



SWAMI VIVEKANAND
SUBHARTI
UNIVERSITY
UGC Approved Meerut



AN ISO 21001: 2018 ORGANIZATION

OFFICE OF THE REGISTRAR

Gp Capt M Yakoob

M-in-D (Retd.), M.Tech.

REGISTRAR

registrar@subharti.org

Ref.No.U-508(i)/SVSU/2025/1565

Date:25.01.2025

NOTIFICATION

It is hereby notified for information of all the concerned that the Academic Council in its 34th meeting held on 25-07-2024 vide resolution No.34(7) has approved the ordinance relating to course curriculum & syllabus of degree of Four Year Degree Program (FYDP) of the following:

Ordinance No.V-126 (B9), relating to B.Sc.-Information Technology

The copies of all above are enclosed and shall be applicable from Academic Session 2024-25 onwards.

This issues with the approval of the Hon'ble Vice Chancellor.

Ref.No.U-508(i)/SVSU/2025/1565

Copy forwarded to information of:

1. Hon'ble Vice-Chancellor
2. Controller of Examination
3. Dean-Academics
4. Director-IQAC
5. Dean-Faculty of Science (for compliance please)
6. CTO (with a request to upload the ordinance on University website)
7. Additional Registrar-Academics
8. Guard File

Yakoob
25.01
2025

Registrar

Date: 25.01.2025

Yakoob
25.01
2025

Registrar



0121 6678000

Subhartipuram, NH-58, Delhi-Haridwar Bypass Road, Meerut-250005 (U.P.) INDIA

SWAMI VIVEKANAND SUBHARTI UNIVERSITY

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Syllabus

For

Bachelor in Science (IT)

Under

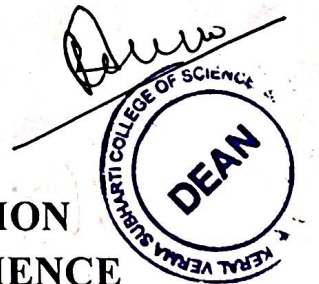
National Education Policy-2020

Four Year Undergraduate Program (FYUP)

Effective From

2024-25

**DEPARTMENT OF COMPUTER APPLICATION
KERAL VERMA SUBHARTI COLLEGE OF SCIENCE**



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Deptt. of Computer Application
Faculty of Science
S.V.S.U., MEERUT**

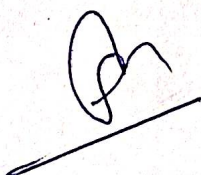
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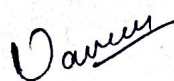
Year wise Structure of B.Sc. (Information Technology)

Year	Sem.	Course Code	Paper Title	Theory/Practical	Credits
1	I	B180101T	Problem Solving using Computer	Theory/Practical	4
1	I	B180102P	Software Lab using Python	Theory	4
1	II	B180201T	Operating Systems	Practical	2
1	II	B180202P	Operating Systems Lab	Theory	4
2	III	B180301T	Database Management Systems	Practical	2
2	III	B180302P	Database Management Systems Lab	Theory	4
2	IV	B180401T	Web Technology	Practical	2
2	IV	B180402P	Web Technology Lab	Theory	4
3	V	B180501T	Analysis of Algorithms and Data Structures	Practical	2
3	V	B180502T	E-Commerce	Theory	4
3	V	B180503P	Lab on Algorithms and Data Structures Using Java	Theory	4
3	V	B180504R	Research Project-I	Practical	2
3	VI	B180601T	Data Communication and Computer Network	Project	3
3	VI	B180602T	Information Security & Cyber Laws	Theory	4
3	VI	B180603P	Lab on Computer Networks	Theory	4
3	VI	B180604R	Research Project-II	Practical	2
				Project	3

Syllabus Developed by:

S. No.	Name	Designation	Department	College/ University
1	Prof. Ashutosh Gupta	Director/Professor	School of Science	U.P.Rajarshi Tandon Open University, Prayagraj
2	Prof. Manu Pratap Singh	Professor	Dept. of Computer Science	Dr. B. R. Ambedkar University, Agra
3	Dr. Deepak Kumar Verma	Assistant Professor	Dept. of CSE	CSJM University, Kanpur







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**Year wise Structure
of
B.Sc. (Information Technology)**

Subject prerequisites

To study the Information Technology, a student must have had the subject(s) computer science OR Mathematics in class12th.

Programme outcomes (POs): Students taking admission to B.Sc. program are expected to get prepared with following outcomes:

PO 1	Explaining the basic scientific principles and methods.
PO 2	Inculcating scientific thinking and awareness among the student.

Programme specific outcomes (PSOs)

PEO 1	To prepare students for career in Information Technology and its applications in professional career
PEO 2	To develop the student to cope up with the advancements in respective IT field
PEO 3	The student will determine the appropriate level of technology for use in: a) experimental design and implementation, b) analysis of experimental data, and c) Information Security and well acquainted with cyber laws
PEO 4	Implement solutions in a variety of contexts related to science, technology, business and industry, and illustrate these solutions using symbolic, numeric, or graphical methods

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Sl. No.	Topic	Marks	Internal Assessment	Marks
1	Class. Assignment	05	Unit Vides	25
2	Quiz	10	Experiment/Demonstration	20
3	2nd Quiz	10	Work up & Project Work	20
4		25	Project Record File	10
				75

Year wise Structure of B.Sc. for subject Information Technology

Type of Award	Subject: Information Technology										Total Credit of the subject
	Year	Sem.	Paper 1 Theory	credit	Paper 2 Theory	credit	Paper 3 Practical	credit	Research Project	credit	
Certificate in Computer Science	1	I	Problem Solving using Computer	4	--		Software Lab using Python	2	Nil	Nil	6
		II	Operating Systems	4	--		Operating Systems Lab	2	Nil	Nil	6
Diploma in Computer Science	2	III	Database Management Systems	4	--		Database Management Systems Lab	2	Nil	Nil	6
		IV	Web Technology	4	--		Web Technology Lab	2	Nil	Nil	6
Bachelor of Science	3	V	Analysis of Algorithms and Data Structures	4	E-Commerce	4	Lab on Algorithms and Data Structures Using Java	2	Research Project-I	3	13
		VI	Data Communication and Computer Network	4	Information Security & Cyber Laws	4	Lab on Computer Networks	2	Research Project-II	3	13
Total Credits:										50	

Practical Evaluation & Assessment			
Internal Assessment	Marks	External Assessment	Marks
Class Interaction	05	Viva Voce	25
Quiz 1	10	Execution/Demonstration	20
Quiz 2	10	Write up/theory work	20
		Practical Record File	10
	25		75


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Syllabus for B.Sc.: Subject: Information Technology

Programme/Class: Certificate in Computer Science	Year: First	Semester: First
Subject: Information Technology		
Course Code: B180101T	Course Title: Problem Solving using Computer	
Course outcomes:		
<p>CO1: Understand hardware components of computer system such as memory system organization, input/output devices, aware of software components of computer system, and windows operating system concepts.</p> <p>CO 2: Develops basic understanding of computers, the concept of algorithm and algorithmic thinking.</p> <p>CO3: Develops the ability to analyze a problem, develop an algorithm to solve it.</p> <p>CO4: Develops the use of the Python programming language to implement various algorithms, and develops the basic concepts and terminology of programming in general.</p> <p>CO5: Introduces the more advanced features of the Python language</p>		
Credits: 4	Core Compulsory	
Max. Marks: 25+75	Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		
Unit	Topic	No. of Lectures
I	Computer Fundamentals: Introduction to Computers: Characteristics of Computers, Uses of computers, Types and generations of Computers.	7
II	Basic Computer Organization - Units of a computer, CPU, ALU, memory hierarchy, registers, I/O devices. Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors In programming Documentation.	8
III	Techniques of Problem Solving: Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.	7
IV	Overview of Programming: Structure of a Python Program, Elements of Python	8
V	Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment Operator, Ternary operator, Bit wise operator, Increment or Decrement operator).	8

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VI	Creating Python Programs: Input and Output Statements, Control statements (Looping- while Loop, for Loop, Loop Control, Conditional Statement- if...else, Difference between break, continue and pass).	7
VII	Structures: Numbers, Strings, Lists, Tuples, Dictionary, Date & Time, Modules, Defining Functions, Exit function, default arguments.	7
VIII	Introduction to Advanced Python: Objects and Classes, Inheritance, Regular Expressions, Event Driven Programming, GUI Programming.	8

Suggested Readings:

1. P. K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications, 2007.
2. Dr. Anita Goel, Computer Fundamentals, Pearson Education, 2010.
3. T. Budd, Exploring Python, TMH, 1st Ed, 2011
4. Python Tutorial/Documentation www.python.org 2010
5. Allen Downey, Jeffrey Elkner, Chris Meyers, How to think like a computer scientist: learning with Python, Freely available online. 2012

Suggestive digital platforms weblinks-

<https://www.pearsoned.co.in/prc/book/anita-goel-computer-fundamentals-1e-1/9788131733097>

<http://docs.python.org/3/tutorial/index.html>

<http://interactivepython.org/courselib/static/pythonds>

<http://www.ibiblio.org/g2swap/byteofpython/read/>

This course can be opted as an elective by the students of following subjects:

"Skill Based Elective"

"Elective"

Suggested Continuous Evaluation Methods: Max. Marks: 25

1. Assessment Type: Class Tests (Max. Marks 14)

Suggested Usage:

Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers, not names be written to avoid bias in marking; Display of model answer copies.

After Completion of Unit I and Unit II, a first-class test of max. marks of 7 shall be conducted.

After Completion of Unit III and IV, a second-class test of max. marks of 7 shall be conducted.

If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.

2. Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) / Recall Type -Filling Blanks; One word / PhraseAnswers (Max Marks: 5)

Suggested Usage: Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be "End of the class quiz".

3. Assessment Type: Assignments (Max Marks: 4)

Suggested Usage: Some class assignments shall be given to students at the end of each Unit. Note making techniques be taught to students; Not just direct questions from notes, but application analysis and synthesis of that knowledge.

4. Assessment Type: Class Interaction (Max. marks: 2)

Course prerequisites: None

Suggested equivalent online courses:

Further Suggestions:
None

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Programme/Class: Certificate in Information Technology	Year: First	Semester: First
Subject: Information Technology		
Course Code: B180102P	Course Title: Software Lab using Python	
Course outcomes: <ol style="list-style-type: none"> 1. To learn and understand Python programming basics. 2. To learn and understand python looping, control statements and string manipulations. 3. Students should be made familiar with the concepts of GUI controls and designing GUI applications. 4. To learn and know the concepts of file handling, exception handling and database connectivity. 		
Credits: 2	Max. Marks: 25+75	Min. Passing Marks:
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4		
Suggested Readings: <ol style="list-style-type: none"> 1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/) 2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011. 3. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013. 4. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013 5. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012. 		

Section: A (Simple programs)

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria:
 - Grade A: Percentage ≥ 80
 - Grade B: Percentage ≥ 70 and < 80
 - Grade C: Percentage ≥ 60 and < 70
 - Grade D: Percentage ≥ 40 and < 60
 - Grade E: Percentage < 40
3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
4. WAP to display the first n terms of Fibonacci series.
5. WAP to find factorial of the given number.
6. WAP to find sum of the following series form terms: $1 - 2/2! + 3/3! - \dots - n/n!$
7. WAP to calculate the sum and product of two compatible matrices.

Section: B (Visual Python)

ould be written using user defined functions, wherever possible.

iven program to create mathematical 3Dobjects

integers and display them as a histogram.

sine, cosine, polynomial and exponential curves.

graph of people with pulse rate p vs. height h . The values of p and h are to be entered by the user.

te the mass m in a chemical reaction. The mass m (in gms) disintegrates according to the formula $m=60/(t+2)$, wh
for t vs. m , where $t \geq 0$.

n of 1000 bacteria is introduced into a nutrient medium. The population p grows as follows :

$(15000(1+t))/(15+e)$

is measured in hours. WAP to determine the size of the population at given time t and plot a graph for P vs t for the speci

city and acceleration, and plot the following graphs depicting equations of motion :

time ($v=u+at$)

time ($s=u*t+0.5*a*t*t$)

velocity ($s=(v*v-u*u)/2*a$)

	Year: First	Semester: First
Subject: Computer Science		
Course Title: Differential Calculus & Integral Calculus		

e is to give foundation knowledge for the students to understand basics of
spect for developing enhanced quantitative skills and pursuing higher mathematics



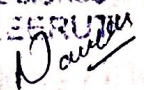
omplete the course they will have wide ranging application of the subject and have the
ons such as sequence and series. They will also be able to know about convergence
y have knowledge about curvature, envelope and evolutes and trace curve in polar,
urves.



e course is to equip the student with necessary analytic and technical skills. By
l he learns to solve a variety of practical problems in science and engineering.

ith standard concepts and tools at an intermediate to advance level that will serve

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convergence criterion, Cauchy sequence, limit superior and limit inferior quence, subsequence, Series of non-negative terms, convergence and ce, Comparison tests, Cauchy's integral test, Ratio tests, Root test, ogarithmic test, de Morgan and Bertrand's tests, alternating ibnitz's theorem, absolute and conditional convergence.	
continuity and differentiability of function of single variable, Cauchy's n, Heine's definition, equivalence of definition of Cauchy and Heine, continuity, Borel's theorem, boundedness theorem, Bolzano's theorem, iate value theorem, extreme value theorem, Darboux's intermediate value for derivatives, Chain rule, indeterminate forms.	7
theorem, Lagrange and Cauchy Mean value theorems, mean value of higher order, Taylor's theorem with various forms of remainders, e differentiation, Leibnitz theorem, Maclaurin's and Taylor's series, n homogeneous function.	7
and normals, Asymptotes, Curvature, Envelops and evolutes, Tests for and convexity, Points of inflexion, Multiple points, Parametric ation of curves and tracing of parametric curves, Tracing of curves in and Polar forms.	7
Part-B Integral Calculus	7
integrals as limit of the sum, Riemann integral, Integrability of s and monotonic functions, Fundamental theorem of integral calculus, ue theorems of integral calculus, Differentiation under the sign of n.	7
r integrals, their classification and convergence, Comparison test, bel's test, Dirichlet's test, quotient test, Beta and Gamma s.	7
tion, Volumes and Surfaces of Solid of revolution, Pappus Multiple integrals, change of order of double integration, 's theorem, Liouville's theorem for multiple integrals.	7
Differentiation, Gradient, Divergence and Curl, Normal on a Directional Derivative, Vector Integration, Theorems of reen, Stokes and related problems.	7
Differential Calculus): ntroduction to Real Analysis, John Wiley & Sons John Wiley & Sons Inc. antha, Differential Calculus, New Age Publication. is, Calculus, John Wiley and Sons, Inc., 2002. Calculus, Pearson Education, 2007. eb links: NPTEL/SWAYAM/MOOCs idi may be prescribed by the Universities. al Calculus):	



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Elective by the students of following subjects: Engg. and Tech. (UG), Economics(UG/PG), Commerce(UG), BBA/BCA, B.Sc.(C.S.)	
Assessed Continuous Evaluation Methods: Max. Marks: 25	
	Max Marks
	10
Tests	5
	5
to Indian ancient Mathematics and Mathematicians).	5
In this course, a student must have subject Mathematics in class 12 th	
Prerequisites:	

Year: First	Semester: First
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Subject: Mathematics

Course Title: Practical

of the course is to equip the student to plot the different graph and solve the different types of equations using software such as Mathematica /MATLAB /Maple /Scilab/Maxima etc.






