

RAMDEOBABA UNIVERSITY

[RBU]

NAGPUR – 440013



RBU

RAMDEOBABA UNIVERSITY, NAGPUR
Formerly Shri Ramdeobaba College of Engineering & Management (RCOEM) Est. 1984

TEACHING & EVALUATION SCHEME

BACHELOR OF COMPUTER APPLICATION

School of Computer Science & Engineering

2026-2030

Semester-I

S. No.	Course Type	Course Code	Course Name	L	P	C	Continuous Assessment	End Sem / Internal Eval	Total	Duration of End Semester
1	PCC	26BC18TP0101	Fundamentals of Programming	3	2	4	50 + 25	50 + 25	150	03 Hrs
2	PCC	26BC18TP0102	Digital Systems	3	2	4	50 + 25	50 + 25	150	03 Hrs
3	PCC	26BC18TH0103	Cyber Law & Ethics	2	0	2	50	50	100	02 Hrs
4	SEC	26BC18PR0104	Office Automation Lab	0	2	1	25	25	50	-
5	SEC	26HS02EP0101	Foundation of Business English	2	2	3	50 + 25	50 + 25	150	02 Hrs
6	BSC	26HS03TP0108	Matrices and Calculus	3	2	4	50 + 25	50 + 25	150	03 Hrs
7	VAC	26HS01TP0102	Environmental Science	1	2	2	50	-	50	-
				14	12	20	425	375	800	

Semester-II

S. No.	Course Type	Course Code	Course Name	L	P	C	Continuous Assessment	End Sem / Internal Eval	Total	Duration of End Semester
1	PCC	26BC18TP0201	Data Structures	4	2	5	50 +25	50 +25	150	03 Hrs
2	PCC	26BC18TP0202	Object-Oriented Programming	4	2	5	50 +25	50 +25	150	03 Hrs
3	PCC	26BC18TP0203	Introduction to Web Programming	2	2	3	50 +25	50 +25	150	02 Hrs
4	PCC	26BC18TH0204	Computer Organisation and Architecture	3	0	3	50	50	100	03 Hrs
5	VAC	26HS02TH0207	Foundational Literature of Indian Civilization	2	0	2	50	50	100	02 Hrs
6	BSC	26HS03TH0218	Foundation of Probability and Statistics	3	0	3	50	50	100	03 Hrs
TOTAL				18	6	21	375	375	750	

**Exit Option: Undergraduate Certificate in Computer Application
(41 credits and an additional 8 Credits)**

Exit Courses

1.	Computer Hardware and Networking	Online/offline Certification Course	8
2.	Advanced JAVA programming		8
3.	Python Programming		8

SEM III

S. No.	Course Type	Course Code	Course Name	L	P	C	Continu- ous Assess- ment	End Sem / Intern- al Eval	Tota- l	Duratio- n of End Semeste- r
1	PCC	26BC18TP0301	Database Management System	3	2	4	50 +25	50 +25	150	03 Hrs
2	PCC	26BC18TP0302	Design and Analysis of Algorithms	3	2	4	50 +25	50 +25	150	03 Hrs
3	PCC	26BC18TP0303	Operating Systems	3	2	4	50 +25	50 +25	150	03 Hrs
4	SEC	26BC18PR0304	Advanced Web Programming	0	4	2	25	25	50	-
5	SEC	26BC18TH0305	Creativity, Innovation & Design Thinking	2	0	2	50	50	100	02 Hrs
6	SEC	26BC18PR0306	Software Lab-I	0	2	1	25	25	50	-
7	BSC	26HS03TH0305	Discrete Mathematics & Graph Theory	3	0	3	50	50	100	03 Hrs
			TOTAL	14	12	20	375	375	750	

