpenGL Version,3rd / 4th Edition, Pearson Education,2011 2. Edward Angel: Interactive Computer Graphics- A Top Down approach with OpenGL, 5th edition. Pearson Education, 2008 	
<p>Reference Books:</p>	
<ol style="list-style-type: none"> 1. James D Foley, Andries Van Dam, Steven K Feiner, John F Huges Computer graphics with OpenGL: pearson education 2. Xiang, Plastock : Computer Graphics , sham's outline series, 2nd edition, TMG. 3. Kelvin Sung, Peter Shirley, steven Baer : Interactive Computer Graphics, concepts and applications, Cengage Learning 4. M M Raiker, Computer Graphics using OpenGL, Filip learning/Elsevier 	


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CLOUD COMPUTING AND ITS APPLICATIONS (Effective from the academic year 2018 -2019) SEMESTER – VI			
Subject Code	18CS63	CIE Marks	40
Number of Contact Hours/Week	3:2:0	SEE Marks	60
Total Number of Contact Hours	50	Exam Hours	3 Hrs
CREDITS –4			
Course Learning Objectives: This course (18CS63) will enable students to:			
<ul style="list-style-type: none"> • Explain the fundamentals of cloud computing • Illustrate the cloud application programming and aneka platform • Contrast different cloud platforms used in industry 			
Module 1			Contact Hours
Introduction ,Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Manjrasoft Aneka Virtualization, Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples Xen: Paravirtualization, VMware: Full Virtualization, Microsoft Hyper-V			10
Module 2			
Cloud Computing Architecture, Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition, Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy Organizational Aspects Aneka: Cloud Application Platform, Framework Overview, Anatomy of the Aneka Container, From the Ground Up: Platform Abstraction Layer, Fabric Services, foundation Services, Application Services, Building Aneka Clouds, Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode, Cloud Programming and Management, Aneka SDK, Management Tools			10
Module 3			
Concurrent Computing: Thread Programming, Introducing Parallelism for Single Machine Computation, Programming Applications with Threads, What is a Thread?, Thread APIs, Techniques for Parallel Computation with Threads, Multithreading with Aneka, Introducing the Thread Programming Model, Aneka Thread vs. Common Threads, Programming Applications with Aneka Threads, Aneka Threads Application Model, Domain Decomposition: Matrix Multiplication, Functional Decomposition: Sine, Cosine, and Tangent. High-Throughput Computing: Task Programming, Task Computing, Characterizing a Task, Computing Categories, Frameworks for Task Computing, Task-based Application Models, Embarrassingly Parallel Applications, Parameter Sweep Applications, MPI Applications, Workflow Applications with Task Dependencies, Aneka Task-Based Programming, Task Programming Model, Developing Applications with the Task Model, Developing Parameter			10

Sweep Application, Managing Workflows.	
Module 4	
Data Intensive Computing: Map-Reduce Programming, What is Data-Intensive Computing?, Characterizing Data-Intensive Computations, Challenges Ahead, Historical Perspective, Technologies for Data-Intensive Computing, Storage Systems, Programming Platforms, Aneka MapReduce Programming, Introducing the MapReduce Programming Model, Example Application	10
Module 5	
Cloud Platforms in Industry, Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google AppEngine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance. Cloud Applications Scientific Applications, Healthcare: ECG Analysis in the Cloud, Biology: Protein Structure Prediction, Biology: Gene Expression Data Analysis for Cancer Diagnosis, Geoscience: Satellite Image Processing, Business and Consumer Applications, CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.	10
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Explain cloud computing, virtualization and classify services of cloud computing • Illustrate architecture and programming in cloud • Describe the platforms for development of cloud applications and List the application of cloud. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud. Computing McGraw Hill Education	
Reference Books:	
1. Dan C. Marinescu, Cloud Computing Theory and Practice, Morgan Kaufmann, Elsevier 2013.	


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DATA MINING AND DATA WAREHOUSING (Effective from the academic year 2018 -2019) SEMESTER – VI			
Subject Code	18CS641	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS641) will enable students to:			
<ul style="list-style-type: none"> Define multi-dimensional data models. Explain rules related to association, classification and clustering analysis. Compare and contrast between different classification and clustering algorithms 			
Module 1			Contact Hours
Data Warehousing & modeling: Basic Concepts: Data Warehousing: A multitier Architecture, Data warehouse models: Enterprise warehouse, Data mart and virtual warehouse, Extraction, Transformation and loading, Data Cube: A multidimensional data model, Stars, Snowflakes and Fact constellations: Schemas for multidimensional Data models, Dimensions: The role of concept Hierarchies, Measures: Their Categorization and computation, Typical OLAP Operations			08
Module 2			
Data warehouse implementation& Data mining: Efficient Data Cube computation: An overview, Indexing OLAP Data: Bitmap index and join index, Efficient processing of OLAP Queries, OLAP server Architecture ROLAP versus MOLAP Versus HOLAP. : Introduction: What is data mining, Challenges, Data Mining Tasks, Data: Types of Data, Data Quality, Data Preprocessing, Measures of Similarity and Dissimilarity.			08
Module 3			
Association Analysis: Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm, Evaluation of Association Patterns.			08
Module 4			
Classification : Decision Trees Induction, Method for Comparing Classifiers, Rule Based Classifiers, Nearest Neighbor Classifiers, Bayesian Classifiers.			08
Module 5			
Clustering Analysis: Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph-Based Clustering, Scalable Clustering Algorithms.			08
Course Outcomes: The student will be able to :			
<ul style="list-style-type: none"> Identify data mining problems and implement the data warehouse Write association rules for a given data pattern. Choose between classification and clustering solution. 			
Question Paper Pattern:			
<ul style="list-style-type: none"> The question paper will have ten questions. Each full Question consisting of 20 marks There will be 2 full questions (with a maximum of four sub questions) from each module. Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module. 			
Textbooks:			
1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, First			

impression,2014.

2. Jiawei Han, Micheline Kamber, Jian Pei: Data Mining -Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher, 2012.


Reference Books:

1. Sam Anahory, Dennis Murray: Data Warehousing in the Real World, Pearson,Tenth Impression,2012.
2. Michael.J.Berry,Gordon.S.Linoff: Mastering Data Mining , Wiley Edition, second edition,2012.


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OBJECT ORIENTED MODELING AND DESIGN (Effective from the academic year 2018 -2019) SEMESTER – VI			
Subject Code	18CS642	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS642) will enable students to: <ul style="list-style-type: none"> Describe the concepts involved in Object-Oriented modelling and their benefits. Demonstrate concept of use-case model, sequence model and state chart model for a given problem. Explain the facets of the unified process approach to design and build a Software system. Translate the requirements into implementation for Object Oriented design. Choose an appropriate design pattern to facilitate development procedure. 			
Module 1			Contact Hours
Introduction, Modelling Concepts and Class Modelling: What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. Class Modelling: Object and Class Concept; Link and associations concepts; Generalization and Inheritance; A sample class model; Navigation of class models; Advanced Class Modelling, Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived Data; Packages. Text Book-1: Ch 1, 2, 3 and 4			08
Module 2			
UseCase Modelling and Detailed Requirements: Overview; Detailed object-oriented Requirements definitions; System Processes-A use case/Scenario view; Identifying Input and outputs-The System sequence diagram; Identifying Object Behaviour-The state chart Diagram; Integrated Object-oriented Models. Text Book-2:Chapter- 6:Page 210 to 250			08
Module 3			
Process Overview, System Conception and Domain Analysis: Process Overview: Development stages; Development life Cycle; System Conception: Devising a system concept; elaborating a concept; preparing a problem statement. Domain Analysis: Overview of analysis; Domain Class model: Domain state model; Domain interaction model; Iterating the analysis. Text Book-1:Chapter- 10,11,and 12			08
Module 4			
Use case Realization :The Design Discipline within up iterations: Object Oriented Design-The Bridge between Requirements and Implementation; Design Classes and Design within Class Diagrams; Interaction Diagrams-Realizing Use Case and defining methods; Designing with Communication Diagrams; Updating the Design Class Diagram; Package Diagrams-Structuring the Major Components; Implementation Issues for Three-Layer Design. Text Book-2: Chapter 8: page 292 to 346			08
Module 5			
Design Patterns: Introduction; what is a design pattern?, Describing design patterns, the catalogue of design patterns, Organizing the catalogue, How design patterns solve design problems, how to select a design patterns, how to use a design pattern; Creational patterns:			08

prototype and singleton (only); structural patterns adaptor and proxy (only).	
Text Book-3: Ch-1: 1.1, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8,Ch-3,Ch-4.	
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Describe the concepts of object-oriented and basic class modelling. • Draw class diagrams, sequence diagrams and interaction diagrams to solve problems. • Choose and apply a befitting design pattern for the given problem. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
<ol style="list-style-type: none"> 1. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005 2. Satzinger, Jackson and Burd: Object-Oriented Analysis & Design with the Unified Process, Cengage Learning, 2005. 3. Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides: Design Patterns –Elements of Reusable Object-Oriented Software, Pearson Education,2007. 	
Reference Books:	
<ol style="list-style-type: none"> 1. Grady Booch et. al.: Object-Oriented Analysis and Design with Applications,3rd Edition,Pearson Education,2007. 2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michel Stal: Pattern – Oriented Software Architecture. A system of patterns , Volume 1, John Wiley and Sons.2007. 3. Booch, Jacobson, Rumbaugh : Object-Oriented Analysis and Design with Applications, 3rd edition, pearson, Reprint 2013 	


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CRYPTOGRAPHY, NETWORK SECURITY AND CYBERLAW (Effective from the academic year 2018 -2019) SEMESTER – VI			
Subject Code	18CS643	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS643) will enable students to:			
<ul style="list-style-type: none"> • Explain the concepts of Cyber security • Illustrate key management issues and solutions. • Familiarize with Cryptography and very essential algorithms • Introduce cyber Law and ethics to be followed. 			
Module 1			Contact Hours
Introduction - Cyber Attacks, Defence Strategies and Techniques, Guiding Principles, Mathematical Background for Cryptography - Modulo Arithmetic's, The Greatest Common Divisor, Useful Algebraic Structures, Chinese Remainder Theorem, Basics of Cryptography - Preliminaries, Elementary Substitution Ciphers, Elementary Transport Ciphers, Other Cipher Properties, Secret Key Cryptography – Product Ciphers, DES Construction.			08
Module 2			Contact Hours
Public Key Cryptography and RSA – RSA Operations, Why Does RSA Work?, Performance, Applications, Practical Issues, Public Key Cryptography Standard (PKCS), Cryptographic Hash - Introduction, Properties, Construction, Applications and Performance, The Birthday Attack, Discrete Logarithm and its Applications - Introduction, Diffie-Hellman Key Exchange, Other Applications.			08
Module 3			Contact Hours
Key Management - Introduction, Digital Certificates, Public Key Infrastructure, Identity-based Encryption, Authentication-I - One way Authentication, Mutual Authentication, Dictionary Attacks, Authentication – II – Centralised Authentication, The Needham-Schroeder Protocol, Kerberos, Biometrics, IPSec-Security at the Network Layer – Security at Different layers: Pros and Cons, IPSec in Action, Internet Key Exchange (IKE) Protocol, Security Policy and IPSEC, Virtual Private Networks, Security at the Transport Layer - Introduction, SSL Handshake Protocol, SSL Record Layer Protocol, OpenSSL.			08
Module 4			Contact Hours
IEEE 802.11 Wireless LAN Security - Background, Authentication, Confidentiality and Integrity, Viruses, Worms, and Other Malware, Firewalls – Basics, Practical Issues, Intrusion Prevention and Detection - Introduction, Prevention Versus Detection, Types of Intrusion Detection Systems, DDoS Attacks Prevention/Detection, Web Service Security – Motivation, Technologies for Web Services, WS- Security, SAML, Other Standards.			08
Module 5			Contact Hours
IT act aim and objectives, Scope of the act, Major Concepts, Important provisions, Attribution, acknowledgement, and dispatch of electronic records, Secure electronic records and secure digital signatures, Regulation of certifying authorities: Appointment of Controller and Other officers, Digital Signature certificates, Duties of Subscribers, Penalties and adjudication, The cyber regulations appellate tribunal, Offences, Network service providers not to be liable in certain cases, Miscellaneous Provisions.			08
Course Outcomes: The student will be able to :			
<ul style="list-style-type: none"> • Discuss cryptography and its need to various applications 			