After completion of this course student would be able to know the convergence of sequences through plotting, verification of Cauchy's root test by plotting n^{th} roots and Ratio test by plotting the ratio of n^{th} and $(n + 1)^{\text{th}}$ terms. Student will be able to plot Complex numbers and their representations, Operations like addition, subtraction, Multiplication and division of polar form.

Student will be able to perform following task of matrix as Addition, Multiplication, Inverse, Transpose, Determinant, Eigen value equation and verification of the Cayley-Hamilton theorem, Solving the systems of linear equations.

2	Core Compulsory / Elective
25+75	Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 0-0-4

Topics

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Lab work to be performed in Computer Lab.

Actuals to be done using Mathematica /MATLAB /Maple /Scilab/Maxima etc.

Graphs of the following functions:

Graph of integer function)

\mathbb{N}

$\in \mathbb{N}$

\mathbb{N}

\mathbb{N}

$|ax + b|, c \pm |ax + b|$

$x \sin\left(\frac{1}{x}\right), e^x, e^{-x}$ for $x \neq 0$.

$(ax + b)^{-1}, \sin(ax + b), \cos(ax + b), |\sin(ax + b)|, |\cos(ax + b)|$.

discuss the effect of changes in the real constants a and b on the graphs.

Using the graph find the solution of the equation

$e^x = 1 - x^2, x = \log_{10}(x), \cos(x) = x, \sin(x) = x, \cos(y) = \cos(x), \sin(y) = \sin(x)$ etc

Graphs of polynomial of degree 2,3, 4 and 5, and their first and second derivatives.

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- (4) Sketching parametric curves, e.g., Trochoid, Cycloid, Epicycloid and Hypocycloid etc.
- (5) Tracing of conic in Cartesian coordinates.
- (6) Graph of circular and hyperbolic functions.
- (7) Obtaining surface of revolution of curves.
- (8) Complex numbers and their representations, Operations like addition, Multiplication, Division, Modulus. Graphical representation of polar form.
- (9) Find numbers between two real numbers and plotting of finite and infinite subset of \mathbb{R} .
- (10) Matrix Operations: Addition, Multiplication, Inverse, Transpose, Determinant, Rank, Eigenvectors, Eigenvalues, Characteristic equation and verification of the Cayley-Hamilton theorem, Solving the systems of linear equations.
- (11) Study the convergence of sequences through plotting.
- (12) Verify Bolzano-Weierstrass theorem through plotting of sequences and hence identify convergent subsequences from the plot. (13) Study the convergence/divergence of infinite series by plotting their sequences of partial sum.
- (14) Cauchy's root test by plotting n -th roots.
- (15) Ratio test by plotting the ratio of n -th and $(n + 1)$ -th term.

Suggested Readings

Suggested Readings (Part-B Integral Calculus):

1. T.M. Apostol, Calculus Vol. II, John Wiley Publication
2. Shanti Narayan & Dr. P.K. Mittal, Integral Calculus, S.Chand
3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
4. Suggestive digital platforms web links: NPTEL/SWAYAM/MOOCs

Course Books published in Hindi may be prescribed by the Universities


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Suggested Continuous Evaluation Methods:		Max. Marks: 25
SN	Assessment Type	Max. Marks
1	Class Tests	10
2	Online Quizzes/ Objective Tests	5
3	Presentation	5
4	Assignment	5

Course prerequisites: To study this course, a student must have subject Mathematics in class 12th

Suggested equivalent online courses:

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Sl. No.	Topic	No. of Lectures
I	Operating system and functions, Classification of Operating systems: Batch, interactive, Time sharing, Real time System, Mechanism of Systems, Multuser Systems, Multiprogrammed Systems, Operating System Structure, System Components, Operating System Services, Semantics, Monolithic and Microkernel systems.	7
II	Process Management Process Concept, Process States, Process Synchronization, Critical Section, Mutual Exclusion, Classical Synchronization Problems, Process Scheduling, Process Synchronization, Process Transitions, Scheduling Algorithms, Interprocess Communication, Threads and their management, Security Issues.	8
III	CPU Scheduling Scheduling Concepts, Techniques of Scheduling, Preemptive and Non-preemptive Scheduling: First Come First Serve, Shortest Request First, Priority Response Ratio First, Round Robin, Least Complete First, Shortest Time to Go, Load, Medium, Short Scheduling, Priority Scheduling, Loadbalancing, system model, Deadlock identification, prevention, avoidance and detection, recovery from deadlock.	9
IV	File Management File system, File operations, Protection, sharing, Paging, Superblock, Virtual Memory, Device Mapping, File Compression Algorithms, Formatting.	10
V	File Management and Disk Scheduling File systems and file operations, file buffering, disk scheduling, file recovery.	11

Programme/Class: Certificate in Computer Science	Year: First	Semester: Second
Subject: Information Technology		
Course Code: B180201T	Course Title: Operating System	
Course outcomes: After the completion of the course the students will be able: <ol style="list-style-type: none"> 1. Understand role, responsibilities, features, and design of operating system. 2. Analyze memory management schemes and process scheduling algorithms. 3. Apply process synchronization techniques to formulate solution for critical section problems. 4. Illustrate concept of disk scheduling. 5. Evaluate process deadlock handling techniques. 		
Credits: 4	Core Compulsory	
Max. Marks: 25+75	Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		
Unit	Topic	No. of Lectures
I	Introduction Operating system and functions, Classification of Operating systems: Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multithreaded Systems, Operating System Structure, System Components, Operating System Services, Kernels, Monolithic and Microkernel Systems.	7
II	Process Management Process Concept, Process States, Process Synchronization, Critical Section, Mutual Exclusion, Classical Synchronization Problems, Process Scheduling, Process States, Process Transitions, Scheduling Algorithms Interprocess Communication, Threads and their management, Security Issues.	8
III	CPU Scheduling Scheduling Concepts, Techniques of Scheduling, Preemptive and Non-Preemptive Scheduling: First-Come-First-Serve, Shortest Request Next, Highest Response Ration Next, Round Robin, Least Complete Next, Shortest Time to Go, Long, Medium, Short Scheduling, Priority Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	8
IV	Memory Management Memory allocation, Relocation, Protection, Sharing, Paging, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing.	7
V	I/O Management and Disk Scheduling I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID.	8


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VI	File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	7
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- 1. Thomas H. Cormack, Andrew S. Tanenbaum and Peter D. Galanter, "Operating System Concepts", 6th Edition, Wiley, 2004.
- 2. William Stallings, "Operating Systems: Internals and Design Principles", Seventh Edition, Prentice Hall, 2007.
- 3. Charles D. Katz, "Operating Systems", First Edition, McGraw-Hill, 2004.

This book can be used as an elective for the students of following subjects:
 E. S. in Engineering and I.T.

Assignment Questions available in Matrix

I. Assessment and Types: Class Tests (40%, Marks 10)

Suggested Usage:

Include all types of questions, i.e., short answer, objective. Design to test all levels of knowledge. Questions must be prepared to ensure inclusion of all possible levels of knowledge and proper spacing of content. Marking Criteria made known to students. The questions provide written feedback separately and discuss answers in the class. Class Tests are compulsory, not written to avoid bias in marking. Compliance of marks as per below.

After completion of Unit I and Unit II, a first class test of max. marks of 7 shall be conducted.

After completion of Unit III and Unit IV, a second class test of max. marks of 7 shall be conducted.

A total of two tests appear in any one of both class tests, a marking test shall be conducted of max. marks of 7 out of total 14 marks.

Assignment Type: Multiple Choice / Objective Type (such as MCQs, True/False, Assertion/Reasoning), Short Type - Filling Blanks, One word/Phrase

Class Test Type: Multiple Choice / Objective Type (such as MCQs, True/False, Assertion/Reasoning), Short Type - Filling Blanks, One word/Phrase

Assignment Type: Multiple Choice / Objective Type (such as MCQs, True/False, Assertion/Reasoning), Short Type - Filling Blanks, One word/Phrase

Assignment Type: Multiple Choice / Objective Type (such as MCQs, True/False, Assertion/Reasoning), Short Type - Filling Blanks, One word/Phrase

VII	Shell introduction and Shell Scripting: What is shell and various type of shell, Various editors present in linux, Different modes of operation in vi editor,	7
VIII	What is shell script, Writing and executing the shell script, Shell variable (user defined and system variables) System calls, Using system calls, Pipes and Filters, Decision making in Shell Scripts (If else, switch), Loops in shell, Functions, Utility programs (cut, paste, join, tr , uniq utilities), Pattern matching utility (grep)	8

Suggested Readings:

1. Andrew S. Tanenbaum and Herbert Bos, "Modern Operating Systems," Fourth Edition, Pearson, 2014.
2. Abraham Silberschatz, Greg Gagne, and Peter B. Galvin, "Operating System Concepts," Tenth Edition, Wiley, 2018.
3. William Stallings, "Operating Systems: Internals and Design Principles," Seventh Edition, Prentice Hall, 2011.
4. DhanjayDhamdhare, "Operating Systems," First Edition, McGraw-Hill, 2008
- 5.

This course can be opted as an elective by the students of following subjects:

B. Sc in Engineering and BCA

Suggested Continuous Evaluation Methods:

1. Assessment Type: Class Tests (Max. Marks 14)

Suggested Usage:

Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers , not names be written to avoid bias in marking; Display of model answer copies.

After Completion of Unit I and Unit II, a first class test of max. marks of 7 shall be conducted.

After Completion of Unit III and IV, a second class test of max. marks of 7 shall be conducted.

If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.

2. Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) /Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5)

Suggested Usage: Teachers be trained in construction, advantages, disadvantages andprecautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be "End of the class quiz".

3. Assessment Type: Assignments (Max Marks: 4)

Suggested Usage: Some class assignments shall be given to students at the end of each

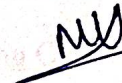
Unit. Note making techniques be taught to students; Not just direct questions from notes, but application analysis and synthesis of that knowledge.

4. **Assessment Type: Class Interaction (Max. marks: 2)**

Course prerequisites: To study this course, a student must have had the subject Mathematics in class 12th and Problem solving using computers in first semester.

Suggested equivalent online courses:

Further Suggestions:



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Programme/Class: Certificate in Computer Science	Year: First	Semester: Second
Subject: Information Technology		
Course Code: B180202P	Course Title: Operating Systems Lab	
Course outcomes:		
Ability to:		
<ol style="list-style-type: none"> 1. Use of Linux operating system and able to write shell programs. 2. Simulate and demonstrate the concepts of operating systems. 		
Credits: 2	Max. Marks: 25+75	Min. Passing Marks:
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4		
Suggested Readings: <ol style="list-style-type: none"> 1. Sumitabh Das, "Your Unix/Linux: The Ultimate Guide," McGraw Hill, 2012. 2. Richard Blum and Christine Bresnahan, "Linux Command Line and Shell Scripting Bible," Wiley, 2015. 3. Stroustrup, Bjarne, Programming: Principles and Practice Using C++, Addison Wesley, USA, 2014, 2nd ed. 4. E Balagurusamy, Object Oriented Programming with C++, McGraw Hill Education (India) Pvt. Ltd., India, 2013, 6th ed. 		

Lab on Operating Systems

Note: Following exercises can be performed using Linux or Unix

1. Usage of following commands:
ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, touch, cd.
2. Usage of following commands:
cal, cat(append), cat(concatenate), mv, cp, man, date.
3. Usage of following commands:
chmod, grep, tput (clear, highlight), bc.
4. Write a shell script to check if the number entered at the command line is prime or not.
5. Write a shell script to modify "cal" command to display calendars of the specified months.
6. Write a shell script to modify "cal" command to display calendars of the specified range of months.
7. Write a shell script to accept a login name. If not a valid login name display message – "Entered login name is invalid".
8. Write a shell script to display date in the mm/dd/yy format.
9. Write a shell script to display on the screen sorted output of "who" command along with the total number of users.
10. Write a shell script to display the multiplication table any number,
11. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
12. Write a shell script to check whether the file have all the permissions or not.
13. Simulate FCFS CPU scheduling algorithm in C++.
14. Simulate SJF CPU scheduling algorithm in C++.
15. Simulate Priority CPU scheduling algorithm in C++.
16. Simulate Round Robin CPU scheduling algorithm in C++.