Semester-IV

S. No.	Course Type	Course Code	Course Name	L	P	C	Continuous Assessment	End Sem / Internal Eval	Total	Duration of End Semester
1	PCC	26BC18TP0401	Foundation of Data Science	3	2	4	50 +25	50 +25	150	03 Hrs
2	PCC	26BC18TP0402	Computer Networks	3	2	4	50 +25	50 +25	150	03 Hrs
3	PCC	26BC18TP0403	Cloud Computing	3	2	4	50 +25	50 +25	150	03 Hrs
4	PCC	26BC18TP0404	Software Engineering	3	2	4	50 +25	50 +25	150	03 Hrs
5	SEC	26BC18PR0405	Software Lab-II	0	2	1	25	25	50	-
6	PCC	26BC18TH0406	Elective-I	3	0	3	50	50	100	03 Hrs
7	VAC	26HS04PR0204	Health, Fitness & Wellbeing	0	2	1	25	25	50	-
Total				15	12	21	400	400	800	

Course Code	Elective-I [SEM-4]
26BC18TH0406-1	Computer Vision
26BC18TH0406-2	UI/UX Design

Exit Option: Undergraduate Diploma in Computer Application (82 credits and an additional 8 Credits)		
Exit Courses		
1.	Mobile Development	8
2.	Data Analyst	8
3.	Ethical Hacking	8
4.	IT certified data engineer	8
5.	Blockchain and its application	8

Semester-V

S. No.	Course Type	Course Code	Course Name	L	P	C	Continuous Assessment	End Sem / Internal Eval	Total	Duration of End Semester
1	PCC	26BC18TP0501	Cryptography & Network Security	3	2	4	50 +25	50 +25	150	03 Hrs
2	PCC	26BC18TP0502	Artificial Intelligence	3	2	4	50 +25	50 +25	150	03 Hrs
3	SEC	26BC18PR0503	Microsoft DotNet Technology Lab	0	4	2	25	25	50	-
4	SEC	26BC18PR0504	IT infrastructure Lab	0	4	2	25	25	50	-
5	PEC	26BC18TP0505	Elective-II	3	2	4	50 +25	50 +25	150	03 Hrs
6	SEC	26BC18PR0506	Capstone Project- 1	0	6	3	50	50	100	-
7	SEC	26BC18PR0507	Basic Competitive Coding	0	2	1	25	25	50	-
Total				09	22	20	350	350	700	

Course Code	Elective-II [SEM-5]
26BC18TP0505-1	Mobile Application Development
26BC18TP0505-2	Fundamentals of AR/VR

Semester-VI

S. No.	Course Type	Course Code	Course Name	L	P	C	Continuous Assessment	End Sem / Internal Eval	Total	Duration of End Semester
1	PCC	26BC18TP0601	Data Analytics and Visualization	3	2	4	50 +25	50 +25	150	03 Hrs
2	PCC	26BC18TP0602	Machine Learning	4	2	5	50 +25	50 +25	150	03 Hrs
3	PCC	26BC18TH0603	Basics of Ethical Hacking	3	0	3	50	50	100	03 Hrs
4	PEC	26BC18TP0604	Elective-III	3	2	4	50 +25	50 +25	150	03 Hrs
5	SEC	26BC18PR0605	Capstone Project– 2	0	6	3	50	50	100	-
6	VAC	26BC18PR0606	Participative Learning	0	2	1	50	-	50	-
Total Credits				13	14	20	375	325	700	

Course Code	Elective-III [SEM-6]
26BC18TP0604-1	Data Warehousing and Data Mining
26BC18TP0604-2	Full stack web development

Exit Option: Undergraduate Degree 'Bachelors in Computer Application' (122 credits and an additional 8 Credits)			
Exit Courses			
1.	Project	-	8

BCA (Honours)
Semester-VII (Honours)

Sr. No.	Course type	Course Code	Course Name	L	P	C	Continuous Assessment	End Sem Exam	Total	Exam Duration
1	PCC	26BC18TP0701	Generative AI	3	2	4	50 +25	50 +25	150	03 Hrs
2	PCC	26BC18TP0702	Deep Learning	3	2	4	50 +25	50 +25	150	03 Hrs
3	PCC	26BC18TP0703	Digital Forensic	3	2	4	50 +25	50 +25	150	03 Hrs
4	PEC	26BC18TP0704	Elective-IV	3	2	4	50 +25	50 +25	150	03 Hrs
5	SEC	26BC18TP0705	Project Phase- I	0	8	4	75	75	150	-
TOTAL				12	16	20	375	375	750	