<ul style="list-style-type: none"> • Design and develop simple cryptography algorithms • Understand cyber security and need cyber Law
Question Paper Pattern:
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module.
Textbooks:
1. Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition (Chapters-1,3,4,5,6,7,8,9,10,11,12,13,14,15,19(19.1-19.5),21(21.1-21.2),22(22.1-22.4),25
Reference Books:
<ol style="list-style-type: none"> 1. Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyay, Mc-GrawHill, 3rd Edition, 2015 2. Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition 3. Cyber Law simplified- Vivek Sood, Mc-GrawHill, 11th reprint, 2013 4. Cyber security and Cyber Laws, Alfred Basta, Nadine Basta, Mary brown, ravindra kumar, Cengage learning



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MOBILE APPLICATION DEVELOPMENT (OPEN ELECTIVE) (Effective from the academic year 2018 -2019) SEMESTER – VI			
Subject Code	18CS651	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS651) will enable students to:			
<ul style="list-style-type: none"> • Learn to setup Android application development environment • Illustrate user interfaces for interacting with apps and triggering actions • Interpret tasks used in handling multiple activities • Identify options to save persistent application data • Appraise the role of security and performance in Android applications 			
Module – 1			Teaching Hours
Get started, Build your first app, Activities, Testing, debugging and using support libraries			8 Hours
Module – 2			
User Interaction, Delightful user experience, Testing your UI			8 Hours
Module – 3			
Background Tasks, Triggering, scheduling and optimizing background tasks			8 Hours
Module – 4			
All about data, Preferences and Settings, Storing data using SQLite, Sharing data with content providers, Loading data using Loaders			8 Hours
Module – 5			
Permissions, Performance and Security, Firebase and AdMob, Publish			8 Hours
Course outcomes: The students should be able to:			
<ul style="list-style-type: none"> • Create, test and debug Android application by setting up Android development environment • Implement adaptive, responsive user interfaces that work across a wide range of devices. • Infer long running tasks and background work in Android applications • Demonstrate methods in storing, sharing and retrieving data in Android applications • Analyze performance of android applications and understand the role of permissions and security • Describe the steps involved in publishing Android application to share with the world 			
Question Paper Pattern:			
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. 			
The students will have to answer 5 full questions, selecting one full question from each module.			
Textbooks:			
1. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017. https://www.gitbook.com/book/google-developer-training/android-developer-fundamentals-course-concepts/details (Download pdf file from the above link)			
Reference Books:			

5. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd, 2014.
6. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O'Reilly SPD Publishers, 2015.
7. J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126565580
8. Anubhav Pradhan, Anil V Deshpande, " Composing Mobile Apps" using Android, Wiley 2014, ISBN: 978-81-265-4660-2


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INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS (Effective from the academic year 2018 -2019) SEMESTER – VI			
Subject Code	18CS652	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS652) will enable students to:			
Module 1			Contact Hours
Introduction to C, constants, variables, data types, input output operations, operators and expressions, control statements, arrays, strings, built-in functions, user defined functions, structures, unions and pointers			08
Text Book 1: Chapter 1 and 2			
Module 2			
Algorithms, Asymptotic notations, Introduction to data structures, Types of data structures, Arrays.			08
Text Book 1: Chapter 3 and 4			
Module 3			
Linked lists, Stacks			08
Text Book 1: Chapter 5 and 6			
Module 4			
Queues, Trees			08
Text Book 1: Chapter 7 and 8			
Module 5			
Graphs, Sorting ,(selection, insertion, bubble, quick)and searching(Linear, Binary, Hash)			08
Text Book 1: Chapter 7 and 8			
Course Outcomes: The student will be able to :			
<ul style="list-style-type: none"> Identify different data structures in C programming language Appraise the use of data structures in problem solving Implement data structures using C programming language. 			
Question Paper Pattern:			
<ul style="list-style-type: none"> The question paper will have ten questions. Each full Question consisting of 20 marks There will be 2 full questions (with a maximum of four sub questions) from each module. Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module. 			
Textbooks:			
1. Data structures using C , E Balagurusamy, McGraw Hill education (India) Pvt. Ltd, 2013.			
Reference Books:			
NIL			



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PYTHON APPLICATION PROGRAMMING (OPEN ELECTIVE) (Effective from the academic year 2018 -2019) SEMESTER – VI			
Subject Code	18CS653	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS653) will enable students to:			
<ul style="list-style-type: none"> • Learn Syntax and Semantics and create Functions in Python. • Handle Strings and Files in Python. • Understand Lists, Dictionaries and Regular expressions in Python. • Implement Object Oriented Programming concepts in Python • Build Web Services and introduction to Network and Database Programming in Python. 			
Module – 1			Teaching Hours
Why should you learn to write programs, Variables, expressions and statements, Conditional execution, Functions			8 Hours
Module – 2			
Iteration, Strings, Files			8 Hours
Module – 3			
Lists, Dictionaries, Tuples, Regular Expressions			8 Hours
Module – 4			
Classes and objects, Classes and functions, Classes and methods			8 Hours
Module – 5			
Networked programs, Using Web Services, Using databases and SQL			8 Hours
Course outcomes: The students should be able to:			
<ul style="list-style-type: none"> • Examine Python syntax and semantics and be fluent in the use of Python flow control and functions. • Demonstrate proficiency in handling Strings and File Systems. • Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions. • Interpret the concepts of Object-Oriented Programming as used in Python. • Implement exemplary applications related to Network Programming, Web Services and Databases in Python. 			
Question Paper Pattern:			
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 			
Text Books:			
3. Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3", 1 st Edition, CreateSpace Independent Publishing Platform, 2016. (http://do1.dr-chuck.com/pythonlearn/EN_us/pythonlearn.pdf) (Chapters 1 – 13, 15)			

4. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015. (<http://greenteapress.com/thinkpython2/thinkpython2.pdf>) (Chapters 15, 16, 17) (Download pdf files from the above links)


Reference Books:

1. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014
2. Mark Lutz, "Programming Python", 4th Edition, O'Reilly Media, 2011. ISBN-13: 978-9350232873
3. Wesley J Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365
4. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, "Data Structures and Algorithms in Python", 1st Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126562176
5. Reema Thareja, "Python Programming using problem solving approach", Oxford university press, 2017


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SYSTEM SOFTWARE AND OPERATING SYSTEM LABORATORY (Effective from the academic year 2018 -2019) SEMESTER – VI			
Subject Code	18CSL66	CIE Marks	40
Number of Contact Hours/Week	0:2:2	SEE Marks	60
Total Number of Lab Contact Hours	36	Exam Hours	3 Hrs
Credits – 2			
Course Learning Objectives: This course (18CSL66) will enable students to:			
<ul style="list-style-type: none"> To make students familiar with Lexical Analysis and Syntax Analysis phases of Compiler Design and implement programs on these phases using LEX & YACC tools and/or C/C++/Java To enable students to learn different types of CPU scheduling algorithms used in operating system. To make students able to implement memory management - page replacement and deadlock handling algorithms 			
Descriptions (if any):			
<p>Exercises to be prepared with minimum three files (Where ever necessary):</p> <ol style="list-style-type: none"> Header file. Implementation file. Application file where main function will be present. <p>The idea behind using three files is to differentiate between the developer and user sides. In the developer side, all the three files could be made visible. For the user side only header file and application files could be made visible, which means that the object code of the implementation file could be given to the user along with the interface given in the header file, hiding the source file, if required. Avoid I/O operations (printf/scanf) and use <i>data input file</i> where ever it is possible.</p>			
Programs List:			
1.			
a.	Write a LEX program to recognize valid <i>arithmetic expression</i> . Identifiers in the expression could be only integers and operators could be + and *. Count the identifiers & operators present and print them separately.		
b.	Write YACC program to evaluate <i>arithmetic expression</i> involving operators: +, -, *, and /		
2.	Develop, Implement and Execute a program using YACC tool to recognize all strings ending with <i>b</i> preceded by <i>n a's</i> using the grammar <i>aⁿ b</i> (note: input <i>n</i> value)		
3.	Design, develop and implement YACC/C program to construct <i>Predictive / LL(1) Parsing Table</i> for the grammar rules: <i>A → aBa</i> , <i>B → bB ε</i> . Use this table to parse the sentence: <i>abba\$</i>		
4.	Design, develop and implement YACC/C program to demonstrate <i>Shift Reduce Parsing</i> technique for the grammar rules: <i>E → E+T T</i> , <i>T → T*F F</i> , <i>F → (E) id</i> and parse the sentence: <i>id + id * id</i> .		
5.	Design, develop and implement a C/Java program to generate the machine code using <i>Triples</i> for the statement <i>A = -B * (C + D)</i> whose intermediate code in three-address form: $T1 = -B$ $T2 = C + D$ $T3 = T1 + T2$ $A = T3$		
6.			

a.	Write a LEX program to eliminate <i>comment lines</i> in a <i>C</i> program and copy the resulting program into a separate file.
b.	Write YACC program to recognize valid <i>identifier, operators and keywords</i> in the given text (<i>C program</i>) file.
7.	Design, develop and implement a C/C++/Java program to simulate the working of Shortest remaining time and Round Robin (RR) scheduling algorithms. Experiment with different quantum sizes for RR algorithm.
8.	Design, develop and implement a C/C++/Java program to implement Banker's algorithm. Assume suitable input required to demonstrate the results
9.	Design, develop and implement a C/C++/Java program to implement page replacement algorithms LRU and FIFO. Assume suitable input required to demonstrate the results.
Laboratory Outcomes: The student should be able to:	
<ul style="list-style-type: none"> • Implement and demonstrate Lexer's and Parser's • Evaluate different algorithms required for management, scheduling, allocation and communication used in operating system. 	
Conduct of Practical Examination:	
<ul style="list-style-type: none"> • All laboratory experiments, excluding the first, are to be included for practical examination. • Experiment distribution <ul style="list-style-type: none"> ○ For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity. ○ For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity. • Change of experiment is allowed only once and marks allotted for procedure part to be made zero. • Marks Distribution (<i>Subjected to change in accordance with university regulations</i>) <ul style="list-style-type: none"> m) For questions having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks n) For questions having part A and B <ul style="list-style-type: none"> i. Part A – Procedure + Execution + Viva = 4 + 21 + 5 = 30 Marks ii. Part B – Procedure + Execution + Viva = 10 + 49 + 11 = 70 Marks 	