17. Simulate FIFO page replacement algorithm in C++.
 18. Simulate LRU page replacement algorithm in C++.

Programme: Certificate Class: B.Sc.(IT)		Year: First	Semester: Second
Subject: Mathematics			
Course Code: B030201T		Course Title: Matrices and Differential Equations & Geometry	
Course outcomes: CO1: The subjects of the course are designed in such a way that they focus on developing mathematical skills in algebra, calculus and analysis and give in depth knowledge of geometry, calculus, algebra and other theories. CO2: The student will be able to find the rank, eigen values of matrices and study the linear homogeneous and non-homogeneous equations. The course in differential equation intends to develop problem solving skills for solving various types of differential equation and geometrical meaning of differential equation. CO3: The subjects learn and visualize the fundamental ideas about coordinate geometry and learn to describe some of the surface by using analytical geometry. CO4: On successful completion of the course students have gained knowledge about regular geometrical figures and their properties. They have the foundation for higher course in Geometry.			
Credits: 6		Core Compulsory/ Elective	
Max. Marks: 25+75		Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0			
Part A Differential Calculus			
Unit	Topic	No. of Lectures	
I	Introduction to Indian ancient Mathematics and Mathematicians should be included under Continuous Internal Evaluation (CIE). Definition of a sequence, theorems on limits of sequences, bounded and monotonic sequences, Cauchy's convergence criterion, Cauchy sequence, limit superior and limit inferior of a sequence, subsequence, Series of non-negative terms, convergence and divergence, Comparison tests, Cauchy's integral test, Ratio tests, Root test, Raabe's logarithmic test, de Morgan and Bertrand's tests, alternating series, Leibnitz's theorem, absolute and conditional convergence.	9	
II	Limit, continuity and differentiability of function of single variable, Cauchy's definition, Heine's definition, equivalence of definition of Cauchy and Heine, Uniform continuity, Borel's theorem, boundedness theorem, Bolzano's theorem.	7	

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	Intermediate value theorem, extreme value theorem, Darboux's intermediate value theorem for derivatives, Chain rule, indeterminate forms.	
III	Rolle's theorem, Lagrange and Cauchy Mean value theorems, mean value theorems of higher order, Taylor's theorem with various forms of remainders, Successive differentiation, Leibnitz theorem, Maclaurin's and Taylor's series, theorem on homogeneous function.	7
IV	Tangent and normals, Asymptotes, Curvature, Envelops and evolutes, Tests for concavity and convexity, Points of inflexion, Multiple points, Parametric representation of curves and tracing of parametric curves, Tracing of curves in Cartesian and Polar forms.	7
	Part-B Integral Calculus	7
V	Definite integrals as limit of the sum, Riemann integral, Integrability of continuous and monotonic functions, Fundamental theorem of integral calculus, Mean value theorems of integral calculus, Differentiation under the sign of Integration.	7
VI	Improper integrals, their classification and convergence, Comparison test, μ -test, Abel's test, Dirichlet's test, quotient test, Beta and Gamma functions.	7
VII	Rectification, Volumes and Surfaces of Solid of revolution, Pappus theorem, Multiple integrals, change of order of double integration, Dirichlet's theorem, Liouville's theorem for multiple integrals.	7
VIII	Vector Differentiation, Gradient, Divergence and Curl, Normal on a surface, Directional Derivative, Vector Integration, Theorems of Gauss, Green, Stokes and related problems.	7

Suggested Readings (Part- A Differential Calculus):

8. R.G. Bartle & D.R. Sherbert, Introduction to Real Analysis, John Wiley & Sons
9. T.M. Apostol, Calculus Vol. I, John Wiley & Sons Inc.
10. S. Balachandra Rao & C. K. Shantha, Differential Calculus, New Age Publication.
11. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.
12. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007.
13. Suggestive digital platforms web links: NPTEL/SWAYAM/MOOCs
14. Course Books published in Hindi may be prescribed by the Universities.

Suggested Readings (Part-B Integral Calculus):

5. T.M. Apostol, Calculus Vol. II, John Wiley Publication
6. Shanti Narayan & Dr. P.K. Mittal, Integral Calculus, S.Chand
7. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
8. Suggestive digital platforms web links: NPTEL/SWAYAM/MOOCs
9. Course Books published in Hindi may be prescribed by the Universities.

This course can be opted as an elective by the students of following subjects: Engg. and Tech. (UG), Chemistry/Biochemistry/Life Sciences(UG), Economics(UG/PG), Commerce(UG), BBA/BCA, B.Sc.(C.S.)

Suggested Continuous Evaluation Methods: Max. Marks: 25

S.No		Max Marks
1.	Class Tests	10
2.	Online Quizzes/ Objective Tests	5
3.	Presentation	5
4.	Assignment (Introduction to Indian ancient Mathematics and Mathematicians).	5

Course prerequisites: To study this course, a student must have subject Mathematics in class 12th

Suggested equivalent online courses:

Further Suggestions:

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VOCATIONAL COURSE

(To be Choose from the List of Subjects Provided by the University)

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Sl. No.	Topic	Hours
I	Introduction to Database System Concepts, File systems in database systems, Data base systems architecture Data models and their types, Data base schemas and instances, Data independence, Database Languages and interfaces	4
II	Data Modeling Concepts ER model concepts: Notations for ER diagram, Extended ER diagram, Extended E-R model, U-R model design with constraints and keys. Weak entity set strong entity set, Relationship at higher degree	4
III	Relational model concepts: candidate keys, constraints, Relational Algebra operations, Extended relational algebra operations, Relational Calculus, Tuple and Domain relational calculus	4
IV	Database Design Functional dependencies, Normal forms, First, second and third normal forms, BCNF, Multi-valued dependencies and Fourth Normal form, Join Dependencies and Fifth Normal form	4
V	Introduction to SQL Basic Structure of SQL: Query, Set operators, SELECT, UNION, INSERT, UPDATE, and DELETE, Nested queries, Aggregate function, Null values, Priviled Relational, Modification of the Database, Joins, Views and triggers in SQL.	4
VI	Transaction, Query Processing Transaction and system concepts: transaction status, ACID properties of transactions, Transaction Management: concurrent execution, scheduling and Recovery, Serializability of schedules, Query Processing and Optimization: Measures of Query cost, Cost Evaluation of a query, Optimization: Transformation of relational algebra to physical execution plan.	4
VII	Concurrency & Control: Concurrency control Techniques: Two phase locking, multigrades for data recovery, Locking: Two phase locking, serializability control.	4
VIII	Database Security: Importance of data Privacy and PDS, Access Control: Database privileges, Access Control: Security for database Applications, Role of Database Administrator.	4

Programme/Class: Diploma in computer science	Year: Second	Semester: Third
Subject: Information Technology		
Course Code: B180301T	Course Title: Database Management System	
Course outcomes:		
After the completion of the course the students will be able to:		
<ol style="list-style-type: none"> 1. Understands the basic concepts of data base management systems. 2. Design E-R diagrams for real world applications. 3. Formulate relational algebraic expressions using relational data models and languages. 4. Apply normalization transaction properties and concurrency control to design database. 5. Analyze the security algorithms for database protection. 		
Credits: 4	Core Compulsory	
Max. Marks: 25+75	Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		
Unit	Topic	No. of Lectures
I	Introduction: Database System Concepts, File system vs. database system, Database system architecture, Data models and their types, Data base scheme and instances, Data independence, Database Languages and Interfaces.	7
II	Data Modeling Concepts ER model concepts: Notations for ER diagram, Extended E-R diagram, Extended E-R model, E-R model design issues, constraints, and keys: Weak entity set strong entity set, Relationships of higher degree.	8
III	Relational model concepts: code rules, constraints, Relational Algebra operations, Extended relational algebra operations, Relational Calculus, Tuple and Domain relational calculus.	8
IV	Database Design Functional dependencies, Normal forms, First, second, and third normal forms, BCNF, Multi-valued dependencies and Fourth Normal form, Join Dependencies and Fifth Normal form.	7
V	Introduction to SQL Basic Structure of SQL Query, Set operators, SELECT, UNION, INTERSECT, and EXCEPT, Nested queries, Aggregate function, Null values, Derived Relations, Modification of the Database, Joined relations and up-dates in SQL.	8
VI	Transaction, Query Processing Transaction and system concepts: transaction states, ACID properties of transactions, Transaction Management concurrent execution schedules and Recoverability, Serializability of schedules. Query Processing and Optimization: Measures of Query cost, Cost, Evaluation of expression. Optimization: Transformation of relational expression, Choice of evaluation plan.	8
VII	Concurrency Control: Concurrency Control Techniques: Two phase Locking Techniques for Concurrency Control; Time stamping in Concurrency control.	7
VIII	Database Security: Importance of data, Threats and risks, Users and database privileges, Access Control, Security for Internet Applications, Role of Database Administrator.	7

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Suggested Readings:

1. Henry F. Korth and Abraham Silberschatz, "Database System Concepts," Second Edition, McGraw Hill, 1991.
2. Atul Kahate, "Introduction to Database Management Systems," Pearson India, 2004.
3. Raghu Ramakrishnan and Johannes Gehrike, "Database Management Systems," Third McGraw Hill, Edition, 2003.
4. R.Elmasri,S.B.NavatheDatabaseSystemsModels,Languages,Designandapplication Programming, 6 Edition, Pearson Education,2013.
5. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.

This course can be opted as an elective by the students of following subjects:
B. Sc in Engineering and BCA

Suggested Continuous Evaluation Methods:

1. Assessment Type: Class Tests (Max. Marks 14)

Suggested Usage:

Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers , not names be written to avoid bias in marking; Display of model answer copies.

After Completion of Unit I and Unit II, a first class test of max. marks of 7 shall be conducted.

After Completion of Unit III and IV, a second class test of max. marks of 7 shall be conducted.

If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.

2. Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) /Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5)

Suggested Usage : Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be "End of the class quiz".

3. Assessment Type: Assignments (Max Marks: 4)

Suggested Usage: Some class assignments shall be given to students at the end of each Unit. Note making techniques be taught to students; Not just direct questions from notes, but application analysis and synthesis of that knowledge.

4. Assessment Type: Class Interaction (Max. marks: 2)

Course prerequisites: To study this course, a student must have had the subject Mathematics in class 12th and Problem solving using computers in first semester.

Suggested equivalent online courses:

Further Suggestions:

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Suggested Readings

- 1. Database Systems: Concepts and Design, 6th Edition, Abraham Silberschatz, Henry F. Korth, and S. K. Abraham, Wiley, 2006.
- 2. Fundamentals of Database Systems, 7th Edition, Ramez Elmasri and Shambhu Chandra, Pearson Education, 2003.
- 3. Database Systems: The Complete Book, 3rd Edition, Hector Garcia-Molina and Jeffrey D. Ullman, Morgan Kaufmann, 2002.
- 4. Database Systems: Introduction to Database Systems, 6th Edition, Abraham Silberschatz, Henry F. Korth, and S. K. Abraham, Wiley, 2006.
- 5. Database Systems: The Complete Book, 3rd Edition, Hector Garcia-Molina and Jeffrey D. Ullman, Morgan Kaufmann, 2002.

Software Lab based on Database Management Systems

Note: MS Access may be used

Lab Objectives

1. Create and modify tables and relationships in a database.
2. Design of Tables using fields, data types, creating Tables along with foreign key relationships, Access, Filter and Criteria queries.
3. Tables and Data operations (Insert, Select, Update, Delete).
4. Primary, foreign keys, relationships, All types of queries (SELECT, INSERT, UPDATE, DELETE).
5. Filtering data using criteria, criteria tables, criteria queries, criteria tables, criteria queries, criteria tables, criteria queries.
6. Importing data from other sources into the database.
7. Accessing data from other sources into the database.
8. Formatting data in tables and queries in the database.

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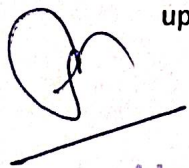
Programme/Class: Diploma in computer science	Year: Second	Semester: Third
Subject: Information Technology		
Course Code: B180302P	Course Title: Database Management Systems Lab	
Course outcomes:		
Ability to: <ol style="list-style-type: none"> 1. Understand, analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations. 2. Design and implement a database schema for a given problem. 3. Do connectivity of PHP and MySQL to develop applications. 		
Credits: 2	Max. Marks: 25+75	Min. Passing Marks:
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4		
Suggested Readings:		
<ol style="list-style-type: none"> 1. Paul DuBois, "MySQL Cookbook: Solutions for Database Developers and Administrators," Third Edition, O'Reilly Media, 2014. 2. Frank M. Kromann, "Beginning PHP and MySQL: From Novice to Professional," Fifth Edition, A press, 2018. 3. Joel Murach and Ray Harris, "Murach's PHP and MySQL," First Edition, Mike Murach & Associates, 2010. 4. Luke Welling, Laura Thomson, "PHP and MySQL Web Development," Fourth Edition, Addison-Wesley, 2008. 		

Software Lab based on Database Management Systems

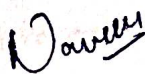
Note: PHP/MySQL may be used

List of Experiments

1. Creation of databases and execution of SQL queries.
2. Creation of Tables using MySQL: Data types, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables.
3. Practicing DML commands- Insert, Select, Update, Delete.
4. Practicing Queries using ANY, ALL, IN, EXISTS, NOT, EXISTS, UNION, INTERSECT, and CONSTRAINTS, etc.
5. Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.
6. Use of COMMIT, ROLLBACK and SAVEPOINT.
7. Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger.
8. To remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form.

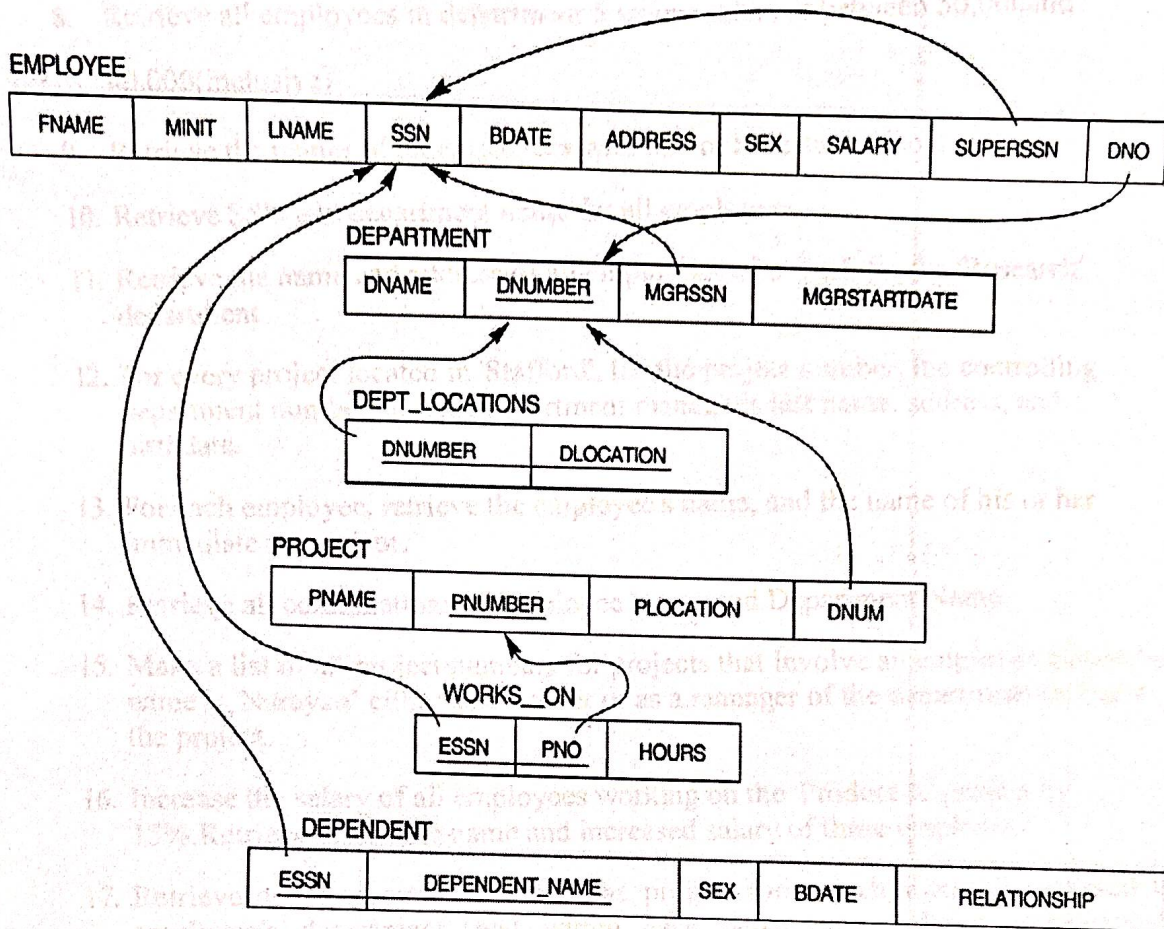


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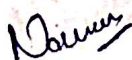
Relational Database Schema - COMPANY



Questions to be performed on above schema

1. Create tables with relevant foreign key constraints
2. Populate the tables with data
3. Perform the following queries on the database:
 1. Display all the details of all employees working in the company.
 2. Display ssn, l name, f name, address of employees who work in department no7.
 3. Retrieve the birthdate and address of the employee whose name is 'Franklin T. Wong'
 4. Retrieve the name and salary of every employee
 5. Retrieve all distinct salary values
 6. Retrieve all employee names whose address is in 'Bellaire'



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7. Retrieve all employees who were born during the 1950s
8. Retrieve all employees in department 5 whose salary is between 50,000 and 60,000 (inclusive)
9. Retrieve the names of all employees who do not have supervisors
10. Retrieve SSN and department name for all employees
11. Retrieve the name and address of all employees who work for the 'Research' department
12. For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birthdate.
13. For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.
14. Retrieve all combinations of Employee Name and Department Name
15. Make a list of all project numbers for projects that involve an employee whose last name is 'Narayan' either as a worker or as a manager of the department that controls the project.
16. Increase the salary of all employees working on the 'Product X' project by 15%. Retrieve employee name and increased salary of these employees.
17. Retrieve a list of employees and the project name each works in, ordered by the employee's department, and within each department ordered alphabetically by employee first name.
18. Select the names of employees whose salary does not match with salary of any employee in department 10.
19. Retrieve the name of each employee who has a dependent with the same first name and same sex as the employee.
20. Retrieve the employee numbers of all employees who work on project located in Bellaire, Houston, or Stafford.
21. Find the sum of the salaries of all employees, the maximum salary, the minimum salary, and the average salary. Display with proper headings.
22. Find the sum of the salaries and number of employees of all employees of the 'Marketing' department, as well as the maximum salary, the minimum salary, and the average salary in this department.
23. Select the names of employees whose salary is greater than the average salary of all employees in department 10.
24. For each department, retrieve the department number, the number of employees in the department, and their average salary.
25. For each project, retrieve the project number, the project name, and the number of employees who work on that project.


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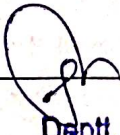
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26. Change the location and controlling department number for all projects having more than 5 employees to 'Bellaire' and 6 respectively.
27. For each department having more than 10 employees, retrieve the departmentno, no of employees drawing more than 40,000 as salary.
28. Insert a record in Project table which violates referential integrity constraint with respect to Department number. Now remove the violation by making necessary insertion in the Department table.
29. Delete all dependents of employee whose ssn is '123456789'.
30. Delete an employee from Employee table with ssn = '12345' (make sure that this employee has some dependents, is working on some project, is a manager of some department and is supervising some employees). Check and display the cascading effect on Dependent and Works on table. In Department table MGRSSN should be set to default value and in Employee table SUPERSSN should be set to NULL.
31. Perform a query using alter command to drop/add field and a constraint in Employee table.

Note: The instructors should design detailed experiments based on above suggested experiments.

Programme: Certificate	Year: Second	Semester: Third
Class: B.Sc.(IT)	Subject: Computer Science	
Course Code: B030301T	Course Title: Algebra & Mathematical Methods	
Course outcomes:		
CO1: Group theory is one of the building blocks of modern algebra. Objective of this course is to introduce students to basic concepts of Group, Ring theory and their properties.		
CO2: A student learning this course gets a concept of Group, Ring, Integral Domain and their properties. This course will lead the student to basic course in advanced mathematics and Algebra.		
CO3: The course gives emphasis to enhance students' knowledge of functions of two variables, Laplace Transforms, Fourier Series.		
CO4: On successful completion of the course students should have knowledge about higher different mathematical methods and will help him in going for higher studies and research.		
Credits: 6	Core Compulsory/ Elective	


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Max. Marks: 25+75

Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

**Part A
Algebra**

Unit	Topic	No. of Lectures
I	Introduction to Indian ancient Mathematics and Mathematicians should be included under Continuous Internal Evaluation (CIE). Equivalence relations and partitions, Congruence modulo n , Definition of a group with examples and simple properties, Subgroups, Generators of a group, Cyclic groups.	12
II	Permutation groups, Even and odd permutations, The alternating group, Cayley's theorem, Direct products, Coset decomposition, Lagrange's theorem and its consequences, Fermat and Euler theorems	11
III	Normal subgroups, Quotient groups, Homomorphism and isomorphism, Fundamental theorem of homomorphism, Theorems on isomorphism.	11
IV	Rings, Subrings, Integral domains and fields, Characteristic of a ring, Ideal and quotient rings, Ring homomorphism, Field of quotient of an integral domain.	11
	Part-B Mathematical Methods	7
V	Limit and Continuity of functions of two variables, Differentiation of function of two variables, Necessary and sufficient condition for differentiability of functions two variables, Schwarz's and Young theorem, Taylor's theorem for functions of two variables with examples, Maxima and minima for functions of two variables, Lagrange multiplier method. Jacobians.	12
VI	Existence theorems for Laplace transforms, Linearity of Laplace transform and their properties, Laplace transform of the derivatives and integrals of a function, Convolution theorem, inverse Laplace transforms, Solution of the differential equations using Laplace transforms.	11
VII	Fourier series, Fourier expansion of piecewise monotonic functions, Half and full range expansions, Fourier transforms (finite and infinite), Fourier integral.	11
VIII	Calculus of variations-Variational problems with fixed boundaries- Euler's equation for functionals containing first order derivative and one independent variable, Extremals, Functionals dependent on higher order derivatives, Functionals dependent on more than one independent variable, Variational problems in parametric form.	11

Suggested Readings(Part-A Algebra):

1. J.B. Fraleigh, A first course in Abstract Algebra, Addison-weley
2. I. N. Herstein, Topics in Algebra, John Wiley & Sons
3. Suggested digital platform: NPTEL/SWAYAM/MOOCs

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4. Course Books published in Hindi may be prescribed by the Universities.

This course can be opted as an elective by the students of following subjects: Engg. and Tech. (UG), B.Sc.(C.S.)

Suggested Continuous Evaluation Methods: Max. Marks: 25

S.No		Max Marks
1.	Class Tests	10
2.	Online Quizzes/ Objective Tests	5
3.	Presentation	5
4.	Assignment (Introduction to Indian ancient Mathematics and Mathematicians).	5

Course prerequisites: To study this course, a student must have subject Mathematics in class 12th

Suggested equivalent online courses:

Further Suggestions:

MINOR/ELECTIVE SUBJECT

(To be Choose from the List of Subjects Provided by the University)

Programme/Class: Diploma in computer science		Year: Second	Semester: Fourth
Subject: Information Technology			
Course Code: B180401T		Course Title: Web Technology	
Course outcomes: CO1 Implement interactive web page(s) using HTML, CSS and JavaScript. CO2 Design a responsive web site using HTML5 and CSS CO3 Build Dynamic web site using server side PHP Programming and Database connectivity. CO4 Describe and differentiate different Web Extensions and Web Services.			
Credits: 4		Core Compulsory	
Max. Marks: 25+75		Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0			
Unit	Topic	No. of Lectures	
I	Introduction to WWW: Protocols and programs, secure connections, application and development tools, the web browser, What is server, choices, setting up UNIX and Linux web servers, Logging users, dynamic IP, Web Design: Web site design principles, planning the site and navigation	7	
II	Introduction to HTML: The development process, HTML tags and simple HTML forms, web site structure, Introduction to XHTML: XML, Move to XHTML, Meta tags, Character entities, frames and frame sets, inside, browser	8	
III	Style sheets: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2.	7	
IV	Java script: Client-side scripting, What is Java script, How to develop Java script, simple Java script, variables, functions, conditions, loops and repetition, Advance script, Java script and objects, Java script own objects, the DOM and web browser environments, forms and Validations,	8	
V	DHTML: Combining HTML, CSS and Java script, events and buttons, controlling your browser, Ajax: Introduction, advantages & disadvantages, Purpose of it ,ajax based web application, alternatives of ajax	8	

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VI	XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application.XML, XSL and XSLT. Introduction to XSL, XML transformed simple example, XSL elements, transforming with XSLT	8
VII	PHP: Starting to script on server side, Arrays, function and forms, advance PHP	7
VIII	Databases: Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP my admin and database bugs.	7

Suggested Readings:

1. Jon Duckett "Beginning Web Programming" WROX.
2. Marty Hall and Larry Brown "Core Servlets and Java Server pages Vol. 1: Core Technologies", Pearson.
3. Dan Woods and Gautam Guliani, "Open Source for the Enterprise: Managing Risks, Reaping Rewards", O'Reilly, Shroff Publishers and Distributors, 2005.
4. Sebesta, "Programming world wide web" Pearson.
5. Dietel and Nieto, "Internet and World Wide Web – How to program", PHI/Pearson Education Asia.
6. Murach, "Murach's beginning JAVA JDK 5", SPD
7. Wang, "An Introduction to web Design and Programming", Thomson

This course can be opted as an elective by the students of following subjects:
B. Sc in Engineering and BCA

Suggested Continuous Evaluation Methods:

1. Assessment Type: Class Tests (Max. Marks 14)

Suggested Usage:

Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers, not names be written to avoid bias in marking; Display of model answer copies.

After Completion of Unit I and Unit II, a first class test of max. marks of 7 shall be conducted.

After Completion of Unit III and IV, a second class test of max. marks of 7 shall be conducted.

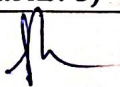
If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.

2. Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) / Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5)




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Suggested Usage : Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be "End of the class quiz".

3. Assessment Type: Assignments (Max Marks: 4)

Suggested Usage: Some class assignments shall be given to students at the end of each Unit. Note making techniques be taught to students; Not just direct questions from notes, but application analysis and synthesis of that knowledge.

4. Assessment Type: Class Interaction (Max. marks: 2)

Course prerequisites:

To study this course, a student must have had the subject DBMS and Data Structure is required.

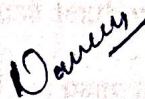
Suggested equivalent online courses:

1. https://onlinecourses.swayam2.ac.in/nou20_cs05/preview
2. <https://www.edx.org/learn/web-development>
3. <https://www.coursera.org/courses?query=web%20technologies>

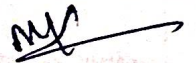
Further Suggestions:











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5. Create your class timetable using table tag.

6. Create your resume using HTML tags also experiment with colors, text, link, size and also other tags you studied.

Practical Set - 2 CSS


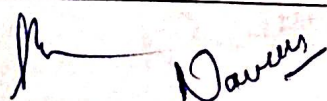
7. Design a web page of your home town with an attractive background color, text color, an image, link etc. (use Internal CSS).

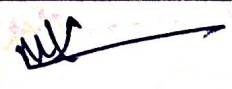
8. Use inline CSS to format your resume that you created.

9. Use External CSS to format your class timetable as you created.

10. Use Internal, but not, and inline CSS to format college web page that you created.

Programme/Class: Diploma in computer science	Year: Second	Semester: Fourth
Subject: Information Technology		
Course Code: B180402P	Course Title: Web Technology Lab	
Course outcomes:		
CO 1: Understand and evaluate web application architecture, technologies and frameworks CO 2: Apply the knowledge of web technology in developing web applications CO 3: Evaluate different solutions in field of web application development CO 4: implement small to large scale project to provide live solution in web application development fields		
Credits: 3	Max. Marks: 25+75	Min. Passing Marks:
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-6		
Practical List on Web Technology		
Practical Set -1 HTML		
1 Design web pages for your college containing a description of the courses, departments, faculties, library etc, use href, list tags.		
2 Create your class timetable using table tag.		
3 Create user Student feedback form (use textbox, text area , checkbox, radio button, select box etc.)		
4 Create a web page using frame. Divide the page into two parts with Navigation links on left hand side of page (width=20%) and content page on right hand side of page (width = 80%). On clicking the navigation Links corresponding content must be shown on the right hand side.		
5 Write html code to develop a webpage having two frames that divide the webpage into two equal rows and then divide the row into equal columns fill each frame with a different background color.		
6 Create your resume using HTML tags also experiment with colors, text, link, size and also other tags you studied.		
Practical Set -2 CSS		
7 Design a web page of your home town with an attractive background color, text color, an Image, font etc. (use internal CSS).		
8 Use Inline CSS to format your resume that you created.		
9 Use External CSS to format your class timetable as you created.		
10 Use External, Internal, and Inline CSS to format college web page that you created.		



Practical Set -3 JavaScript

- 11 Develop a JavaScript to display today's date.
- 12 Develop simple calculator for addition, subtraction, multiplication and division operation using JavaScript
- 13 Create HTML Page with JavaScript which takes Integer number as input and tells whether the number is ODD or EVEN.
- 14 Create HTML Page that contains form with fields Name, Email, Mobile No, Gender, Favorite Color and a button now write a JavaScript code to combine and display the information in textbox when the button is clicked.
- 15 implement Validation in above Feedback Form.
- 16 Use regular expression for validation in Feedback Form.
- 17 Using ajax retrieve data from a TXT file and display it.

Practical Set -4 XML

- 18 Create XML file to store student information like Enrollment Number, Name, Mobile Number, Email Id.
- 19 Create DTD for above XML File.
- 20 Create XML Schema for above (Practical No. 18)
- 21 Create XSL file to convert above (refer Practical No. 17) XML file into XHTML file.

Practical Set -5 PHP

- 22 Write a php program to display today's date in dd-mm-yyyy format.
- 23 Write a php program to check if number is prime or not.
- 24 Write a php program to print first 10 Fibonacci Numbers.
- 25 Create HTML page that contain textbox, submit / reset button. Write php program to display this information and also store into text file.
- 26 Write a php script to read data from txt file and display it in html table (the file contains info in format Name: Password: Email)
- 27 Write a PHP Script for login authentication. Design an html form which takes username and password from user and validate against stored username and password in

file.