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COMPUTER GRAPHICS LABORATORY WITH MINI PROJECT (Effective from the academic year 2018 -2019) SEMESTER – VI			
Subject Code	18CSL67	CIE Marks	40
Number of Contact Hours/Week	0:2:2	SEE Marks	60
Total Number of Lab Contact Hours	36	Exam Hours	3 Hrs
Credits – 2			
Course Learning Objectives: This course (18CSL67) will enable students to:			
<ul style="list-style-type: none">• Demonstrate simple algorithms using OpenGL Graphics Primitives and attributes.• Implementation of line drawing and clipping algorithms using OpenGL functions• Design and implementation of algorithms Geometric transformations on both 2D and 3D objects.			
Descriptions (if any):			
Programs List:			
PART A			
Design, develop, and implement the following programs using OpenGL API			
1.	Implement Brenham's line drawing algorithm for all types of slope. Refer:Text-1: Chapter 3.5 Refer:Text-2: Chapter 8		
2.	Create and rotate a triangle about the origin and a fixed point. Refer:Text-1: Chapter 5-4		
3.	Draw a colour cube and spin it using OpenGL transformation matrices. Refer:Text-2: Modelling a Coloured Cube		
4.	Draw a color cube and allow the user to move the camera suitably to experiment with perspective viewing. Refer:Text-2: Topic: Positioning of Camera		
5.	Clip a lines using Cohen-Sutherland algorithm Refer:Text-1: Chapter 6.7 Refer:Text-2: Chapter 8		
6.	To draw a simple shaded scene consisting of a tea pot on a table. Define suitably the position and properties of the light source along with the properties of the surfaces of the solid object used in the scene. Refer:Text-2: Topic: Lighting and Shading		
7.	Design, develop and implement recursively subdivide a tetrahedron to form 3D sierpinski gasket. The number of recursive steps is to be specified by the user. Refer: Text-2: Topic: sierpinski gasket.		
8.	Develop a menu driven program to animate a flag using Bezier Curve algorithm Refer: Text-1: Chapter 8-10		
9.	Develop a menu driven program to fill the polygon using scan line algorithm		
PART B MINI PROJECT			
Student should develop mini project on the topics mentioned below or similar applications using Open GL API. Consider all types of attributes like color, thickness, styles, font, background, speed etc., while doing mini project. (During the practical exam: the students should demonstrate and answer Viva-Voce)			
Sample Topics:			
Simulation of concepts of OS, Data structures, algorithms etc.			
Laboratory Outcomes: The student should be able to:			
<ul style="list-style-type: none">• Apply the concepts of computer graphics• Implement computer graphics applications using OpenGL			

- Animate real world problems using OpenGL

Conduct of Practical Examination:

- All laboratory experiments, excluding the first, are to be included for practical examination.
- Experiment distribution
 - For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity.
 - For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity.
- Change of experiment is allowed only once and marks allotted for procedure part to be made zero.
- Marks Distribution (*Subjected to change in accordance with university regulations*)
 - o) For questions having only one part – Procedure + Execution + Viva-Voce: $15+70+15 = 100$ Marks
 - p) For questions having part A and B
 - i. Part A – Procedure + Execution + Viva = $4 + 21 + 5 = 30$ Marks
 - ii. Part B – Procedure + Execution + Viva = $10 + 49 + 11 = 70$ Marks


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MOBILE APPLICATION DEVELOPMENT
(Effective from the academic year 2018 -2019)
SEMESTER – VI

Subject Code	18CSMP68	CIE Marks	40
Number of Contact Hours/Week	0:0:2	SEE Marks	60
Total Number of Lab Contact Hours	3 Hrs/Week	Exam Hours	3 Hrs

Credits – 2

Course Learning Objectives: This course (18CSMP68) will enable students to:

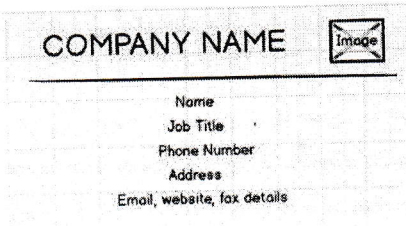
- Learn and acquire the art of Android Programming.
- Configure Android studio to run the applications.
- Understand and implement Android's User interface functions.
- Create, modify and query on SQLite database.
- Inspect different methods of sharing data using services.

Descriptions (if any):

Programs List:

PART A


Design, develop, and implement the following programs using OpenGL API

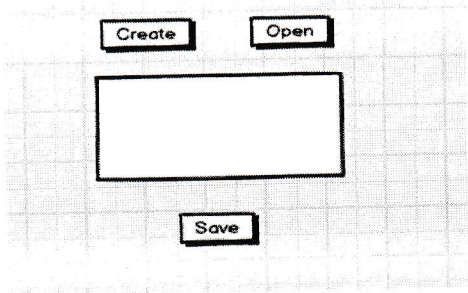
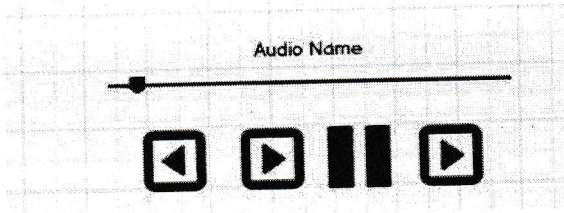
1.	<p>Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address is to be displayed. Insert a horizontal line between the job title and the phone number.</p> <div style="text-align: center;">  </div>
2.	<p>Develop an Android application using controls like Button, TextView, EditText for designing a calculator having basic functionality like Addition, Subtraction, Multiplication, and Division.</p>

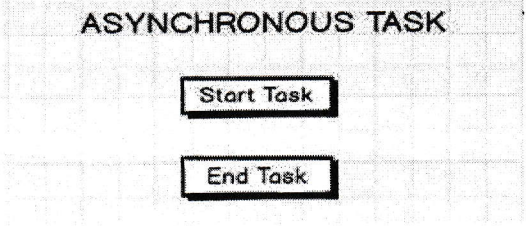
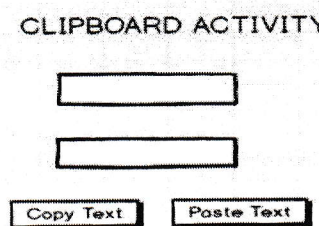
	<div><div>SIMPLE CALCULATOR</div><div>Result</div><div>Input <Edit Text></div><div><div>7</div><div>8</div><div>9</div><div>/</div><div>4</div><div>5</div><div>6</div><div>*</div><div>1</div><div>2</div><div>3</div><div>-</div><div>.</div><div>0</div><div>=</div><div>+</div><div>C</div></div></div>
3.	<p>Create a SIGN Up activity with Username and Password. Validation of password should happen based on the following rules:</p> <ul style="list-style-type: none">• Password should contain uppercase and lowercase letters.• Password should contain letters and numbers.• Password should contain special characters.• Minimum length of the password (the default value is 8). <p>On successful SIGN UP proceed to the next Login activity. Here the user should SIGN IN using the Username and Password created during signup activity. If the Username and Password are matched then navigate to the next activity which displays a message saying “Successful Login” or else display a toast message saying “Login Failed”.The user is given only two attempts and after that display a toast message saying “Failed Login Attempts” and disable the SIGN IN button. Use Bundle to transfer information from one activity to another.</p> <div><div>SIGNUP ACTIVITY</div><div><div>Username:</div><div></div><div>Password:</div><div></div><div>SIGN UP</div></div></div>

	<p style="text-align: center;">LOGIN ACTIVITY</p> <p>Username: <input type="text"/></p> <p>Password: <input type="password"/></p> <p style="text-align: center;"><input type="button" value="SIGN IN"/></p>
4.	<p>Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds.</p> <p style="text-align: center;">CHANGING WALLPAPER APPLICATION</p> <p style="text-align: center;"><input type="button" value="CLICK HERE TO CHANGE WALLPAPER"/></p>
5.	<p>Write a program to create an activity with two buttons START and STOP. On pressing of the START button, the activity must start the counter by displaying the numbers from One and the counter must keep on counting until the STOP button is pressed. Display the counter value in a TextView control.</p> <p style="text-align: center;">COUNTER APPLICATION</p> <p style="text-align: center;">Counter Value</p> <p style="text-align: center;"><input type="button" value="START"/></p> <p style="text-align: center;"><input type="button" value="STOP"/></p>
6.	<p>Create two files of XML and JSON type with values for City_Name, Latitude, Longitude, Temperature, and Humidity. Develop an application to create an activity with two buttons to parse the XML and JSON files which when clicked should display the data in their respective layouts side by side.</p>

	<p>PARSING XML AND JSON DATA</p> <div> <div> <div>PARSING XML AND JSON DATA</div> <div> <div>Parse XML Data</div> <div>Parse JSON Data</div> </div> </div> <div> <div>XML DATA</div> <div> City_Name: Mysore Latitude: 12.295 Longitude: 76.639 Temperature: 22 Humidity: 90% </div> </div> <div> <div>JSON Data</div> <div> City_Name: Mysore Latitude: 12.295 Longitude: 76.639 Temperature: 22 Humidity: 90% </div> </div> </div>
7.	<p>Develop a simple application with one EditText so that the user can write some text in it. Create a button called "Convert Text to Speech" that converts the user input text into voice.</p> <div> <div>TEXT TO SPEECH APPLICATION</div> <div>Convert Text to Speech</div> </div>
8.	<p>Create an activity like a phone dialer with CALL and SAVE buttons. On pressing the CALL button, it must call the phone number and on pressing the SAVE button it must save the number to the phone contacts.</p> <div> <div>CALL AND SAVE APPLICATION</div> <div> <div>1234567890</div> <div>DEL</div> <div> <div>1</div><div>2</div><div>3</div> <div>4</div><div>5</div><div>6</div> <div>7</div><div>8</div><div>9</div> <div>*</div><div>0</div><div>#</div> <div>CALL</div><div>SAVE</div> </div> </div> </div>
PART B	
1.	<p>Write a program to enter Medicine Name, Date and Time of the Day as input from the user and store it in the SQLite database. Input for Time of the Day should be either Morning or Afternoon or Evening or Night. Trigger an alarm based on the Date and Time of the Day and display the Medicine Name.</p>


	<div><div>MEDICINE DATABASE</div><div>Medicine Name: <input type="text"/></div><div>Date: <input type="text"/></div><div>Time of the Day: <input type="text"/></div><div>Insert</div></div>																																			
2.	<div><div><div>Develop a content provider application with an activity called “Meeting Schedule” which takes Date, Time and Meeting Agenda as input from the user and store this information into the SQLite database. Create another application with an activity called “Meeting Info” having DatePicker control, which on the selection of a date should display the Meeting Agenda information for that particular date, else it should display a toast message saying “No Meeting on this Date”.</div><div><div><div>MEETING SCHEDULE</div><div>Date: <input type="text"/></div><div>Time: <input type="text"/></div><div>Meeting Agenda: <input type="text"/></div><div>Add Meeting Agenda</div></div><div><div>MEETING INFO</div><div>Pick a date to get meeting info: <input type="text"/> </div><div><div><div>Mon, Jul 23</div><div>JULY 2018</div><table><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr><tr><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td></tr><tr><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td></tr><tr><td>29</td><td>30</td><td>31</td><td></td><td></td><td></td><td></td></tr></table><div>CANCELOK</div></div><div>Search</div></div></div></div></div></div>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31				
1	2	3	4	5	6	7																														
8	9	10	11	12	13	14																														
15	16	17	18	19	20	21																														
22	23	24	25	26	27	28																														
29	30	31																																		
3.	<div><div>Create an application to receive an incoming SMS which is notified to the user. On clicking this SMS notification, the message content and the number should be displayed on the screen. Use appropriate emulator control to send the SMS message to your application.</div></div>																																			