28 Write PHP Script for storing and retrieving user information from MySQL table.

- (a) Design A HTML page which takes Name, Address, Email and Mobile No. From user (register.php)
- (b) Store this data in Mysql database / text file.
- (c) Next page display all user in html table using PHP (display.php)

29 Write a PHP script for user authentication using PHP-MYSQL. Use session for storing username.

30 Using ajax fetch information from a database with AJAX.

Practical Set -6 Website (Optional)

Students have to create a whole website which contains above topics in Website

Programme/Class: Diploma		Year: Second	Semester: Fourth
Subject: Computer Science			
Course Code: B030401T		Course Title: Differential Equation & Mechanic	
Course outcomes:			
<p>CO1: The objective of this course is to familiarize the students with various methods of solving differential equations, partial differential equations of first order and second order and to have qualitative applications.</p> <p>CO2: A student doing this course is able to solve differential equations and is able to model problems in nature using ordinary differential equations. After completing this course, a student will be able to take more courses on wave equation, heat equation, diffusion equation, gas dynamics, non linear evolution equation etc. These entire courses are important in engineering and industrial applications for solving boundary value problem.</p> <p>CO3: The object of the paper is to give students knowledge of basic mechanics such as simple harmonic motion, motion under other laws and forces.</p> <p>CO4: The student, after completing the course can go for higher problems in mechanic such as hydro dynamics, this will be helpful in getting employment in industry.</p>			
Credits: 6		Core Compulsory	
Max. Marks: 25+75		Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 6-0-0			
Part- A Differential Equations			
Unit	Topic	No. of Lectures	
I	Second order linear differential equations with variable coefficients: Use of a known solution to find another, normal form, method of undetermined coefficient, variation of parameters, Series solutions of differential equations, Power series method.	10	12
II	Bessel, Legendre and Hypergeometric functions and their properties, recurrence and generating relations.	5	11
III	Origin of first order partial differential equations. Partial differential equations of the first order and degree one, Lagrange's solution, Partial differential equation of first order and degree greater than one. Charpit's method of solution, Surfaces	5	11

	Orthogonal to the given system of surfaces.	
IV	Origin of second order PDE, Solution of partial differential equations of the second and higher order with constant coefficients, Classification of linear partial differential equations of second order, Solution of second order partial differential equations with variable coefficients, Monge's method of solution.	11

Part- B Mechanics

Unit	Topic	No. of Lectures
V	Frame of reference, work energy principle, Forces in three dimensions, Poinot's central axis, Wrenches, Null lines and planes.	12
VI	Virtual work, Stable and Unstable equilibrium, Catenary, Catenary of uniform strength.	11
VII	Velocities and accelerations along radial and transverse directions, and along tangential and normal directions, Simple Harmonic motion, Motion under other law of forces. Elastic strings, Motion in resisting medium, Constrained motion, Motion on smooth and rough plane curves.	11
VIII	Motion of particles of varying mass, Rocket motion, Central orbit, Kepler's laws of motion, Motion of particle in three dimensions, Rotating frame of reference, Rotating Earth, Acceleration in terms of different coordinates systems.	11

Suggested Readings (Part-A Differential Equations):

1. G.F. Simmons, Differential Equations with Application and Historical Notes, Tata –McGrawHill
2. B. Rai, D.P. Choudhary & H. J. Freedman, A Course of Ordinary Differential Equations, Narosa
3. Ian N. Snedden, Elements of Partial Differential Equations, Dover Publication
4. L.E. Elsgolts, Differential Equation and Calculus of variations, University Press of the Pacific.
5. Suggested digital platform:NPTEL/SWAYAM/MOOCs
6. Course Books published in Hindi may be prescribed by the Universities.

Suggested Readings (Part-B Mechanics):

1. R.C. Hibbeler, Engineering Mechanics-Statics, Prentics Hall Publishers
2. R.C. Hibbeler, Engineering Mechanics-Dynamics, Prentics Hall Publishers
3. A. Nelson, Engineering Mechanics Statics and Dynamics, Tata McGraw Hill
4. J.L. Synge & B.A. Griffith, Principles of Mechanics, Tata McGraw Hill
5. Suggested digital platform:NPTEL/SWAYAM/MOOCs
6. Course Books published in Hindi may be prescribed by the Universities.

Suggested Continuous Evaluation Methods: Max. Marks: 25

SN	Assessment Type	Max. Marks
1	Class Tests	10
2	Online Quizzes/ Objective Tests	5
3	Presentation	5
4	Assignment	5

Course prerequisites: To study this course, a student must have subject Mathematics in class 12th

Suggested equivalent online courses:

Further Suggestions:

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Programme/Class: Bachelor of Science		Year: Third	Semester: Fifth
Subject: Information Technology			
Course Code: B180501T		Course Title: Analysis of Algorithm and Data Structures	
Course outcomes:			
<p>CO 1: Understand that various problem-solving categories exist such as; iterative technique, divide and conquer, dynamic programming, greedy algorithms, and understand various searching and sorting algorithms</p> <p>CO 2: Employ a deep knowledge of various data structures when constructing a program.</p> <p>CO 3: Design and construct simple object-oriented software with an appreciation for data abstraction and information hiding.</p> <p>CO 4: Effectively use software development tools including libraries, compilers, editors, linkers and debuggers to write and troubleshoot programs.</p>			
Credits: 4		Core Compulsory	
Max. Marks: 25+75		Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0			
Unit	Topic	No. of Lectures	
I	Introduction: Basic Design and Analysis techniques of Algorithms, Correctness of Algorithm, Algorithm Design Techniques: Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms.	7	
II	Sorting Techniques: Elementary sorting techniques-Bubble Sort, Insertion Sort, Merge Sort, Advanced Sorting techniques-Heap Sort, Quick Sort, Sorting in Linear Time-Bucket Sort, Radix Sort and Count Sort	8	
III	Searching Techniques and Complexity Analysis: Linear and Binary search, Medians & Order Statistics.	7	
IV	Arrays Arrays: Single and Multi-dimensional Arrays, Sparse Matrices;	7	
V	Stacks and Queues: Implementing stack using array and linked list, Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Array and Linked representation of Queue, De-queue, Priority Queues	8	
VI	Linked Lists: Singly, Doubly and Circular Lists, representation of Stack and Queue as Linked Lists.	8	
VII	Recursion: Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion;	7	
VIII	Trees: Introduction to Tree as a data structure; Binary Trees, Binary Search Tree, (Creation, and Traversals of Binary Search	8	

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Trees)

Suggested Readings:

1. Cormen T.H., Leiserson Charles E., Rivest Ronald L., Stein Clifford, Introduction to Algorithms, PHI Learning Pvt. Ltd., 2009, 3rd Edition.
2. Basse Sara & A.V. Gelder, Computer Algorithm: Introduction to Design and Analysis Pearson, 2000, 3rd Edition.
3. Drozdek Adam, "Data Structures and algorithm in C++", Cengage Learning, 2012, Third Edition.
4. Tenenbaum Aaron M., Augenstein Moshe J., Langsam Yedidyah, "Data Structures Using C and C++", PHI, 2009, Second edition.
5. Kruse Robert L., "Data Structures and Program Design in C++", Pearson.
6. **Suggestive digital platforms weblinks or online course-**
<https://www.oercommons.org/authoring/14873-data-structure/view>
<https://www.oercommons.org/courses/data-structure-and-algorithms>
[https://onlinecourses.swayam2.ac.in/cec19_cs04/preview\(online course\)](https://onlinecourses.swayam2.ac.in/cec19_cs04/preview(online course))

This course can be opted as an elective by the students of following subjects:

B. Sc in Mathematics, Physics, Electronics, Statistics, Engineering and BCA

Suggested Continuous Evaluation Methods:

1. Assessment Type: Class Tests (Max. Marks 14)

Suggested Usage:

Include all types of questions-essays, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers, not names be written to avoid bias in marking; Display of model answer copies.

After Completion of Unit I and Unit II, a first-class test of max. marks of 7 shall be conducted.

After Completion of Unit III and IV, a second-class test of max. marks of 7 shall be conducted.

If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.

2. Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) /Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5)

Suggested Usage: Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be "End of the class quiz".

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3. Assessment Type: Assignments (Max Marks: 4)

Suggested Usage: Some class assignments shall be given to students at the end of each Unit. Note making techniques be taught to students; Not just direct questions from notes, but application analysis and synthesis of that knowledge.

4. Assessment Type: Class Interaction (Max. marks: 2)

Course prerequisites: To study this course, a student must have had the subject Mathematics in class 12th and Computer Fundamental, and C++ and Object-Oriented Programming in certificate

Suggested equivalent online courses:

1 <https://nptel.ac.in/courses/106/102/106102064/>

Further Suggestions:

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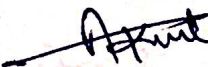
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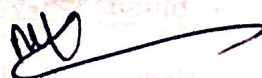
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Programme/Class: Bachelor of Science	Year: Third	Semester: Fifth
Subject: Information Technology		
Course Code: B180502T	Course Title: E-Commerce	
Course outcomes:		
<ol style="list-style-type: none"> 1. Understand the basic concepts and technologies used in the field of E-Commerce 2. Understand the processes of developing and implementing information systems 3. Be aware of the ethical, social, and security issues of information systems and 4. To apply their computer science skills to the conduct of e-commerce with some understanding of the legal, security, commercial, economic, marketing and infrastructure issues involved 		
Credits: 4	Core Compulsory	
Max. Marks: 25+75	Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		
Unit	Topic	No. of Lectures
I	Unit 1: Introduction of E-commerce: Introduction, E-commerce or Electronic Commerce- An Overview, History of Electronic Commerce, Electronic Commerce – Cutting edge, Electronic Commerce Framework, Advantages and Disadvantage of E-commerce, Roadmap of E-commerce in India	7
II	Unit 2: Network and E-commerce Infrastructure: Introduction, Network Infrastructure: An Overview, The Internet Hierarchy, Basic Blocks of e-commerce, Networks layers & TCP/IP protocols, The Advantages of Internet, World Wide Web, E-commerce Infrastructure: Introduction, E-commerce Infrastructure-An Overview, Hardware, Server Operating System, Software, Network Website	8
III	Unit 3: Managing the e-Enterprise: Introduction, e-Enterprise, Managing the e-Enterprise, E-business Enterprise, Comparison between Conventional Design and E-organization, Organization of Business in an e-Enterprise, Process Models: Introduction, Business Models, E-business Models Based on the Relationship of Transaction Parties, e-commerce Sales Life Cycle (ESLC) Model	7
IV	Unit 4: Management of Risk: Introduction, Introduction, An Overview of Risks Associated with Internet Transactions, Internet Associated Risks, Intranet Associated Risks, risks associated with Business Transaction Data Transferred between Trading Partners, Risk Management, Disaster Recovery Plans, Risk Management	8


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	Paradigm	
V	Unit 5: E-Commerce Systems: Electronic Payment Systems, Electronic Cash, Smart Cards and Electronic Payment Systems, Credit Card Based Electronic Payment Systems, Risks and Electronic Payment Systems, Electronic Data Interchange (EDI): The Meaning of EDI, History of EDI, EDI Working Concept, Implementation difficulties of EDI, Financial EDI, EDI and Internet	7
VI	Unit 6: E-Marketing: The scope of E-Marketing, Internet Marketing Techniques, Website Design Issues: Factors that Make People Return to Your Site, Strategies for Website Development, Consumer Oriented Business: Consumer Market, One-to-One Marketing, Consumer Demographics, Maintaining Loyalty, Gaining Acceptance, Online Catalogue, the Pilot Catalogue, A Unique Search Engine	8
VII	Unit 7: Management Challenges and Opportunities: New Business Model, Required Changes in Business Processes, Channel Conflicts, Legal and Regulatory Environment for e-commerce, Security and Privacy, Managerial Opportunities	7
VIII	Unit 8: Future Directions: Software Agents, Technology Behind Software Agents, Types of Software Agents, Characteristics and Properties of Software Agents, Frame-work for Software Agent-based e-commerce, m-commerce, m-commerce Architecture, Areas of Potential Growth and Future for m-commerce	8

Suggested Readings:

1. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.
2. Pete Lohsin, John Vacca "Electronic Commerce", New Age International
3. Goel, Ritendra "E-commerce", New Age International
4. Laudon, "E-Commerce: Business, Technology, Society", Pearson Education
5. Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH
6. Turban, "Electronic Commerce 2004: A Managerial Perspective", Pearson Education

This course can be opted as an elective by the students of following subjects:

Open for All

Suggested Continuous Evaluation Methods:

1. Assessment Type: Class Tests (Max. Marks 14)

Suggested Usage:

Include all types of questions-essays, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions

and proper sampling of content; Marking Criteria made known to students; Teacher should

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provide written feedback selectively and discuss answers in the class; Only Role/Code numbers, not names be written to avoid bias in marking; Display of model answer copies.

After Completion of Unit I and Unit II, a first-class test of max. marks of 7 shall be conducted.

After Completion of Unit III and IV, a second-class test of max. marks of 7 shall be conducted.

If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.

2. **Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) / Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5)**

Suggested Usage: Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be "End of the class quiz".

3. **Assessment Type: Assignments (Max Marks: 4)**

Suggested Usage: Some class assignments shall be given to students at the end of each Unit. Note making techniques be taught to students; Not just direct questions from notes, but application analysis and synthesis of that knowledge.

4. **Assessment Type: Class Interaction (Max. marks: 2)**

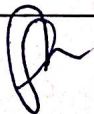
Course prerequisites:

None

Suggested equivalent online courses:

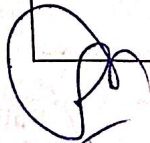
Further Suggestions:

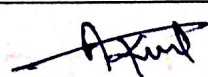
List of Programs in Soft Computing with Python:

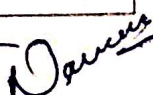


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Programme/Class: Bachelor of Science	Year: Third	Semester: Fifth
Subject: Information Technology		
Course Code: B180503P	Course Title: Lab on Algorithm and Data Structures with Java	
Course outcomes:		
<p>CO 1: Optimize the solution with respect to time complexity & memory usage</p> <p>CO 2: Assess how the choice of data structures and algorithm design methods impacts the performance of programs.</p> <p>CO 3: Choose the appropriate data structure and algorithm design method for a specified application.</p> <p>CO 4: Solve problems using data structures such as linear lists, stacks, queues, binary trees, binary search trees and writing programs for these solutions</p>		
Credits: 2	Max. Marks: 25+75	Min. Passing Marks:
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4		
Practical List of on Analysis of Algorithms and Data Structures with Java:		
<ol style="list-style-type: none"> 1. Write a program that uses functions to perform the following: <ol style="list-style-type: none"> a) Create a singly linked list of integers. b) Delete a given integer from the above linked list. c) Display the contents of the above list after deletion. 2. Write a program that uses functions to perform the following: <ol style="list-style-type: none"> a) Create a doubly linked list of integers. b) Delete a given integer from the above doubly linked list. c) Display the contents of the above list after deletion. 3. Write a program that uses stack operations to convert a given infix expression into its postfix Equivalent, implement the stack using an array. 4. Write program to implement a double ended queue using <ol style="list-style-type: none"> i) array and ii) doubly linked list respectively. 5. Write a program that uses functions to perform the following: <ol style="list-style-type: none"> a) Create a binary search tree of characters. b) Traverse the above Binary search tree recursively in post-order. 6. Write a program that uses functions to perform the following: <ol style="list-style-type: none"> a) Create a binary search tree of integers. b) Traverse the above Binary search tree non recursively in In-order. 		