	<p style="text-align: center;">SMS APPLICATION</p> <p style="text-align: center;">Display SMS Number Display SMS Message</p>
4.	<p>Write a program to create an activity having a Text box, and also Save, Open and Create buttons. The user has to write some text in the Text box. On pressing the Create button the text should be saved as a text file in MkSDcard. On subsequent changes to the text, the Save button should be pressed to store the latest content to the same file. On pressing the Open button, it should display the contents from the previously stored files in the Text box. If the user tries to save the contents in the Textbox to a file without creating it, then a toast message has to be displayed saying "First Create a File".</p> <p style="text-align: center;">FILE APPLICATION</p>  <p>The diagram shows a grid-based UI layout. At the top, there are two buttons labeled 'Create' and 'Open'. Below them is a large rectangular text box. At the bottom, there is a button labeled 'Save'.</p>
5.	<p>Create an application to demonstrate a basic media player that allows the user to Forward, Backward, Play and Pause an audio. Also, make use of the indicator in the seek bar to move the audio forward or backward as required.</p> <p style="text-align: center;">MEDIA PLAYER APPLICATION</p>  <p>The diagram shows a grid-based UI layout. At the top, there is a label 'Audio Name'. Below it is a horizontal seek bar with a slider. At the bottom, there are four square buttons containing icons for backward, forward, play/pause, and stop.</p>
6.	<p>Develop an application to demonstrate the use of Asynchronous tasks in android. The asynchronous task should implement the functionality of a simple moving banner. On pressing the Start Task button, the banner message should scroll from right to left. On pressing the Stop Task button, the banner message should stop. Let the banner</p>

	<p>message be “Demonstration of Asynchronous Task”.</p> <div style="text-align: center;">  </div>
7.	<p>Develop an application that makes use of the clipboard framework for copying and pasting of the text. The activity consists of two EditText controls and two Buttons to trigger the copy and paste functionality.</p> <div style="text-align: center;">  </div>
8.	<p>Create an AIDL service that calculates Car Loan EMI. The formula to calculate EMI is</p> $E = P * (r(1+r)^n)/((1+r)^n-1)$ <p>where</p> <ul style="list-style-type: none"> E = The EMI payable on the car loan amount P = The Car loan Principal Amount r = The interest rate value computed on a monthly basis n = The loan tenure in the form of months <p>The down payment amount has to be deducted from the principal amount paid towards buying the Car. Develop an application that makes use of this AIDL service to calculate the EMI. This application should have four EditText to read the PrincipalAmount, Down Payment, Interest Rate, Loan Term (in months) and a button named as “Calculate Monthly EMI”. On click of this button, the result should be shown in a TextView. Also, calculate the EMI by varying the Loan Term and Interest Rate values.</p>

CAR EMI CALCULATOR	
Principal Amount:	<input style="width: 100%;" type="text"/>
Down Payment:	<input style="width: 100%;" type="text"/>
Interest Rate:	<input style="width: 100%;" type="text"/>
Loan Term (in months):	<input style="width: 100%;" type="text"/>
<input style="width: 200px; border: 2px solid black;" type="button" value="Calculate Monthly EMI"/>	
<div style="text-align: right; font-weight: bold;">EMI: Result</div>	
Laboratory Outcomes: The student should be able to:	
<ul style="list-style-type: none"> Apply the concepts of computer graphics Implement computer graphics applications using OpenGL Animate real world problems using OpenGL 	
Conduct of Practical Examination:	
<ul style="list-style-type: none"> All laboratory experiments, excluding the first, are to be included for practical examination. Experiment distribution <ul style="list-style-type: none"> For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity. For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity. Change of experiment is allowed only once and marks allotted for procedure part to be made zero. Marks Distribution (<i>Subjected to change in accordance with university regulations</i>) <ul style="list-style-type: none"> q) For questions having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks r) For questions having part A and B <ul style="list-style-type: none"> i. Part A – Procedure + Execution + Viva = 4 + 21 + 5 = 30 Marks ii. Part B – Procedure + Execution + Viva = 10 + 49+ 11 = 70 Marks 	
Text Books:	
1. Google Developer Training, " Android Developer Fundamentals Course – Concept Reference ", Google Developer Training Team, 2017. https://www.gitbook.com/book/google-developer-training/android-developer-fundamentals-course-concepts/details (Download pdf file from the above link)	
Reference Books:	
1. Erik Hellman, " Android Programming – Pushing the Limits ", 1 st Edition, Wiley India Pvt Ltd, 2014. ISBN-13: 978-8126547197	

2. Dawn Griffiths and David Griffiths, **"Head First Android Development"**, 1st Edition, O'Reilly SPD Publishers, 2015. ISBN-13: 978-9352131341
3. Bill Phillips, Chris Stewart and Kristin Marsicano, **"Android Programming: The Big Nerd Ranch Guide"**, 3rd Edition, Big Nerd Ranch Guides, 2017. ISBN-13: 978-0134706054


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VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examination 2018 – 19
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2018 – 19)

VII SEMESTER												
Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	PCC	18CS71	Artificial Intelligence and Machine Learning	CS / IS	4	--	--	03	40	60	100	4
2	PCC	18CS72	Big Data Analytics	CS / IS	4	--	--	03	40	60	100	4
3	PEC	18CS73X	Professional Elective – 2	CS / IS	3	--	--	03	40	60	100	3
4	PEC	18CS74X	Professional Elective – 3	CS / IS	3	--	--	03	40	60	100	3
5	OEC	18CS75X	Open Elective –B	CS / IS	3	--	--	03	40	60	100	3
6	PCC	18CSL76	Artificial Intelligence and Machine Learning Laboratory	CS / IS	--	--	2	03	40	60	100	1
7	Project	18CSP77	Project Work Phase – 1	CS / IS	--	--	2	--	100	--	100	2
8	INT	--	Internship	(If not completed during the vacation of VI and VII semesters, it has to be carried out during the intervening vacations of VII and VIII semesters)								
TOTAL					17	--	4	18	340	360	700	20

Note: PCC: Professional core, PEC: Professional Elective, OEC: Open Elective, INT: Internship.

Professional Elective – 2

Course code under 18CS73X	Course Title
18CS731	Software Architecture and Design Patterns
18CS732	High Performance Computing
18CS733	Advanced Computer Architectures
18CS734	User Interface Design

Professional Electives – 3

Course code under 18CS74X	Course Title
18CS741	Digital Image Processing
18CS742	Network management
18CS743	Natural Language Processing
18CS744	Cryptography
18CS745	Robotic Process Automation Design & Development

Open Elective –B (18CS75x are not to be opted by CSE / ISE Programs)

18CS751	Introduction to Big Data Analytics
18CS752	Python Application Programming
18CS753	Introduction to Artificial Intelligence
18CS754	Introduction to Dot Net framework for Application Development

Students can select any one of the open electives offered by any Department(Please refer to the list of open electives under 18CS75X).

Selection of an open elective is not allowed provided,

- The candidate has studied the same course during the previous semesters of the programme.
- The syllabus content of open elective is similar to that of Departmental core courses or professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the programme.
- Registration to electives shall be documented under the guidance of Programme Coordinator/ Adviser/Mentor.

Project work: Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary project can be assigned to an individual student or to a group having not more than 4 students. In extraordinary cases, like the funded projects requiring students from different disciplines, the project student strength can be 5 or 6.


CIE procedure for Project Work Phase - 1:

(i) **Single discipline:** The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work phase -1, shall be based on the evaluation of the project work phase -1 Report (covering Literature Survey, Problem identification, Objectives and Methodology), project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the Project report shall be the same for all the batch mates.

(ii) **Interdisciplinary:** Continuous Internal Evaluation shall be group wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work phase -1, shall be based on the evaluation of project work phase -1 Report, project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

Internship: All the students admitted to III year of BE/B.Tech shall have to undergo mandatory internship of 4 weeks during the vacation of VI and VII semesters and/or VII and VIII semesters. A University examination shall be conducted during VIII semester and the prescribed credit shall be included in VIII semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.


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 K.S. Institute of Technology

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (Effective from the academic year 2018 -2019) SEMESTER – VII			
Subject Code	18CS71	CIE Marks	40
Number of Contact Hours/Week	4:0:0	SEE Marks	60
Total Number of Contact Hours	50	Exam Hours	3 Hrs
CREDITS –4			
Course Learning Objectives: This course (18CS71) will enable students to:			
<ul style="list-style-type: none"> • Explain Artificial Intelligence and Machine Learning • Illustrate AI and ML algorithm and their use in appropriate applications 			
Module 1			Contact Hours
What is artificial intelligence?, Problems, problem spaces and search, Heuristic search techniques			10
Texbook 1: Chapter 1, 2 and 3			
Module 2			
Knowledge representation issues, Predicate logic, Representaiton knowledge using rules.			10
Concpet Learning: Concept learning task, Concpet learning as search, Find-S algorithm, Candidate Elimination Algorithm, Inductive bias of Candidate Elimination Algorithm.			
Texbook 1: Chapter 4, 5 and 6			
Texbook2: Chapter 2 (2.1-2.5, 2.7)			
Module 3			
Decision Tree Learning: Introduction, Decision tree representation, Appropriate problems, ID3 algorithm, Inductive bias of ID3 algorithm.			10
Artificil Nueral Network: Introduction, NN representation, Appropriate problems, Perceptrons, Backpropagation algorithm.			
Texbook2: Chapter 3 (3.1-3.4, 3.6), Chapter 4 (4.1-4.5)			
Module 4			
Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting, MDL principle, Bates optimal classifier, Gibbs algorithm, Navie Bayes classifier, BBN, EM Algorithm			10
Texbook2: Chapter 6			
Module 5			
Instance-Base Learning: Introduction, k-Nearest Neighbour Learning, Locally weighted regression, Radial basis function, Case-Based reasoning.			10
Reinforcement Learning: Introduction, The learning task, Q-Learning.			
Texbook 1: Chapter 8 (8.1-8.5), Chapter 13 (13.1 – 13.3)			
Course Outcomes: The student will be able to :			
<ul style="list-style-type: none"> • Appaise the theory of Artificial intelligence and Machine Learning. • Illustrate the working of AI and ML Algorithms. • Demonstrate the applications of AI and ML. 			
Question Paper Pattern:			

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Tom M Mitchell, Machine Learning, McGraw Hill Education Pvt Ltd., Chennai.
2. Elaine Rich, Kevin K and S B Nair, Artificial Intelligence, 3rd Ed, McGraw Hill Education Pvt Ltd., Chennai.