7. Write program for implementing the following sorting methods to arrange a list of integers in ascending order:
 - a) Insertion sort
 - b) Merge sort
 - c)
8. Write program for implementing the following sorting methods to arrange a list of integers in ascending order:
 - a) Quick sort
 - b) Selection sort
9. Write program to implement Insertion Sort (The program should report the number of comparisons)
10. Write program implement Merge Sort (The program should report the number of comparisons)
11. Write program implement Heap Sort (The program should report the number of comparisons)
12. Write program implement Randomized Quick sort (The program should report the number of comparisons)
13. Write program for creation and traversal of Binary Search Tree.

Programme/Class: B.SC.(IT)	Year: Third	Semester: Fifth
Subject: Computer Science		
Course Code: B030501T	Course Title: Group and Ring Theory & Linear Algebra	
Course outcomes: CO1: Linear algebra is a basic course in almost all branches of science. The objective of this course is to introduce a student to the basics of linear algebra and some of its applications. CO2: Students will be able to know the concepts of group, ring and other related properties which will prepare the students to take up further applications in the relevant fields. CO3: The student will use this knowledge in computer science, finance mathematics, industrial mathematics and bio mathematics. After completion of this course students appreciate its interdisciplinary nature.		
Credits: 5	Core Compulsory / Elective	
Max. Marks: 25+75	Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 5-0-0		
PART-A Group and Ring Theory		
Unit	Topics	No. of Lectures

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I	Introduction to Indian ancient Mathematics and Mathematicians should be included under Continuous Internal Evaluation (CIE). Automorphism, inner automorphism, Automorphism groups, Automorphism groups of finite and infinite cyclic groups, Characteristic subgroups, Commutator subgroup and its properties; Applications of factor groups to automorphism groups.	10
II	Conjugacy classes, The class equation, p -groups, The Sylow theorems and consequences, Applications of Sylow theorems; Finite simple groups, Nonsimplicity tests; Generalized Cayley's theorem, Index theorem, Embedding theorem and applications.	10
III	Polynomial rings over commutative rings, Division algorithm and consequences, Principal ideal domains, Factorization of polynomials, Reducibility tests, Irreducibility tests, Eisenstein criterion, Unique factorization in $Z[x]$.	9
IV	Divisibility in integral domains, Irreducibles, Primes, Unique factorization domains, Euclidean domains.	9

PART-B Linear Algebra

Unit	Topics	No. of Lectures
V	Vector spaces, Subspaces, Linear independence and dependence of vectors, Basis and Dimension, Quotient space.	10
VI	Linear transformations, The Algebra of linear transformations, rank nullity theorem, their representation as matrices.	9
VII	Linear functionals, Dual space, Characteristic values, Cayley Hamilton Theorem	9
VIII	Inner product spaces and norms, Cauchy-Schwarz inequality, Orthogonal vectors, Orthonormal sets and bases, Bessel's inequality for finite dimensional spaces, Gram-Schmidt orthogonalization process, Bilinear and Quadratic forms.	9


Suggested Readings:

1. Topics in Algebra by I. N. Herstein.
2. Linear Algebra by K. Hoffman and R. Kunze.
3. Suggested digital platform: NPTEL/SWAYAM/MOOCs
4. Course Books published in Hindi may be prescribed by the Universities.

This course can be opted as an elective by the students of following subjects: Engg. and Tech. (UG), BCA, B.Sc.(C.S.)

Suggested Continuous Evaluation Methods: Max. Marks: 25

SN	Assessment Type	Max. Marks
1	Class Tests	10
2	Online Quizzes/ Objective Tests	5



3	Representation	5
4	Assignment (Introduction to Indian ancient Mathematics and Mathematicians)	5

Course prerequisites: To study this course, a student must have Diploma in Mathematics

Suggested equivalent online courses:

Further Suggestions:

PART-B Linear Algebra		
Unit	Topics	No. of Lectures
V	Vector spaces, Subspaces, Linear independence and dependence of vectors, Basis and Dimension, Quotient space.	10
VI	Linear transformations, The Algebra of linear transformations, rank nullity theorem, their representation as matrices.	9
VII	Linear functionals, Dual space, Characteristic values, Cayley Hamilton Theorem	9
VIII	Inner product spaces and norms, Cauchy-Schwarz inequality, Orthogonal vectors, Orthonormal sets and bases, Bessel's inequality for finite dimensional spaces, Gram-Schmidt orthogonalization process, Bilinear and Quadratic forms.	9

Suggested Readings:

5. Topics in Algebra by I. N. Herstein.
6. Linear Algebra by K. Hoffman and R. Kunze.
7. Suggested digital platform: NPTEL/SWAYAM/MOOCs
8. Course Books published in Hindi may be prescribed by the Universities.

This course can be opted as an elective by the students of following subjects: Engg. and Tech. (UG), BCA, B.Sc.(C.S.)

Suggested Continuous Evaluation Methods: Max. Marks: 25

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SN	Assessment Type	Max. Marks
1	Class Tests	10
2	Online Quizzes/ Objective Tests	5
3	Presentation	5
4	Assignment (Introduction to Indian ancient Mathematics and Mathematicians)	5

Course prerequisites: To study this course, a student must have Diploma in Mathematics

Suggested equivalent online courses:

Further Suggestions:

Mathematics, Focus on Computation and Inverse Functions, Mathematical Induction, The well ordering principle, Recursion, Cardinality, Structural Induction, Recursive algorithms, Foundations of Logic, Propositional Logic, Logical Consequences and Truth Tables, Logic Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

IV Counting and Relations: Basics of counting, Permutation, Recursion and Combinations, Binomial coefficients, Recurrence relations, Modeling with recurrence relations with examples of Fibonacci numbers and the Tower of Hanoi problem, Divide and Conquer relations with examples (no theorems), Definite and types of relations, Representing relations using matrices and digraphs, Partial Orderings, Hasse diagrams, Minimal and maximal elements, Lattices.

Programme/Class: Bachelor of Science	Year: Third	Semester: Fifth
Subject: Computer Science		
Course Code: B030501T	Course Title: GRAPH THEORY AND DISCRETE MATHEMATICS	
Course outcomes: CO1: To inquire and understand wide range of concepts in mathematics. CO1: To understand basic properties of Graphs as discrete structures and able to solve in real life problems. CO3: The student will use this knowledge in computer science, finance mathematics, industrial mathematics and bio mathematics. After completion of this course students appreciate its interdisciplinary nature.		
Credits: 5	Core Compulsory / Elective	
Max. Marks: 25+75	Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 5-0-0		
PART-A Group and Ring Theory		

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PART-A
Group and Ring Theory
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Unit	Topics	No. of Lectures
I	Introduction: Application of Graphs, finite and Infinite Graphs, Incidence and Degree, Isolated Vertex, Pendant Vertex and Null Graph. Paths and Circuits : Isomorphism, subgraphs, A Puzzle with multicolored cubes, Walks, Paths and Circuits, Connected Graphs, Disconnected Graphs, and components, Euler Graphs, Operation on Graphs, Hamiltonian Paths and Circuits, the Traveling Salesman Problem.	10
II	Trees and fundamental circuits : Trees, Some Properties of Trees, Pendant Vertices in a Tree, Distance and Centers in a Tree, Rooted and Binary Trees, Spanning Trees, Fundamental Circuits, Finding all spanning trees of a graph, Spanning Trees in a Weighted Graph.	10
III	Set Theory and Logic: Fundamentals of Set theory, Set Operations and the Laws of Set Theory, Counting and Venn Diagrams, Cartesian Products and Relations, Functions—One-to-One, Onto Functions, Function Composition and Inverse Functions. Mathematical Induction, The well ordering principle, Recursive Definitions, Structural Induction, Recursive algorithms. Fundamentals of Logic, Propositional Logic, Logical Connectives and Truth Tables, Logic Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs. Proof Methods and strategy.	15
IV	Counting and Relations: Basics of counting, Pigeonhole Principle, Permutation and Combinations, Binomial coefficients. Recurrence relations, Modeling with recurrence relations with examples of Fibonacci numbers and the tower of Hanoi problem. Divide and Conquer relations with examples (no theorems). Definition and types of relations, Representing relations using matrices and digraphs, Partial Orderings, Hasse diagrams, Maximal and Minimal elements, Lattices.	15

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Suggested Readings:

1. Narsingh Deo. Graph theory with Applications to Engineering and Computer Science , 1974.
2. L.S. Srinath. Linear Programming . (East –West) , New Delhi .First Edition. Suggested digital platform:NPTEL/SWAYAM/MOOCs
3. Course Books published in Hindi may be prescribed by the Universities.

This course can be opted as an elective by the students of following subjects: Engg. and Tech. (UG), BCA, B.Sc.(C.S.)

Suggested Continuous Evaluation Methods: Max. Marks: 25

SN	Assessment Type	Max. Marks
1	Class Tests	10
2	Online Quizzes/ Objective Tests	5
3	Presentation	5
4	Assignment (Introduction to Indian ancient Mathematics and Mathematicians)	5

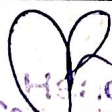
Course prerequisites: To study this course, a student must have Diploma in Mathematics

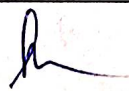


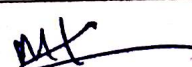
Suggested equivalent online courses:

Further Suggestions:

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Programme/Class: Bachelor of Science	Year: Third	Semester: Six
Subject: Information Technology		
Course Code: B180601T	Course Title: Data Communication and Computer Network	
Course outcomes: After the completion of the course the students will be able: <ol style="list-style-type: none"> 1. To develop understanding of computer networks and communication basics. 2. To understand design issues and services at different layers of reference models. 3. To learn various error detection/correction techniques, routing protocols, congestion control algorithms, and connection establishment/release. 4. To describe and analyze related technical, administrative, and social aspects of networking. 		
Credits: 4	Core Compulsory	
Max. Marks: 25+75	Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		
Unit	Topic	No. of Lectures
I	Introduction to Signals Data and Information, Data communication, Characteristics of data communication, Components of data communication, Data Representation, Data Flow, Simplex, Half Duplex, Full Duplex, Analog and Digital Signals, Periodic and Aperiodic signals, Time and Frequency Domain, Composite Signals	7
II	Basic concepts of Networks: Components of data communication, standards and organizations, Network Classification, Network Topologies; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.	8
III	Physical Layer: Cabling, Network Interface Card, Transmission Media Devices- Repeater, Hub, Bridge, Switch, Router, Gateway.	7
IV	Data Link Layer Designing issues, Framing and Data Link Control, Error detection schemes (parity, checksums, CRCs), Error correction schemes (Hamming codes, binary convolution codes), Data link layer protocols (Simplex, Stop & Wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ, Sliding Window), MAC sublayer (Ethernet, ALOHA, CSMA family, Contention-free access/Token Ring).	8
V	Network Layer Design issues, Switching, Routing algorithms (Shortest path, Link state, Flooding, Broadcast, Multicast), Packet Scheduling, Internetworking, Internet Protocol (IPv4, IPv6), IP addressing, Internet Control Protocols (IMCP, ARP, DHCP), Mobile IP.	8


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VI	Transport Layer Transport layer services, Connection establishment and teardown, TCP, UDP, Congestion Control, Quality of Service, Domain Name System, World Wide Web.	8
VII	Application Layer: Application layer protocols and services – Domain name system, HTTP, WWW, telnet, FTP, SMTP	7
VIII	Network Security : Common Terms, Firewalls, Virtual Private Networks	7

Suggested Readings:

1. Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks," Fifth Edition, Pearson, 2014.
2. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson, 2013.
3. Behrouz A. Forouzan, "Data Communications and Networking," Fourth Edition, McGraw-Hill Higher Education, 2007

This course can be opted as an elective by the students of following subjects:
B. Sc in Engineering and BCA

Suggested Continuous Evaluation Methods:

5. Assessment Type: Class Tests (Max. Marks 14)

Suggested Usage:

Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers, not names be written to avoid bias in marking; Display of model answer copies.

After Completion of Unit I and Unit II, a first-class test of max. marks of 7 shall be conducted.

After Completion of Unit III and IV, a second-class test of max. marks of 7 shall be conducted.

If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.

6. Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) /Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5)

Suggested Usage: Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be "End of the class quiz".

7. Assessment Type: Assignments (Max Marks: 4)

Suggested Usage: Some class assignments shall be given to students at the end of each Unit. Note making techniques be taught to students; Not just direct questions from notes,

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but application analysis and synthesis of that knowledge.

8. Assessment Type: Class Interaction (Max. marks: 2)

Course prerequisites: To study this course, a student must have had the subject Mathematics in class 12th. In addition, the basic knowledge of DBMS, Operating System, Analysis of Algorithm and Data Structure is required.