Reference Books:

1. Stuart Russell, Peter Norving , Artificial Intelligence: A Modern Approach, Pearson Education 2nd Edition
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, 2nd edition, Springer series in statistics.
3. Ethem Alpaydin, Introduction to machine learning, second edition, MIT press


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BIG DATA AND ANALYTICS (Effective from the academic year 2018 -2019) SEMESTER – VII			
Subject Code	18CS72	CIE Marks	40
Number of Contact Hours/Week	4:0:0	SEE Marks	60
Total Number of Contact Hours	50	Exam Hours	3 Hrs
CREDITS –4			
Course Learning Objectives: This course (18CS72) will enable students to:			
<ul style="list-style-type: none"> Understand Hadoop Distributed File system and examine MapReduce Programming Explore Hadoop tools and manage Hadoop with Ambari Appraise the role of Business intelligence and its applications across industries Assess core data mining techniques for data analytics Identify various Text Mining techniques 			
Module 1			Contact Hours
Hadoop Distributed File System Basics, Running Example Programs and Benchmarks, Hadoop MapReduce Framework, MapReduce Programming			10
Module 2			
Essential Hadoop Tools, Hadoop YARN Applications, Managing Hadoop with Apache Ambari, Basic Hadoop Administration Procedures			10
Module 3			
Business Intelligence Concepts and Application, Data Warehousing, Data Mining, Data Visualization			10
Module 4			
Decision Trees, Regression, Artificial Neural Networks, Cluster Analysis, Association Rule Mining			10
Module 5			
Text Mining, Naïve-Bayes Analysis, Support Vector Machines, Web Mining, Social Network Analysis			10
Course Outcomes: The student will be able to :			
<ul style="list-style-type: none"> Master the concepts of HDFS and MapReduce framework Investigate Hadoop related tools for Big Data Analytics and perform basic Hadoop Administration Recognize the role of Business Intelligence, Data warehousing and Visualization in decision making Infer the importance of core data mining techniques for data analytics Compare and contrast different Text Mining Techniques 			
Question Paper Pattern:			
<ul style="list-style-type: none"> The question paper will have ten questions. Each full Question consisting of 20 marks There will be 2 full questions (with a maximum of four sub questions) from each module. Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module. 			
Textbooks:			
<ol style="list-style-type: none"> Douglas Eadline, "Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem", 1st Edition, Pearson Education, 2016. ISBN-13: 978-9332570351 Anil Maheshwari, "Data Analytics", 1st Edition, McGraw Hill Education, 2017. ISBN-13: 978- 			

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Reference Books:

1. Tom White, "**Hadoop: The Definitive Guide**", 4th Edition, O'Reilly Media, 2015.ISBN-13: 978-9352130672
2. Boris Lublinsky, Kevin T.Smith, Alexey Yakubovich,"**Professional Hadoop Solutions**", 1stEdition, Wrox Press, 2014ISBN-13: 978-8126551071
3. Eric Sammer,"**Hadoop Operations: A Guide for Developers and Administrators**",1stEdition, O'Reilly Media, 2012.ISBN-13: 978-9350239261


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SOFTWARE ARCHITECTURE AND DESIGN PATTERNS (Effective from the academic year 2018 -2019) SEMESTER – VII			
Subject Code	18CS731	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS731) will enable students to:			
<ul style="list-style-type: none"> Learn How to add functionality to designs while minimizing complexity. What code qualities are required to maintain to keep code flexible? To Understand the common design patterns. To explore the appropriate patterns for design problems 			
Module 1			Contact Hours
Introduction: what is a design pattern? describing design patterns, the catalog of design pattern, organizing the catalog, how design patterns solve design problems, how to select a design pattern, how to use a design pattern. What is object-oriented development? , key concepts of object oriented design other related concepts, benefits and drawbacks of the paradigm			08
Module 2			
Analysis a System: overview of the analysis phase, stage 1: gathering the requirements functional requirements specification, defining conceptual classes and relationships, using the knowledge of the domain. Design and Implementation, discussions and further reading.			08
Module 3			
Design Pattern Catalog: Structural patterns, Adapter, bridge, composite, decorator, facade, flyweight, proxy.			08
Module 4			
Interactive systems and the MVC architecture: Introduction , The MVC architectural pattern, analyzing a simple drawing program , designing the system, designing of the subsystems, getting into implementation , implementing undo operation , drawing incomplete items, adding a new feature , pattern based solutions.			08
Module 5			
Designing with Distributed Objects: Client server system, java remote method invocation, implementing an object oriented system on the web (discussions and further reading) a note on input and output, selection statements, loops arrays.			08
Course Outcomes: The student will be able to :			
<ul style="list-style-type: none"> Design and implement codes with higher performance and lower complexity Be aware of code qualities needed to keep code flexible Experience core design principles and be able to assess the quality of a design with respect to these principles. Capable of applying these principles in the design of object oriented systems. Demonstrate an understanding of a range of design patterns. Be capable of comprehending a design presented using this vocabulary. Be able to select and apply suitable patterns in specific contexts 			
Question Paper Pattern:			
<ul style="list-style-type: none"> The question paper will have ten questions. Each full Question consisting of 20 marks There will be 2 full questions (with a maximum of four sub questions) from each module. 			

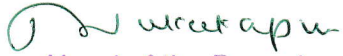
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Object-oriented analysis, design and implementation, brahma dathan, sarnath rammath, universities press, 2013
2. Design patterns, erich gamma, Richard helan, Ralph johman , john vlissides ,PEARSON Publication, 2013.


Reference Books:

1. Frank Bachmann, Regine Meunier, Hans Rohnert "Pattern Oriented Software Architecture" –Volume 1, 1996.
2. William J Brown et al., "Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis", John Wiley, 1998.


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ADVANCED JAVA AND J2EE (Effective from the academic year 2018 -2019) SEMESTER – VII			
Subject Code	18CS732	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS732) will enable students to:			
<ul style="list-style-type: none"> Identify the need for advanced Java concepts like Enumerations and Collections Construct client-server applications using Java socket API Make use of JDBC to access database through Java Programs Adapt servlets to build server side programs Demonstrate the use of JavaBeans to develop component-based Java software 			
Module 1			Contact Hours
Enumerations, Autoboxing and Annotations(metadata): Enumerations, Enumeration fundamentals, the values() and valueOf() Methods, java enumerations are class types, enumerations Inherits Enum, example, type wrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of Warning. Annotations, Annotation basics, specifying retention policy, Obtaining Annotations at run time by use of reflection, Annotated element Interface, Using Default values, Marker Annotations, Single Member annotations, Built-In annotations.			08
Module 2			
The collections and Framework: Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, Why Generic Collections?, The legacy Classes and Interfaces, Parting Thoughts on Collections.			08
Module 3			
String Handling : The String Constructors, String Length, Special String Operations, String Literals, String Concatenation, String Concatenation with Other Data Types, String Conversion and toString() Character Extraction, charAt(), getChars(), getBytes() toCharArray(), String Comparison, equals() and equalsIgnoreCase(), regionMatches() startsWith() and endsWith(), equals() Versus == , compareTo() Searching Strings, Modifying a String, substring(), concat(), replace(), trim(), Data Conversion Using valueOf(), Changing the Case of Characters Within a String, Additional String Methods, StringBuffer , StringBuffer Constructors, length() and capacity(), ensureCapacity(), setLength(), charAt() and setCharAt(), getChars(),append(), insert(), reverse(), delete() and deleteCharAt(), replace(), substring(), Additional StringBuffer Methods, StringBuilder			08
Text Book 1: Ch 15			
Module 4			
Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking. Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects			08


Text Book 1: Ch 31 Text Book 2: Ch 11	
Module 5	
The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions. Text Book 2: Ch 06	08
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs • Build client-server applications and TCP/IP socket programs • Illustrate database access and details for managing information using the JDBC API • Describe how servlets fit into Java-based web application architecture • Develop reusable software components using Java Beans 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
<ol style="list-style-type: none"> 1. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007. 2. Jim Keogh: J2EE-TheCompleteReference, McGraw Hill, 2007. 	
Reference Books:	
<ol style="list-style-type: none"> 1. Y. Daniel Liang: Introduction to JAVA Programming, 7th Edition, Pearson Education, 2007. 2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education, 2004. 3. Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015. 	


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STORAGE AREA NETWORKS
(Effective from the academic year 2018 -2019)
SEMESTER – VII

Subject Code	18CS733	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS733) will enable students to:			
<ul style="list-style-type: none"> • Evaluate storage architectures, • Define backup, recovery, disaster recovery, business continuity, and replication • Examine emerging technologies including IP-SAN • Understand logical and physical components of a storage infrastructure • Identify components of managing and monitoring the data center • Define information security and identify different storage virtualization technologies 			
Module 1			Contact Hours
Storage System Introduction to evolution of storage architecture, key data center elements, virtualization, and cloud computing. Key data center elements – Host (or compute), connectivity, storage, and application in both classic and virtual environments. RAID implementations, techniques, and levels along with the impact of RAID on application performance. Components of intelligent storage systems and virtual storage provisioning and intelligent storage system implementations.			08
Module 2			
Storage Networking Technologies and Virtualization Fibre Channel SAN components, connectivity options, and topologies including access protection mechanism ‘zoning’, FC protocol stack, addressing and operations, SAN-based virtualization and VSAN technology, iSCSI and FCIP protocols for storage access over IP network, Converged protocol FCoE and its components, Network Attached Storage (NAS) - components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform.			08
Module 3			
Backup, Archive, and Replication This unit focuses on information availability and business continuity solutions in both virtualized and non-virtualized environments. Business continuity terminologies, planning and solutions, Clustering and multipathing architecture to avoid single points of failure, Backup and recovery - methods, targets and topologies, Data deduplication and backup in virtualized environment, Fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection			08
Module 4			
Cloud Computing Characteristics and benefits This unit focuses on the business drivers, definition, essential characteristics, and phases of journey to the Cloud. ,Business drivers for Cloud computing, Definition of Cloud computing, Characteristics of Cloud computing, Steps involved in transitioning from Classic data center to Cloud computing environment Services and deployment models, Cloud infrastructure components, Cloud migration considerations			08
Module 5			
Securing and Managing Storage Infrastructure This chapter focuses on framework and domains of storage security along with covering security. implementation at storage networking. Security threats, and countermeasures in various domains Security solutions for FC-SAN, IP-SAN and NAS environments, Security in virtualized and cloud environments,			08

Monitoring and managing various information infrastructure components in classic and virtual environments, Information lifecycle management (ILM) and storage tiering, Cloud service management activities	
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> Identify key challenges in managing information and analyze different storage networking technologies and virtualization Explain components and the implementation of NAS Describe CAS architecture and types of archives and forms of virtualization Illustrate the storage infrastructure and management activities 	
Question Paper Pattern:	
<ul style="list-style-type: none"> The question paper will have ten questions. Each full Question consisting of 20 marks There will be 2 full questions (with a maximum of four sub questions) from each module. Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
<ol style="list-style-type: none"> Information Storage and Management, Author : EMC Education Services, Publisher: Wiley ISBN: 9781118094839 Storage Virtualization, Author: Clark Tom, Publisher: Addison Wesley Publishing Company ISBN : 9780321262516 	
Reference Books:	



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DIGITAL IMAGE PROCESSING (Effective from the academic year 2018 -2019) SEMESTER – VII			
Subject Code	18CS741	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS741) will enable students to:			
<ul style="list-style-type: none"> Define the fundamental concepts in image processing Evaluate techniques followed in image enhancements Illustrate image segmentation and compression algorithms 			
Module 1			Contact Hours
Introduction Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Sampling and Quantization, Representing Digital Images (Data structure), Some Basic Relationships Between Pixels- Neighbors and Connectivity of pixels in image, Applications of Image Processing: Medical imaging, Robot vision, Character recognition, Remote Sensing.			08
Module 2			
Image Enhancement In The Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.			08
Module 3			
Image Enhancement In Frequency Domain: Introduction, Fourier Transform, Discrete Fourier Transform (DFT), properties of DFT , Discrete Cosine Transform (DCT), Image filtering in frequency domain.			08
Module 4			
Image Segmentation: Introduction, Detection of isolated points, line detection, Edge detection, Edge linking, Region based segmentation- Region growing, split and merge technique, local processing, regional processing, Hough transform, Segmentation using Threshold.			08
Module 5			
Image Compression: Introduction, coding Redundancy , Inter-pixel redundancy, image compression model, Lossy and Lossless compression, Huffman Coding, Arithmetic Coding, LZW coding, Transform Coding, Sub-image size selection, blocking, DCT implementation using FFT, Run length coding.			08
Course Outcomes: The student will be able to :			
<ul style="list-style-type: none"> Explain fundamentals of image processing Compare transformation algorithms Contrast enhancement, segmentation and compression techniques 			
Question Paper Pattern:			
<ul style="list-style-type: none"> The question paper will have ten questions. Each full Question consisting of 20 marks There will be 2 full questions (with a maximum of four sub questions) from each module. Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module. 			
Textbooks:			

1. Rafael C G., Woods R E. and Eddins S L, Digital Image Processing, Prentice Hall, 3rd edition, 2008.


Reference Books:

1. Milan Sonka, "Image Processing, analysis and Machine Vision", Thomson Press India Ltd, Fourth Edition.
2. Fundamentals of Digital Image Processing- Anil K. Jain, 2nd Edition, Prentice Hall of India.
3. S. Sridhar , Digital Image Processing, Oxford University Press, 2nd Ed, 2016.


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NETWORK MANAGEMENT (Effective from the academic year 2018 -2019) SEMESTER – VII			
Subject Code	18CS742	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS742) will enable students to:			
<ul style="list-style-type: none"> • Illustrate the need for interoperable network management. • Explain the concepts and architecture behind standards based network management. • Differentiate the concepts and terminology associated with SNMP and TMN • Describe network management as a typical distributed application 			
Module 1			Contact Hours
Introduction: Analogy of Telephone Network Management, Data and Telecommunication Network Distributed computing Environments, TCP/IP-Based Networks: The Internet and Intranets, Communications Protocols and Standards- Communication Architectures, Protocol Layers and Services; Case Histories of Networking and Management – The Importance of topology , Filtering Does Not Reduce Load on Node, Some Common Network Problems; Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions- Goal of Network Management, Network Provisioning, Network Operations and the NOC, Network Installation and Maintenance; Network and System Management, Network Management System platform, Current Status and Future of Network Management.			08
Module 2			
Basic Foundations: Standards, Models, and Language: Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1- Terminology, Symbols, and Conventions, Objects and Data Types, Object Names, An Example of ASN.1 from ISO 8824; Encoding Structure; Macros, Functional Model.			08
Module 3			
SNMPv1 Network Management: Managed Network: The History of SNMP Management, Internet Organizations and standards, Internet Documents, The SNMP Model, The Organization Model, System Overview. The Information Model – Introduction, The Structure of Management Information, Managed Objects, Management Information Base. The SNMP Communication Model – The SNMP Architecture, Administrative Model, SNMP Specifications, SNMP Operations, SNMP MIB Group, Functional Model SNMP Management – RMON: Remote Monitoring, RMON SMI and MIB, RMONII- RMONI Textual Conventions, RMONI Groups and Functions, Relationship Between Control and Data Tables, RMON1 Common and Ethernet Groups, RMON Token Ring Extension Groups, RMON2 – The RMON2 Management Information Base, RMON2 Conformance Specifications.			08
Module 4			
Broadband Access Networks, Broadband Access Technology; HFCT Technology: The Broadband LAN, The Cable Modem, The Cable Modem Termination System, The HFC Plant, The RF Spectrum for Cable Modem; Data Over Cable, Reference Architecture; HFC Management – Cable Modem and CMTS Management, HFC Link Management, RF Spectrum Management, DSL Technology; Asymmetric Digital Subscriber Line Technology			08

– Role of the ADSL Access Network in an Overall Network, ADSL Architecture, ADSL Channeling Schemes, ADSL Encoding Schemes; ADSL Management – ADSL Network Management Elements, ADSL Configuration Management, ADSL Fault Management, ADSL Performance Management, SNMP-Based ADSL Line MIB, MIB Integration with Interfaces Groups in MIB-2, ADSL Configuration Profiles	
Module 5	
Network Management Applications: Configuration Management- Network Provisioning, Inventory Management, Network Topology, Fault Management- Fault Detection, Fault Location and Isolation 24 Techniques, Performance Management – Performance Metrics, Data Monitoring, Problem Isolation, Performance Statistics; Event Correlation Techniques – Rule-Based Reasoning, Model-Based Reasoning, CaseBased Reasoning, Codebook correlation Model, State Transition Graph Model, Finite State Machine Model, Security Management – Policies and Procedures, Security Breaches and the Resources Needed to Prevent Them, Firewalls, Cryptography, Authentication and Authorization, Client/Server Authentication Systems, Messages Transfer Security, Protection of Networks from Virus Attacks, Accounting Management, Report Management, Policy- Based Management, Service Level Management.	08
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets. Apply network management standards to manage practical networks Formulate possible approaches for managing OSI network model. Use on SNMP for managing the network Use RMON for monitoring the behavior of the network Identify the various components of network and formulate the scheme for the managing them 	
Question Paper Pattern:	
<ul style="list-style-type: none"> The question paper will have ten questions. Each full Question consisting of 20 marks There will be 2 full questions (with a maximum of four sub questions) from each module. Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
1. Mani Subramanian: Network Management- Principles and Practice, 2nd Pearson Education, 2010.	
Reference Books:	
1. J. Richard Burke: Network management Concepts and Practices: a Hands-On Approach, PHI, 2008.	


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WEB TECHNOLOGY AND ITS APPLICATIONS (Effective from the academic year 2018 -2019) SEMESTER – VII			
Subject Code	18CS743	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS743) will enable students to:			
<ul style="list-style-type: none"> • Illustrate the Semantic Structure of HTML and CSS • Compose forms and tables using HTML and CSS • Design Client-Side programs using JavaScript and Server-Side programs using PHP • Infer Object Oriented Programming capabilities of PHP • Examine JavaScript frameworks such as jQuery and Backbone 			
Module 1			Contact Hours
Introduction to HTML, What is HTML and Where did it come from?, HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.			08
Module 2			
HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats, Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks.			08
Module 3			
JavaScript: Client-Side Scripting, What is JavaScript and What can it do?, JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms, Introduction to Server-Side Development with PHP, What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions			08
Module 4			
PHP Arrays and Superglobals, Arrays, \$_GET and \$_POST Superglobal Arrays, \$_SERVER Array, \$_FILES Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions?, PHP Error Reporting, PHP Error and Exception Handling			08
Module 5			
Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, HTML5 Web Storage, Caching, Advanced JavaScript and jQuery, JavaScript Pseudo-Classes, jQuery Foundations, AJAX, Asynchronous File Transmission, Animation, Backbone MVC Frameworks, XML Processing and Web Services, XML Processing, JSON, Overview of Web Services.			08
Course Outcomes: The student will be able to :			
<ul style="list-style-type: none"> • Adapt HTML and CSS syntax and semantics to build web pages. • Construct and visually format tables and forms using HTML and CSS • Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically. 			

- Appraise the principles of object oriented development using PHP
- Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features.

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1st Edition, Pearson Education India. (ISBN:978-9332575271)

Reference Books:

1. Robin Nixon, "Learning PHP, MySQL & JavaScript with jQuery, CSS and HTML5", 4th Edition, O'Reilly Publications, 2015. (ISBN:978-9352130153)
2. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", 5th Edition, Pearson Education, 2016. (ISBN:978-9332582736)
3. Nicholas C Zakas, "Professional JavaScript for Web Developers", 3rd Edition, Wrox/Wiley India, 2012. (ISBN:978-8126535088)
4. David Sawyer Mcfarland, "JavaScript & jQuery: The Missing Manual", 1st Edition, O'Reilly/Shroff Publishers & Distributors Pvt Ltd, 2014

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INTRODUCTION TO BIG DATA ANALYTICS (OPEN ELECTIVE) (Effective from the academic year 2018 -2019) SEMESTER – VII			
Subject Code	18CS751	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS751) will enable students to:			
<ul style="list-style-type: none"> • Interpret the data in the context of the business. • Identify an appropriate method to analyze the data • Show analytical model of a system 			
Module – 1			Teaching Hours
Introduction to Data Analytics and Decision Making: Introduction, Overview of the Book, The Methods, The Software, Modeling and Models, Graphical Models, Algebraic Models, Spreadsheet Models, Seven-Step Modeling Process. Describing the Distribution of a Single Variable: Introduction,Basic Concepts, Populations and Samples, Data Sets,Variables,and Observations, Types of Data, Descriptive Measures for Categorical Variables, Descriptive Measures for Numerical Variables, Numerical Summary Measures, Numerical Summary Measures with StatTools,Charts for Numerical Variables, Time Series Data, Outliers and Missing Values,Outliers,Missing Values, Excel Tables for Filtering,Sorting,and Summarizing. Finding Relationships among Variables: Introduction, Relationships among Categorical Variables, Relationships among Categorical Variables and a Numerical Variable, Stacked and Unstacked Formats, Relationships among Numerical Variables, Scatterplots, Correlation and Covariance, Pivot Tables.			8 Hours
Module – 2			
Probability and Probability Distributions: Introduction,Probability Essentials, Rule of Complements, Addition Rule, Conditional Probability and the Multiplication Rule, Probabilistic Independence, Equally Likely Events, Subjective Versus Objective Probabilities, Probability Distribution of a Single Random Variable, Summary Measures of a Probability Distribution, Conditional Mean and Variance, Introduction to Simulation. Normal,Binormal,Poisson,and Exponential Distributions: Introduction,The Normal Distribution, Continuous Distributions and Density Functions, The Normal Density,Standardizing:Z-Values,Normal Tables and Z-Values, Normal Calculations in Excel, Empirical Rules Revisited, Weighted Sums of Normal Random Variables, Applications of the Normal Random Distribution, The Binomial Distribution, Mean and Standard Deviation of the Binomial Distribution, The Binomial Distribution in the Context of Sampling, The Normal Approximation to the Binomial, Applications of the Binomial Distribution, The Poisson and Exponential Distributions, The Poisson Distribution, The Exponential Distribution.			8 Hours
Module – 3			
Decision Making under Uncertainty: Introduction,Elements of Decision Analysis, Payoff Tables, Possible Decision Criteria, Expected Monetary Value(EMY),Sensitivity Analysis, Decision Trees, Risk Profiles, The Precision Tree Add-In,Bayes' Rule, Multistage Decision Problems and the Value of Information, The Value of Information, Risk Aversion and			8 Hours