Suggested equivalent online courses:

Further Suggestions:

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Sl. No.	Topic	No. of Lectures
I	Questions: Introduction to Information Systems, Type of Information system, Development of information system, CIA model of Information Characteristics, Introduction to Information Security, Need of information Security, Cyber Security, Business need, Ethical and Professional Issues of security.	2
II	Information Security Model, Components of an Information security, Aspect of information security, Security attacks (Active and Passive Attacks), Security mechanism and Security Services (A-800)	2
III	Information Security Techniques: Introduction to Cryptology, Terminology, cryptanalysis, Similarity of signatures, Substitution Cipher and Transposition Cipher, Single XOR, One-way red,	2
IV	Cryptographic Protocol-I: Encrypted and Authenticated Protocol, One-Way Hash Functions.	2
V	Cryptographic Protocol-II: Public key cryptography, Digital Signature, Digital Watermarking, Authentication, Encryptions and U, pos	2
VI	Security Policies: Why Policies should be developed, Why Policies should Security policies, Policy Issues, Policy Implementation, Simple Security Policies	2

Programme/Class: Bachelor of Science	Year: Third	Semester: Six
Subject: Information Technology		
Course Code: B180602T	Course Title: Information Security & Cyber Laws	
Course outcomes: After the completion of the course the students will be able to: <ol style="list-style-type: none"> 1. Understand types of information Systems, cyber threats, and national/international cyber security standards. 2. Do mathematical modeling and development of security techniques and information system. 3. Develop understanding of legal issues related to cyber security. 4. Apply ethical principles/responsibilities in cyber practices. 		
Credits: 4	Core Compulsory	
Max. Marks: 25+75	Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		
Unit	Topic	No. of Lectures
I	Introduction: Introduction to Information System, Type of information system, Development of information system, CIA model of Information Characteristics, Introduction to Information Security, Need of Information Security, Cyber Security, Business need, Ethical and Professional issues of security.	7
II	Information Security Model, Component of an Information security, Aspect of information security, Security attacks (Active and Passive Attacks), Security mechanism and Security Services (X.800).	8
III	Information Security Techniques, Introduction to Cryptography: Terminology, cryptanalysis, Security of algorithms, Substitution Cipher and Transposition Cipher, Single XOR , One-way Pad,	7
IV	Cryptographic Protocols-I: Arbitrated and Adjudicated Protocol, One- Way Hash function,	8
V	Cryptographic Protocols-II: Public key cryptography, Digital Signature, Digital Watermarking Technique: Characteristics and Types.	7
VI	Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate policies- Sample Security Policies.	8

VII	Cyber Laws I: Information Security Standards, IT act 2000 Provisions, Introduction to digital laws,	7
VIII	Cyber Laws II: cyber laws, intellectual property rights, copyright laws, patent laws, software license.	8

Suggested Readings:

1. Michael E. Whitman and Herbert J. Mattord, "Principles of Information Security," Sixth Edition, Cengage Learning, 2017.
2. Douglas J. Landoll, "Information Security Policies, Procedure, and Standards: A Practitioner's Reference," CRC Press, 2016.
3. Harold F. Tipton, and Micki Krause, "Hand book of information security management," Sixth Edition, Archtech Publication, 2007.
4. William Stallings, "Cryptography and Network Security: Principles and Practice," Sixth Edition, Pearson, 2014.

This course can be opted as an elective by the students of following subjects:

B. Sc in Electronics, Physics, mathematics, Engineering, B.Sc. Vocational, BCA and MCA

Suggested Continuous Evaluation Methods:

1. Assessment Type: Class Tests (Max. Marks 14)

Suggested Usage:

Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers, not names be written to avoid bias in marking; Display of model answer copies.

After Completion of Unit I and Unit II, a first-class test of max. marks of 7 shall be conducted.

After Completion of Unit III and IV, a second-class test of max. marks of 7 shall be conducted.

If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.

2. Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) / Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5)

Suggested Usage: Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be "End of the class quiz".

3. Assessment Type: Assignments (Max Marks: 4)

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Suggested Usage: Some class assignments shall be given to students at the end of each Unit. Note making techniques be taught to students; Not just direct questions from notes, but application analysis and synthesis of that knowledge.

4. Assessment Type: Class Interaction (Max. marks: 2)

Course prerequisites: To study this course, a student must have had the subject Mathematics in class 12th and Computer Fundamental.

Suggested equivalent online courses:

Further Suggestions:

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Implement the concepts of Computer Networks and

1. Simulate Check sum Algorithm.
2. Simulate CRC Algorithm.
3. Simulate Stop & Wait Protocol.
4. Simulate Go-Back-N Protocol.
5. Simulate Selective Repeat Protocol.

Year Third

Subject: Computer Science

Course Code: 1101012 - Knowledge: Numerical Analysis & Operations Research

Programme/Class: Bachelor of Science	Year: Third	Semester: Six
Subject: Information Technology		
Course Code: B180603P	Course Title: Lab on Computer Networks	
Course outcomes:		
CO1	Understand and explain the concept of Data Communication and networks, layered architecture and their applications.	
CO2	Analyze and Set up protocol designing issues for Communication networks.	
CO3	Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction.	
CO4	Apply various network layer techniques for designing subnets and supernets and analyze packet flow on basis of routing protocols.	
CO5	Estimate the congestion control mechanism to improve quality of service of networking application	
Credits: 2		Core Compulsory
Max. Marks: 25+75		Min. Passing Marks:
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4		
Software Lab based on Computer Networks:		
Implement the concepts of Computer Networks such as:		
1. Simulate Check sum Algorithm.		
2. Simulate CRC Algorithm		
3. Simulate Stop & Wait Protocol.		
4. Simulate Go-Back-N Protocol.		
5. Simulate Selective Repeat Protocol.		
and so on....		

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Programme/Class: B.S.C.(IT)	Year: Third	Semester: Six
Subject: Computer Science		
Course Code: B030602T	Course Title: Numerical Analysis & Operations Research	
Course outcomes:		
CO1: The aim of this course is to teach the student the application of various numerical technique for variety of problems occurring in daily life. At the end of the course the student will be able to understand the basic concept of Numerical Analysis and to solve algebraic and differential equation.		
CO2: The main outcome will be that students will be able to handle problems and finding approximated solution. Later he can opt for advance course in Numerical Analysis in higher Mathematics.		
CO3: The student will be able to solve various problems based on convex sets and linear programming.		

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After successful completion of this paper will enable the students to apply the basic concepts of transportation problems and its related problems to apply in further concepts and application of operations research.

Credits: 4	Core Compulsory / Elective
Max. Marks: 25+75	Min. Passing Marks:
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 4-0-0	

PART-A
Numerical Analysis

Unit	Topic	No. of Lectures
I	Solution of equations: bisection, Secant, Regular Falsi, Newton Raphson's method, Newton's method for multiple roots, Interpolation, Lagrange and Hermite interpolation, Difference schemes, Divided differences, Interpolation formula using differences.	8
II	Numerical differentiation, Numerical Quadrature: Newton Cotes Formulas, Gaussian Quadrature Formulas, System of Linear equations: Direct method for solving systems of linear equations (Gauss elimination, LU Decomposition, Cholesky Decomposition), Iterative methods (Jacobi, Gauss Seidel, Relaxation methods). The Algebraic Eigen value problem: Jacobi's method, Givens method, Power method.	8
III	Numerical solution of Ordinary differential equations: Euler method, single step methods, Runge-Kutta method, Multi-step methods: Milne-Simpson method, Types of approximation: Last Square polynomial approximation, Uniform approximation, Chebyshev polynomial approximation.	7
IV	Difference Equations and their solutions, Shooting method and Difference equation method for solving Linear second order differential equation with boundary conditions of first, second and third type.	7

PART-B
Operations Research

Unit	Topics	No. of Lectures
V	Introduction, Linear programming problems, statement and formation of general linear programming problems, graphical method, slack and surplus variables, standard and matrix forms of linear programming problem, basic feasible solution.	8
VI	Convex sets, fundamental theorem of linear programming, basic solution, Simplex method, introduction to artificial variables, two phase method Big-M method and their comparison.	8
VII	Resolution of degeneracy, duality in linear programming problems, primal dual relationships, revised simplex method, sensitivity analysis.	7

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VIII	Transportation problems, assignment problems.	7
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Suggested Readings(Part-A Numerical Analysis):

1. Numerical Methods for Engineering and scientific computation by M. K. Jain, S.R.K. Iyengar & R.K. Jain.
2. Introductory methods of Numerical Analysis by S. S. Sastry
3. Suggested digital platform:NPTEL/SWAYAM/MOOCs
4. Course Books published in Hindi may be prescribed by the Universities.

Suggested Readings(Part-B Operation Research):

1. Taha, Hamdy H, "Operations Research- An Introduction ", Pearson Education.
2. Kanti Swarup , P. K. Gupta , Man Mohan Operations research, Sultan Chand & Sons
3. Hillier Frederick S and Lieberman Gerald J., "Operations Research", McGraw Hill Publication.
4. Winston Wayne L., "Operations Research: Applications and Algorithms", Cengage Learning, 4th Edition.
5. Hira D.S. and Gupta Prem Kumar, "Problems in Operations Research: Principles and Solutions", S Chand & Co Ltd.
6. Kalavathy S., "Operations Research", S Chand.
7. Suggested digital platform:NPTEL/SWAYAM/MOOCs.
8. Course Books published in Hindi may be prescribed by the Universities.

This course can be opted as an elective by the students of following subjects: Engg. and Tech. (UG), Economics(UG/PG), B.Sc.(C.S.)

Suggested Continuous Evaluation Methods: Max. Marks: 25

SN	Assessment Type	Max. Marks
1	Class Tests	10
2	Online Quizzes/ Objective Tests	5
3	Presentation	5
4	Assignment	5

Course prerequisites: To study this course, a student must have Certificate Course in Applied Mathematics

Suggested equivalent online courses:

Further Suggestions:

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Programme/Class: Bachelor of Science(IT)	Year: Third	Semester: Six
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Subject: Computer Science

Course Code: B010602T

Course Title: Analog & Digital Principles & Applications

Course Outcomes (COs)

1. Study the drift and diffusion of charge carriers in a semiconductor.
2. Understand the Two-Port model of a transistor.
3. Study the working, properties and uses of FETs.
4. Comprehend the design and operations of SCRs and UJTs.
5. Understand various number systems and binary codes.
6. Familiarize with binary arithmetic.
7. Study the working and properties of various logic gates.
8. Comprehend the design of combinational and sequential circuits.

Credits: 4

Core Compulsory / Elective

Max. Marks: 25+75

Min. Passing Marks:

Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 4-0-0

PART-A
Analog Electronic Circuits

Unit	Topic	No. of Lectures
I	<p>Semiconductor Junction</p> <p>Expressions for Fermi energy, Electron density in conduction band, Hole density in valence band, Drift of charge carriers (mobility & conductivity), Diffusion of charge carries and Life time of charge carries in a semiconductor. Work function in metals and semiconductors. Expressions for Barrier potential, Barrier width and Junction capacitance (diffusion & transition) for depletion layer in a PN junction. Expressions for Current (diode equation) and Dynamic resistance for PN junction.</p>	9
II	<p>Transistor Modeling</p> <p>Transistor as Two-Port Network. Notation for dc & ac components of voltage & current. Quantitative discussion of Z, Y & h parameters and their equivalent two-generator model circuits.</p> <p>h-parameters for CB, CE & CC configurations. Analysis of transistor amplifier using the hybrid equivalent model and estimation of Input Impedance, Output Impedance and Gain (current, voltage & power).</p>	8
III	<p>Field Effect Transistors</p> <p>JFET: Construction (N channel & P channel); Configuration (CS, CD & CG); Operation in different regions (Ohmic or Linear, Saturated or Active or Pinch off & Break down); Important Terms (Shorted Gate Drain Current, Pinch Off Voltage & Gate Source Cut-Off Voltage); Expression for Drain Current (Shockley equation); Characteristics (Drain & Transfer); Parameters (Drain Resistance, Mutual Conductance or Transconductance & Amplification Factor); Biasing w.r.t. CS configuration (Self Bias & Voltage Divider Bias); Amplifiers (CS & CD or Source Follower); Comparison (N & P channels and BJTs & JFETs).</p> <p>MOSFET: Construction and Working of DE-MOSFET (N channel & P channel) and E-MOSFET (N channel & P channel); Characteristics (Drain & Transfer) of DE-MOSFET and E-MOSFET;</p>	8

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Naveen

Akshay

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	Comparison of JFET and MOSFET..	
IV	<p style="text-align: center;">Other Devices</p> <p>SCR: Construction; Equivalent Circuits (Two Diodes, Two Transistors & One Diode-One Transistor); Working (Off state & On state); Characteristics; Applications (Static switch, Phase control system & Battery charger). UJT: Construction; Equivalent Circuit; Working (Cutoff, Negative Resistance & Saturation regions); Characteristics (Peak & Valley points); Applications (Trigger circuits, Relaxation oscillators & Sawtooth generators).</p>	5
PART-B		
Digital Electronics		
V	<p style="text-align: center;">Number System</p> <p>Number Systems: Binary, Octal, Decimal & Hexadecimal number systems and their inter conversion. Binary Codes: BCD, Excess-3 (XS3), Parity, Gray, ASCII & EBCDIC Codes and their advantages & disadvantages. Data representation.</p>	6
VI	<p style="text-align: center;">Binary Arithmetic</p> <p>Binary Addition, Decimal Subtraction using 9's & 10's complement, Binary Subtraction using 1's & 2's complement, Multiplication and Division.</p>	5
VII	<p style="text-align: center;">Logic Gates</p> <p>Truth Table, Symbolic Representation and Properties of OR, AND, NOT, NOR, NAND, EX-OR & EX-NOR Gates. Implementation of OR, AND & NOT gates (realization using diodes & transistor). De Morgan's theorems. NOR & NAND gates as Universal Gates. Application of EX-OR & EXNOR gates as parity checker. Boolean Algebra. Karnaugh Map.</p>	9
VIII	<p style="text-align: center;">Combinational & Sequential Circuits</p> <p>Combinational Circuits: Half Adder, Full Adder, Parallel Adder, Half Subtractor, Full Subtractor. Data Processing Circuits: Multiplexer, Demultiplexer, Decoders & Encoders. Sequential Circuits: SR, JK & D Flip-Flops, Shift Register (transfer operation of Flip-Flops), and Asynchronous & Synchronous counters.</p>	10
Suggested Readings		
PART A		
1. R.L. Boylestad, L. Nashelsky, "Electronic Devices and Circuit Theory", Prentice-Hall of India Pvt. Ltd., 2015, 11e		
2. J. Millman, C.C. Halkias, Satyabrata Jit, "Electronic Devices and Circuits", McGraw Hill, 2015, 4e		
3. B.G. Streetman, S.K. Banerjee, "Solid State Electronic Devices", Pearson Education India, 2015, 7e		
4. J.D. Ryder, "Electronic Fundamentals and Applications", Prentice-Hall of India Private Limited, 1975, 5e		
5. S.L. Gupta, V. Kumar, "Hand Book of Electronics", Pragati Prakashan, Meerut, 2016, 43e		
PART B		
1. D. Leach, A. Malvino, Goutam Saha, "Digital Principles and Applications", McGraw Hill, 2010, 7e		
2. William H. Gothmann, "Digital Electronics: An Introduction to Theory and Practice", Prentice-Hall of India Private Limited, 1982, 2e		
3. R.P. Jain, "Modern Digital Electronics", McGraw Hill, 2009, 4e		
<i>Books published in Hindi & Other Reference / Text Books may be suggested / added to this list by individual Universities.</i>		
Suggestive Digital Platforms / Web Links		
1. MIT Open Learning - Massachusetts Institute of Technology, https://openlearning.mit.edu/		
2. National Programme on Technology Enhanced Learning (NPTEL),		

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<https://www.youtube.com/user/nptelhrd>

3. Uttar Pradesh Higher Education Digital Library, <http://heecontent.upsdc.gov.in/SearchContent.aspx>

4. Swayam Prabha - DTH Channel, https://www.swayamprabha.gov.in/index.php/program/current_he/8

Course Prerequisites

Passed Semester IV, Theory Paper-1 (B010401T)

This course can be opted as an Elective by the students of following subjects

Open to all

Suggested Continuous Internal Evaluation (CIE) Methods

20 marks for Test / Quiz / Assignment / Seminar
05 marks for Class Interaction

Suggested Equivalent Online Courses

1. Swayam - Government of India, <https://swayam.gov.in/explorer?category=Physics>
2. National Programme on Technology Enhanced Learning (NPTEL), <https://nptel.ac.in/course.html>
3. Coursera, <https://www.coursera.org/browse/physical-science-and-engineering/physics-and-astronomy>
4. edX, <https://www.edx.org/course/subject/physics>
5. MIT Open Course Ware - Massachusetts Institute of Technology, <https://ocw.mit.edu/courses/physics/>

Further Suggestions

- Other Digital Platforms / Web Links and Equivalent Online Courses may be suggested / added to the respective lists by individual Universities.
- In End-Semester University Examinations, equal weightage should be given to Part A (units I to IV) and Part B (units V to VIII) while framing the questions.