<p>Expected Utility, Utility Functions, Exponential Utility, Certainty Equivalents, Is Expected Utility Maximization Used?</p> <p>Sampling and Sampling Distributions: Introduction, Sampling Terminology, Methods for Selecting Random Samples, Simple Random Sampling, Systematic Sampling, Stratified Sampling, Cluster Sampling, Multistage Sampling Schemes, Introduction to Estimation, Sources of Estimation Error, Key Terms in Sampling, Sampling Distribution of the Sample Mean, The Central Limit Theorem, Sample Size Selection, Summary of Key Ideas for Simple Random Sampling.</p>	
Module – 4	
<p>Confidence Interval Estimation: Introduction, Sampling Distributions, The t Distribution, Other Sampling Distributions, Confidence Interval for a Mean, Confidence Interval for a Total, Confidence Interval for a Proportion, Confidence Interval for a Standard Deviation, Confidence Interval for the Difference between Means, Independent Samples, Paired Samples, Confidence Interval for the Difference between Proportions, Sample Size Selection, Sample Size Selection for Estimation of the Mean, Sample Size Selection for Estimation of Other Parameters.</p> <p>Hypothesis Testing: Introduction, Concepts in Hypothesis Testing, Null and Alternative Hypothesis, One-Tailed Versus Two-Tailed Tests, Types of Errors, Significance Level and Rejection Region, Significance from p-values, Type II Errors and Power, Hypothesis Tests and Confidence Intervals, Practical versus Statistical Significance, Hypothesis Tests for a Population Mean, Hypothesis Tests for Other Parameters, Hypothesis Tests for a Population Proportion, Hypothesis Tests for Differences between Population Means, Hypothesis Test for Equal Population Variances, Hypothesis Tests for Difference between Population Proportions, Tests for Normality, Chi-Square Test for Independence.</p>	8 Hours
Module – 5	
<p>Regression Analysis: Estimating Relationships: Introduction, Scatterplots : Graphing Relationships, Linear versus Nonlinear Relationships, Outliers, Unequal Variance, No Relationship, Correlations: Indications of Linear Relationships, Simple Linear Regression, Least Squares Estimation, Standard Error of Estimate, The Percentage of Variation Explained: R-Square, Multiple Regression, Interpretation of Regression Coefficients, Interpretation of Standard Error of Estimate and R-Square, Modeling Possibilities, Dummy Variables, Interaction Variables, Nonlinear Transformations, Validation of the Fit.</p> <p>Regression Analysis: Statistical Inference: Introduction, The Statistical Model, Inferences About the Regression Coefficients, Sampling Distribution of the Regression Coefficients, Hypothesis Tests for the Regression Coefficients and p-Values, A Test for the Overall Fit: The ANOVA Table, Multicollinearity, Include/Exclude Decisions, Stepwise Regression, Outliers, Violations of Regression Assumptions, Nonconstant Error Variance, Nonnormality of Residuals, Autocorrelated Residuals, Prediction.</p>	8 Hours
Course outcomes: The students should be able to:	
<ul style="list-style-type: none"> • Explain the importance of data and data analysis • Interpret the probabilistic models for data • Define hypothesis, uncertainty principle • Evaluate regression analysis 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	

Text Books:

1. S C Albright and W L Winston, Business analytics: data analysis and decision making, 5/e Cengage Learning


Reference Books:


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PROGRAMMING IN JAVA
(OPEN ELECTIVE)
(Effective from the academic year 2018 -2019)
SEMESTER – VII

Subject Code	18CS752	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS752) will enable students to:			
<ul style="list-style-type: none"> • Learn fundamental features of object oriented language and JAVA • Set up Java JDK environment to create, debug and run simple Java programs. • Learn object oriented concepts using programming examples. • Study the concepts of importing of packages and exception handling mechanism. • Discuss the String Handling examples with Object Oriented concepts 			
Module – 1			Teaching Hours
An Overview of Java: Object-Oriented Programming, A First.Simple Program, A Second Short Program, Two Control Statements, Using Blocks of Code, Lexical Issues, The Java Class Libraries, Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, A Few Words About Strings Text book 1: Ch 2, Ch 3			8 Hours
Module – 2			
Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses, Control Statements: Java's Selection Statements, Iteration Statements, Jump Statements. Text book 1: Ch 4, Ch 5			8 Hours
Module – 3			
Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The finalize() Method, A Stack Class, A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding static, Introducing final, Arrays Revisited, Inheritance: Inheritance, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, The Object Class. Text book 1: Ch 6, Ch 7.1-7.9, Ch 8.			8 Hours
Module – 4			
Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces, Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions, Using Exceptions. Text book 1: Ch 9, Ch 10			8 Hours
Module – 5			
Enumerations, Type Wrappers, I/O, Applets, and Other Topics: I/O Basics, Reading			8 Hours


Console Input, Writing Console Output, The PrintWriter Class, Reading and Writing Files, Applet Fundamentals, The transient and volatile Modifiers, Using instanceof, strictfp, Native Methods, Using assert, Static Import, Invoking Overloaded Constructors Through this(), String Handling: The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, Modifying a String, Data Conversion Using valueOf(), Changing the Case of Characters Within a String, Additional String Methods, StringBuffer, StringBuilder.	
Text book 1: Ch 12.1,12.2, Ch 13, Ch 15	
Course outcomes: The students should be able to:	
<ul style="list-style-type: none"> • Explain the object-oriented concepts and JAVA. • Develop computer programs to solve real world problems in Java. 	
Develop simple GUI interfaces for a computer program to interact with users	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Text Books:	
1. Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007. (Chapters 2, 3, 4, 5, 6,7, 8, 9,10, 12,13,15)	
Reference Books:	


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INTRODUCTION TO OPERATING SYSTEM
(OPEN ELECTIVE)
(Effective from the academic year 2018 -2019)
SEMESTER – VII

Subject Code	18CS753	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS753) will enable students to:			
<ul style="list-style-type: none"> • Explain the fundamentals of operating system • Comprehend multithreaded programming, process management, memory management and storage management. • Familiar with various types of operating systems 			
Module – 1			Teaching Hours
<p>Introduction: What OS do, Computer system organization, architecture, structure, Operations, Process, memory and storage management, Protection and security, Distributed systems, Special purpose systems, computing environments.</p> <p>System Structure: OS Services, User OSI, System calls, Types of system calls, System programs, OS design and implementation, OS structure, Virtual machines, OS generation, system boot</p> <p>Textbook1: Chapter 1, 2</p>			8 Hours
Module – 2			
<p>Process Concept: Overview, Process scheduling, Operations on process, IPC, Examples in IPC, Communication in client-server systems.</p> <p>Multithreaded Programming: Overview, Models, Libraries, Issues, OS Examples</p> <p>Textbook1: Chapter 3,4</p>			8 Hours
Module – 3			
<p>Process Scheduling: Basic concept, Scheduling criteria, Algorithm, multiple processor scheduling, thread scheduling, OS Examples, Algorithm Evaluation.</p> <p>Synchronization: Background, the critical section problem, Petersons solution, Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors, Synchronization examples, Atomic transactions</p> <p>Textbook1: Chapter 5, 6</p>			8 Hours
Module – 4			
<p>Deadlocks: System model, Deadlock characterization, Method of handling deadlock, Deadlock prevention, Avoidance, Detection, Recovery from deadlock</p> <p>Memory management strategies: Background, swapping, contiguous memory</p>			8 Hours

allocation, paging, structure of page table, segmentation,	
Textbook1: Chapter 7, 8	
Module – 5	
Virtual Memory management: Background, Demand paging, Copy-on-write, Page replacement, allocation of frames, Trashing, Memory mapped files, Allocating Kernel memory, Operating system examples	8 Hours
File system: File concept, Access methods, Directory structure, File system mounting, File sharing, protection	
Textbook1: Chapter 9, 10	
Course outcomes: The students should be able to:	
<ul style="list-style-type: none"> • Explain the fundamentals of operating system • Comprehend process management, memory management and storage management. • Familiar with various types of operating systems 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Text Books:	
1. A. Silberschatz, P B Galvin, G Gagne, Operating systems, 7 th edition, John Wiley and sons,.	
Reference Books:	

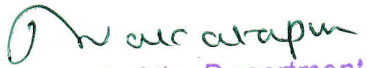

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ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY (Effective from the academic year 2018 -2019) SEMESTER – VII			
Subject Code	18CSL76	CIE Marks	40
Number of Contact Hours/Week	0:0:2	SEE Marks	60
Total Number of Lab Contact Hours	36	Exam Hours	3 Hrs
Credits – 2			
Course Learning Objectives: This course (18CSL76) will enable students to:			
<ul style="list-style-type: none">Implement and evaluate AI and ML algorithms in and Python programming language.			
Descriptions (if any):			
Programs List:			
1.	Implement A* Search algorithm.		
2.	Implement AO* Search algorithm.		
3.	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.		
4.	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.		
5.	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.		
6.	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.		
7.	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.		
8.	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.		
9.	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs		
Laboratory Outcomes: The student should be able to:			
<ul style="list-style-type: none">Implement and demonstrate AI and ML algorithms.Evaluate different algorithms.			
Conduct of Practical Examination:			
<ul style="list-style-type: none">All laboratory experiments, excluding the first, are to be included for practical examination.Experiment distribution<ul style="list-style-type: none">For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity.For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity.Change of experiment is allowed only once and marks allotted for procedure part to be made zero.Marks Distribution (<i>Subjected to change in accordance with university regulations</i>)<ul style="list-style-type: none">s) For questions having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks			

t) For questions having part A and B

i. Part A – Procedure + Execution + Viva = $4 + 21 + 5 = 30$ Marks

ii. Part B – Procedure + Execution + Viva = $10 + 49 + 11 = 70$ Marks


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VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examination 2018 – 19
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2018 – 19)

VIII SEMESTER												
Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	PCC	18CS81	Internet of Things	CS / IS	3	--	--	03	40	60	100	3
2	PEC	18CS82X	Professional Elective – 4	CS / IS	3	--	--	03	40	60	100	3
3	Project	18CSP83	Project Work Phase – 2	CS / IS	--	--	2	03	40	60	100	8
4	Seminar	18CSS84	Technical Seminar	CS / IS	--	--	2	03	100	--	100	1
5	INT	18CSI85	Internship	(Completed during the intervening vacations of VI and VII semesters and /or VII and VIII semesters.)				03	40	60	100	3
TOTAL					06	--	4	15	260	240	500	18

Note: PCC: Professional Core, PEC: Professional Elective, OEC: Open Elective, INT: Internship.

Professional Electives – 4

Course code under 18CS82X	Course Title
18CS821	Mobile Computing
18CS822	Storage Area Networks
18CS823	NoSQL Database
18CS824	Multicore Architecture and Programming

Project Work CIE procedure for Project Work Phase - 2:

(i) **Single discipline:** The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work phase -2, shall be based on the evaluation of project work phase -2 Report, project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

(ii) **Interdisciplinary:** Continuous Internal Evaluation shall be group wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work phase -2, shall be based on the evaluation of project work phase -2 Report, project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

SEE for Project Work Phase - 2:

(i) **Single discipline:** Contribution to the project and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted at the department.

(ii) **Interdisciplinary:** Contribution to the project and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted separately at the departments to which the student/s belongs to.


Internship: Those, who have not pursued /completed the internship shall be declared as fail and have to complete during subsequent University examination after satisfying the internship requirements

AICTE activity Points: In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card. Activity points of the students who have earned the prescribed AICTE activity Points shall be sent the University along with the CIE marks of 8th semester. In case of students who have not satisfied the AICTE activity Points at the end of eighth semester, the column under activity Points shall be marked NSAP (Not Satisfied Activity Points).

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INTERNET OF THINGS (Effective from the academic year 2018 -2019) SEMESTER – VIII			
Subject Code	18CS81	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS81) will enable students to:			
<ul style="list-style-type: none"> Assess the genesis and impact of IoT applications, architectures in real world. Illustrate diverse methods of deploying smart objects and connect them to network. Compare different Application protocols for IoT. Infer the role of Data Analytics and Security in IoT. Identify sensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry. 			
Module 1			Contact Hours
What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.			08
Module 2			
Smart Objects: The “Things” in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.			08
Module 3			
IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.			08
Module 4			
Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment			08
Module 5			
IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples.			08
Course Outcomes: The student will be able to :			
<ul style="list-style-type: none"> Interpret the impact and challenges posed by IoT networks leading to new architectural models. Compare and contrast the deployment of smart objects and the technologies to connect them to network. Appraise the role of IoT protocols for efficient network communication. 			


<ul style="list-style-type: none"> • Elaborate the need for Data Analytics and Security in IoT. • Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.
Question Paper Pattern: <ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module.
Textbooks: <ol style="list-style-type: none"> 1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743) 2. Srinivasa K G, "Internet of Things", CENGAGE Learning India, 2017
Reference Books: <ol style="list-style-type: none"> 1. Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014. (ISBN: 978-8173719547) 2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)


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MOBILE COMPUTING (Effective from the academic year 2018 -2019) SEMESTER – VIII			
Subject Code	18CS821	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS821) will enable students to: <ul style="list-style-type: none"> • Define concepts of wireless communication. • Compare and contrast propagation methods, Channel models, capacity calculations multiple antennas and multiple user techniques used in the mobile communication. • Explain CDMA, GSM, Mobile IP, Wimax and Different Mobile OS • Illustrate various Markup Languages CDC, CLDC, MIDP; Programming for CLDC, MIDlet model and security concerns 			
Module 1			Contact Hours
Mobile Computing Architecture: Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing. Wireless Networks : Global Systems for Mobile Communication (GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications, GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS, Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.			08
Module 2			
Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices. Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6			08
Module 3			
Mobile OS and Computing Environment : Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux, Proprietary OS Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.			08
Module 4			
Building, Mobile Internet Applications: Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.			08
Module 5			
J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.			08


ADVANCED COMPUTER ARCHITECTURES (Effective from the academic year 2018 -2019) SEMESTER – VIII			
Subject Code	18CS822	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS822) will enable students to:			
<ul style="list-style-type: none"> Describe computer architecture. Measure the performance of architectures in terms of right parameters. Summarize parallel architecture and the software used for them 			
Module 1			Contact Hours
Theory of Parallelism: Parallel Computer Models, The State of Computing, Multiprocessors and Multicomputer, Multivector and SIMD Computers, PRAM and VLSI Models, Program and Network Properties, Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow Mechanisms, System Interconnect Architectures, Principles of Scalable Performance, Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches.			08
Module 2			
Hardware Technologies: Processors and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.			08
Module 3			
Bus, Cache, and Shared Memory, Bus Systems, Cache Memory Organizations, Shared Memory Organizations, Sequential and Weak Consistency Models, Pipelining and Superscalar Techniques, Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design (Upto 6.4).			08
Module 4			
Parallel and Scalable Architectures: Multiprocessors and Multicomputers, Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Three Generations of Multicomputers, Message-Passing Mechanisms, Multivector and SIMD Computers, Vector Processing Principles, Multivector Multiprocessors, Compound Vector Processing, SIMD Computer Organizations (Upto 8.4), Scalable, Multithreaded, and Dataflow Architectures, Latency-Hiding Techniques, Principles of Multithreading, Fine-Grain Multicomputers, Scalable and Multithreaded Architectures, Dataflow and Hybrid Architectures.			08
Module 5			
Software for parallel programming: Parallel Models, Languages, and Compilers, Parallel Programming Models, Parallel Languages and Compilers, Dependence Analysis of Data Arrays, Parallel Program Development and Environments, Synchronization and Multiprocessing Modes. Instruction and System Level Parallelism, Instruction Level Parallelism, Computer Architecture, Contents, Basic Design Issues, Problem Definition, Model of a Typical Processor, Compiler-detected Instruction Level Parallelism, Operand Forwarding, Reorder Buffer, Register Renaming, Tomasulo's Algorithm, Branch Prediction, Limitations in Exploiting Instruction Level Parallelism, Thread Level Parallelism.			08
Course Outcomes: The student will be able to :			

<ul style="list-style-type: none"> • Explain the concepts of parallel computing and hardware technologies • Compare and contrast the parallel architectures • Illustrate parallel programming concepts
Question Paper Pattern:
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module.
Textbooks:
1. Kai Hwang and Naresh Jotwani, Advanced Computer Architecture (SIE): Parallelism, Scalability, Programmability, McGraw Hill Education 3/e. 2015
Reference Books:
1. John L. Hennessy and David A. Patterson, Computer Architecture: A quantitative approach, 5th edition, Morgan Kaufmann Elsevier, 2013


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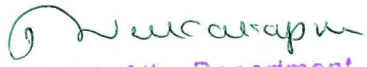
NOSQL DATABASE (Effective from the academic year 2018 -2019) SEMESTER – VIII			
Subject Code	18CS823	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS823) will enable students to:			
<ul style="list-style-type: none"> Define, compare and use the four types of NoSQL Databases (Document-oriented, Key-Value Pairs, Column-oriented and Graph). Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases. Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases. 			
Module 1			Contact Hours
Why NoSQL? The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Aggregate Data Models; Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases. More Details on Data Models; Relationships, Graph Databases, Schemaless Databases, Materialized Views, Modeling for Data Access,			08
Textbook1: Chapter 1,2,3			
Module 2			
Distribution Models; Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication. Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums. Version Stamps, Business and System Transactions, Version Stamps on Multiple Nodes			08
Textbook1: Chapter 4,5,6			
Module 3			
Map-Reduce, Basic Map-Reduce, Partitioning and Combining, Composing Map-Reduce Calculations, A Two Stage Map-Reduce Example, Incremental Map-Reduce Key-Value Databases, What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preference, Shopping Cart Data, When Not to Use, Relationships among Data, Multioperation Transactions, Query by Data, Operations by Sets			08
Textbook1: Chapter 7,8			
Module 4			
Document Databases, What Is a Document Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Different			08

Operations, Queries against Varying Aggregate Structure	
Textbook1: Chapter 9	
Module 5	
Graph Databases, What Is a Graph Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use.	08
Textbook1: Chapter 11	
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Define, compare and use the four types of NoSQL Databases (Document-oriented, Key/Value Pairs, Column-oriented and Graph). • Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases. • Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addison Wesley, 2012	
Reference Books:	
<ol style="list-style-type: none"> 1. Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN-13: 978-9332557338) 2. Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022) 3. Kristina Chodorow, "MongoDB: The Definitive Guide- Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694) 	


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MULTICORE ARCHITECTURE AND PROGRAMMING (Effective from the academic year 2018 -2019) SEMESTER – VII			
Course Code	18CS824	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	3 Hrs
CREDITS –3			
Course Learning Objectives: This course (18CS824) will enable students to: <ul style="list-style-type: none"> • Define technologies of multicore architecture and performance measures • Demonstrate problems related to multiprocessing • Illustrate windows threading, posix threads, openmp programming • Analyze the common problems in parallel programming 			
Module -1			Contact Hours
Introduction to Multi-core Architecture Motivation for Concurrency in software, Parallel Computing Platforms, Parallel Computing in Microprocessors, Differentiating Multi-core Architectures from Hyper- Threading Technology, Multi-threading on Single-Core versus Multi-Core Platforms Understanding Performance, Amdahl's Law, Growing Returns: Gustafson's Law. System Overview of Threading : Defining Threads, System View of Threads, Threading above the Operating System, Threads inside the OS, Threads inside the Hardware, What Happens When a Thread Is Created, Application Programming Models and Threading, Virtual Environment: VMs and Platforms, Runtime Virtualization, System Virtualization. Textbook 1: Ch.1, 2 RBT: L1, L2, L3			08
Module -2			
Fundamental Concepts of Parallel Programming :Designing for Threads, Task Decomposition, Data Decomposition, Data Flow Decomposition, Implications of Different Decompositions, Challenges You'll Face, Parallel Programming Patterns, A Motivating Problem: Error Diffusion, Analysis of the Error Diffusion Algorithm, An Alternate Approach: Parallel Error Diffusion, Other Alternatives. Threading and Parallel Programming Constructs: Synchronization, Critical Sections, Deadlock, Synchronization Primitives, Semaphores, Locks, Condition Variables, Messages, Flow Control- based Concepts, Fence, Barrier, Implementation-dependent Threading Features Textbook 1: Ch.3, 4 RBT: L1, L2, L3			08
Module – 3			
Threading APIs :ThreadingAPIs for Microsoft Windows, Win32/MFC Thread APIs, Threading APIs for Microsoft. NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, Creating Threads, Managing Threads, Thread Synchronization, Signaling, Compilation and Linking. Textbook 1: Ch.5 RBT: L1, L2, L3			08
Module-4			
OpenMP: A Portable Solution for Threading : Challenges in Threading a Loop, Loop-carried Dependence, Data-race Conditions, Managing Shared and Private Data, Loop Scheduling and Portioning, Effective Use of Reductions, Minimizing Threading Overhead, Work-sharing Sections, Performance-oriented Programming, Using Barrier and No wait, Interleaving Single-thread and Multi-thread Execution, Data Copy-in and Copy-out, Protecting Updates of			08

Shared Variables, Intel Task queuing Extension to OpenMP, OpenMP Library Functions, OpenMP Environment Variables, Compilation, Debugging, performance Textbook 1: Ch.6 RBT: L1, L2, L3	
Module-5	
Solutions to Common Parallel Programming Problems : Too Many Threads, Data Races, Deadlocks, and Live Locks, Deadlock, Heavily Contended Locks, Priority Inversion, Solutions for Heavily Contended Locks, Non-blocking Algorithms, ABA Problem, Cache Line Ping-ponging, Memory Reclamation Problem, Recommendations, Thread-safe Functions and Libraries, Memory Issues, Bandwidth, Working in the Cache, Memory Contention, Cache-related Issues, False Sharing, Memory Consistency, Current IA-32 Architecture, Itanium Architecture, High-level Languages, Avoiding Pipeline Stalls on IA-32, Data Organization for High Performance. Textbook 1: Ch.7 RBT: L1, L2, L3	08
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> • Identify the limitations of ILP and the need for multicore architectures • Define fundamental concepts of parallel programming and its design issues • Solve the issues related to multiprocessing and suggest solutions • Make out the salient features of different multicore architectures and how they exploit parallelism • Demonstrate the role of OpenMP and programming concept 	
Question Paper Pattern:	
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full Question consisting of 20 marks • There will be 2 full questions (with a maximum of four sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
1. Multicore Programming , Increased Performance through Software Multi-threading by Shameem Akhter and Jason Roberts , Intel Press , 2006	
Reference Books:	
1. Yan Solihin, "Fundamentals of Parallel Multicore Architecture", 1st Edition, CRC Press/Taylor and Francis, 2015. 2. GerassimosBarlas, "Multicore and GPU Programming: An Integrated Approach Paperback", 1st Edition, Morgan Kaufmann, 2014. 3. Lyla B Das, "The x86 Microprocessors: 8086 to Pentium, Multicores, Atom and the 8051 Microcontroller: Architecture, Programming and Interfacing", 2nd Edition, Pearson Education India, 2014	


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