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- Language - C, C++, Java, VC++, C#, R, Python
- Scripting Languages - PHP, JSP, SHELL, Scripts (Perl), Tcl/Tk
- NET Platform - J#, C#, Net, Visual C#, .Net, ASP, .Net
- Middleware/Component Technologies - COM, DCOM, Active-X, J2E
- Front-End GUI Tools - Net Technologies, Java
- Back-End DBMS - Oracle, SQL Plus, MY SQL, SQL Server
- I/O Interface - Device Drivers, RPC, Threads, Socket programming
- Real Time Operating Systems/Embedded Skills - LINUX, Raspberry Pi, Arduino
- Applications and Research Areas - Financial / Insurance / Manufacturing / Healthcare / Computer Graphics / Instructional Design/ Database Management Systems/ Systems / Servers / Networking/ Communication / Software Development / Embedded / Robotics / AI / ML / IP programming / Real-time systems / Embedded systems

Research Project
(Guidelines for V and VI Semester)

1. Objectives of the Project

- To facilitate the student to independently formulate and solve a social, philosophical, commercial, or technological problem and present the results in written and oral form.
- To render students to the real-life problems.
- To provide opportunities to students to interact with people and present them confidently.

2. Types of Projects

The students are expected to work on:

- (1) Application Oriented Project or
- (2) Research Oriented Project.

However, it is not mandatory for a student to work on a real-life project. The student can formulate a project problem with the help of his Guide and submit the project proposal of the same. **Approval of the project proposal is mandatory.** If approved, the student can commence working on it, and complete it. It is upon the student to carry the same project of V semester to VI semester OR choose a new project for VI semester. Use the latest versions of the software packages for the development of the project.

3. Software and Broad Ideas of Application

- Programming Language/ Application Software/Operating System etc could be any latest technology prevailing / being used as per the will of the student with the consent of the guide.
- **Languages** - C, C++, Java, VC++, C#, R, Python
- **Scripting Languages** - PHP, JSP, SHELL Scripts (Unix), Tcl/TK
- **.NET Platform** - F#, C#. Net, Visual C#. Net, ASP.Net
- **Middle Ware (Component) Technologies** - COM/DCOM, Active-X, EJB
- **Front-End/GUI Tools** - .Net Technologies, Java
- **Back-End/DBMS** - Oracle, SQL Plus, MY SQL, SQL Server
- **UNIX Internals** - Device Drivers, RPC, Threads, Socket programming
- **Real time Operating Systems/Embedded Skills** - LINUX, Raspberry Pi, Arduino.
- **Application and Research Areas** - Financial / Insurance / Manufacturing / Multimedia / Computer Graphics / Instructional Design/ Database Management System/ Internet / Intranet / Computer Networking-Communication Software development/ E-Commerce/ ERP/ MRP/ TCP-IP programming / Routing protocols programming/ Socket programming

4. Eligibility of the Guide

Guide should be a regular teacher of the University/College/Higher Education Institute. Student can also do the project under the guidance of regular teacher of Institute of National Importance with the consent of the enrolled college/institute where the student is studying.

5. Introduction to the Project

The student should include the details in the project diary, in which they will record the progress of their project throughout the course. The project report should be documented with scientific approach to the solution of the problem that the students have sought to address. The project report should be prepared in order to solve the problem in a methodical and professional manner, making due references to appropriate techniques, technologies and professional standards. The project report should contain enough details to enable examiners to evaluate the work. The important points should be highlighted in the body of the report, with details often referred to appendices.

6. Structure and Format of the Project

Chapter 1 to 4 should be submitted in Semester V in spiral binding and these chapters have also to be included in Semester VI report if same project is carried from V to VI semester. If different projects are taken than complete project report is to be submitted in each semester. Semester VI report has to be hard bound with golden embossing. Students will be evaluated based on the project in V and VI semester independently.

(i) **Title Page:**

Sample format of Title page is given below. Students should follow the given format.

(All the text should be in Times New Roman)

<TITLE OF THE PROJECT>
(NOT EXCEEDING 2 LINES, 24 BOLD, ALL CAPS)

A Project Report (12 Bold)

Submitted in partial fulfillment of the
Requirement of the award of the Degree of (Size- 12)

BACHELOR OF SCIENCE (14 BOLD, CAPS)

By (12Bold)

Name of The Student (Size 15, title case)
Roll Number (Size- 15)

COLLEGE LOGO

DEPARTMENT NAME
FACULTY NAME (12 BOLD, CAPS)
UNIVERSITY/COLLEGE NAME (14 BOLD, CAPS)
Affiliated to University Name) (12, Title case, bold,
italic)

Dawney

Akshay

mtb

PS

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Faculty of Science
S.V.S.U., MEEAROT

- (ii) **Original Copy of the Approval Proforma of the Project Proposal:**
 Sample Proforma of Project Proposal is given below. Students should follow the given format.

PROFORMA FOR THE APPROVAL OF PROJECT PROPOSAL

(Note: All entries of the proforma of approval should be filled up with appropriate and complete information. Incomplete proforma of approval in any respect will be rejected)

Roll no:.....

1. Name of the Student

2. Title of the Project

3. Name of the Guide

4. Teaching experience of the Guide

Signature of the Student
 Date:.....

Signature of the Guide
 Date:.....

Signature of the Project Coordinator
 Date:.....

- (iii) **Certificate of Authenticated work:**
 Sample format of Certificate of Authenticated work is given below. Students should follow the given format. Also, HEIs/Institutes/Colleges are required to give plagiarism report for the project work.

UNIVERSITY/COLLEGE NAME (14 BOLD, CAPS)
(Affiliated to University Name) (13, bold, italic)
CITY NAME-PINCODE (13 bold, CAPS)

DEPARTMENT NAME (14 BOLD, CAPS)

College Logo

CERTIFICATE (14 BOLD, CAPS, underlined, centered)

This is to certify that the project entitled, "Title of The Project", is bonafied work of **NAME OF THE STUDENT** bearing Roll No. submitted in partial fulfillment of these requirements for the award of degree of BACHELOR OF SCIENCE in COMPUTER SCIENCE from University Name. (12, times new roman, justified)

Name of Internal Guide (12 bold) Name of Coordinator
 (Don't write names of lecturers or HOD)

External Examiner

Date: College Seal

Sh
 Deptt. of Computer Application
 Faculty of Science
 S.V.S.U., MEERUT

Nancy
Ashu
net

(iv) **Certificate from other Institute of National Importance** (to be issued by the HEI and the photocopy of the certificate is to be attach)

(v) **Abstract**

This should be one/two short paragraphs (100-150 words total), summarizing the project work. It will not be a re-statement of the original project outline. A suggested flow is background, project aims and main achievements. From the abstract, a reader should be able to determine if the project is of interest to them and, it should present results of which they may wish to know more details.

(Project Abstract page format)

Abstract (20bold, caps, centered)

Content goes here (12, justified)

Note: Entire document should be with 1.5line spacing and all paragraphs should start with 1 tab space.

(vi) **Acknowledgements**

This should express student's gratitude to those who have helped in the preparation of project.

ACKNOWLEDGEMENT (20, BOLD, ALL CAPS, CENTERED)

The acknowledgement should be in times new roman, 12 font with 1.5 line spacing, Justified.

(vii) **Declaration**

(Declaration page format)

DECLARATION (20 bold, centered, allcaps)

Content (12, justified)

I here by declare that the project entitled, "Title of the Project" done at [name of place where projects is done] has not been in any case duplicated to submit to any other university for the award of any degree. To the best of my knowledge other than me, no one has submitted to any other university.

The project is done in partial fulfilment of the requirements for the award of degree of **BACHELOR OF SCIENCE** to be submitted as [V OR VI] semester project as part of our curriculum.

Name and Signature of the Student

Head
ptt. of Computer Application
Faculty of Science
S.V.S.U., MEERUT

Navneet

Akshay

ml

(viii) **Table of Contents**

The table of contents gives the readers a view of the detailed structure of the report. The students would need to provide section and subsection headings with associated pages. The formatting details of these sections and subsections are given below.

TABLE OF CONTENTS (20bold, caps, centered)

Should be generated automatically using word processing software.

Chapter 1: Introduction
1.1 Background 01(no bold)
 Objectives 02(no bold)
 Purpose and Scope 03
 Purpose

Chapter 2: Survey of Technologies
2.1.....

Chapter 3: Requirements and Analysis
 Problem Definition
 Requirements Specification

Chapter 4: System Design
 Basic Modules
 Data Design

Chapter 5: Implementation and Testing
.....

Chapter 6: Results and Discussion
.....

Chapter 7: Conclusions
.....

REFERENCES
GLOSSARY
APPENDICES

(ix) **List of Tables**

List of all the tables in the project along with their page numbers.

List of Tables (20 bold, centered, Title Case)

Should be generated automatically using word processing software.

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Navya

Ashutosh

MSB

(x) **List of Figures**

List of all the figures, graphs, charts etc. in the project along with their page numbers.

List of Figures (20 bold, centered, Title Case)

Should be generated automatically using word processing software.

Chapter 1: Introduction

The introduction has several parts as given below:

- **Background:** A brief detail of background and framework of project and its relation to work done in the area.
- **Objectives:** Point wise statement of the aims and objectives of the project
- **Purpose, Scope and Applicability:** The description of Purpose, Scope, and Applicability are given below:
 - **Purpose:** Describe the topic of the project on the basis of why this project is being done. How this project improves the existing system.
 - **Scope:** Describe methodology, assumptions and limitations.
 - **Applicability:** State the application of project.
- **Achievements:** Explain what kind of purpose is achieved after completion of project.
- **Organization of Report:** Summarize remaining chapters of the project report.

(Project Introduction page format)

Chapter 1

Introduction (20 Bold, centered)


Content or text (12, justified)

Note: Introduction has to cover brief description of the project with minimum 4 pages.

Chapter 2: Literature Review OR Survey of Technologies

In this chapter survey of technologies for application oriented project should demonstrate the student awareness and understanding of available technologies OR literature survey is required for research oriented project. The student should give the detail of all the related literature/technologies that are necessary to complete the project. The student should present a comparative study of all those technologies/literature.

Chapter 3: Requirements and Analysis (For Application Oriented) OR [Title of Research Working Chapter]


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A. K. K.


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Chapter 4: System Design (For Application Oriented) OR [Chapter related to Research Work]

Chapter 5: Implementation and Testing

- **Implementation Approaches:** Define the plan of implementation, and the standards or standard data sets used in the implementation.
- **Coding Details and Code Efficiency:** Students not need include full source code, instead, include only the important codes (design of new data structure, algorithms, applets code, forms code etc). The program code should contain comments needed for explaining the work a piece of code does. Comments may be needed to explain why it does it, or, why it does a particular way. The student can explain the function of the code with a shot of the output screen of that program code. The student should explain how the code is efficient and how the students have handled code optimization.
- **Testing Approach**
- **Modifications and Improvements**

Chapter 6: Results and Discussion

- **Test Reports:** Student should provide the test results and reports based on the test cases to show that it works fine in different conditions of input.
- **User Documentation:** In this section, working of the software should be explained; also explain its different functions with screen shots. The user document should be like a manual.

Chapter 7: Conclusions and Future Work

The conclusions shall be summarized with in 2 or 3 pages. This chapter mainly focuses on:

- Limitations of the Proposed System OR Research
- Future Scope describes new areas of investigation and parts of the current work that was not completed due to time constraints and/or problems encountered.

(xi) References

In this, students acknowledge the work of others that they have used or adapted in their own work. Student can follow the given standard for the references for books, journals, and online material. The citation is mandatory in both the reports.

Eg.

Lipson, Charles (2011). Cite right : A quick guide to citation styles; MLA, APA, Chicago, the sciences, professions, and more (2nd ed.). Chicago [u.a.]: University of Chicago Press. p. 187. ISBN 9780226484648.

(xii) Glossary

If any acronyms, abbreviations, symbols, or uncommon terms is used in the project report then their meaning should be explained where they first occur.

[Signature]

Narvesh

Akshat

mk

(xiii) Appendices

Appendix include some further details like results, mathematical derivations, certain illustrative parts of the program code (e.g., class interfaces), user documentation etc.

7. Evaluation

- During the project work, its progress will be monitored, on fortnightly/monthly basis, by the internal guide.
- 2 copies of Project Report to be submitted to department (1 copy to be retained by department, 1 copy for student)
- End Examination shall be based on Project Report, Presentation, Viva, and Demonstration of the software.
- Project carries 3 Credit Points.

Duration (for 1 group):

Evaluation in V and VI semester separately		
Type of evaluation	Total time	Max. Marks
Presentation	10 minutes	25
Viva	10 minutes	20
Demonstration	5 minutes	20
Report checking	5 minutes	35
Total Time/Max. Marks	30 minutes	100

**Format of Certificate of Evaluation
Certificate of Evaluation (14 point, Times, Bold)**

This is to certify that the undersigned have assessed and evaluated the project work titled "....." submitted by the following student(s).

- 1.
- 2.
- 3.

The project report has been accepted/ rejected for the partial fulfillment of B.Sc. programme.

Signature of the examiner
Name of the examiner

Stamp of the Department

8. Project Viva Voice

Student may be asked to write code for some segment of the problem during VIVA to check his coding capabilities. The project can be done in group of at most two or three students. A big project can be modularized and different modules can be assigned as separate project to different students.

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DEAN
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