Course Code	Elective-IV [SEM-7]
26BC18TP0704-1	Customer Relationship Management
26BC18TP0704-2	Enterprise Resource Planning

Semester-VIII (Honours)

S. No.	Course Type	Course Code	Course Name	L	P	C	Continuous Assessment	End Sem / Internal Eval	Total	Duration of End Semester
1	PCC	26BC18TP0801	Cloud Security	3	2	4	50 +25	50 +25	150	03 Hrs
2	PCC	26BC18TP0802	Natural Language Processing	3	2	4	50 +25	50 +25	150	03 Hrs
3	PEC	26BC18TP0803	Elective-V	3	2	4	50 +25	50 +25	150	03 Hrs
4	PEC	26BC18TP0804	Elective-VI	3	2	4	50 +25	50 +25	150	03 Hrs
5	SEC	26BC18PR0805	Project Phase-II	0	8	4	75	75	150	-
TOTAL				12	16	20	375	375	750	

Course Code	Elective-V [SEM-8]
26BC18TP0803-1	Internet of Things
26BC18TP0803-2	GPU Programming

Course Code	Elective-V([SEM-8]
26BC18TP0804-1	Vulnerability Assessment and Penetration Testing
26BC18TP0804-2	Financial Analytics

Award of Undergraduate Degree
Bachelor in Computer Application with Honours (BCA Honours)

BCA (Honours with Research)

Semester-VII (Honours with Research)

Sr. No.	Course type	Course Code	Course Name	L	P	C	Continuou s Assessme nt	End Sem Exam	Tota l	Exam Duratio n
1	PCC	26BC18TH0706	Research Methodology	4	0	4	50	50	100	03 Hrs
2	PROJ	26BC18PR0707	Research Internship / TBI Internship	0	32	16	300	300	600	-
TOTAL				4	32	20	350	350	700	

Semester-VIII (Honours with Research)

S. No.	Course Type	Course Code	Course Name	L	P	C	Contin uous Assess ment	End Sem / Internal Eval	Total	Duration of End Semester
1	PROJ	26BC18PR0806	Research Internship / TBI Internship		40	20	375	375	750	-
Total Credits						20	375	375	750	

Award of Undergraduate Degree
Bachelor in Computer Application Honours with Research (BCA Honours with Research)

Syllabus for Semester I, Bachelor of Computer Application

Course Code: 26BC18TP0101

Course: Fundamentals of Programming

L: 3 Hrs P: 2 Hr, Per Week

Total Credits: 4

Course Outcomes:

On successful completion of the course, the student shall be able to

1. Design logic for simple problem statements.
2. Code problem statements involving decision-making and loops.
3. Use functions for modular programming and apply the concept of arrays in coding.
4. Apply the concept of structures and sorting algorithms in coding.
5. Perform file operations.

Syllabus:

Unit I: Introduction to components of a computer system, Algorithm and Flowchart for problem-solving. Introduction to C language: Keywords, Constant, Variable, Data types, Operators.

Unit II: Types of Statements, Decision Control Statement- if and Conditional operators.

Switch case statement, Loops, Pre-processor Directives.

Unit III: Concept of functions, User defined and Library Functions, parameter passing, Recursion, Storage class, Pointers, Arrays: 1-D, 2-D.

Unit IV: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Pointers to the array, Command line arguments , Structures, Simple structures, Array of Structures

Unit V: File handling Streams in C, Types of Files, File Input/ Output Operations: Modes of file opening, Reading and writing the file, Closing the files, using fflush ().

Text Books :

1. The C Programming Language: B. W. Kernighan and D. M. Ritchie, Second Edition, Pearson, June 2015
2. Programming in ANSI C: E. Balguruswami McGraw Hill
3. Programming in C: B. Gottfried, Second Edition, Schaum Outline Series, Tata Mc-Graw Hill Publishers, 1996

Reference Books :

1. Mastering C: K. R. Venugopal and S. R. Prasad, Tata McGraw Hill
2. Let Us C: Yashwant Kanetkar, BPB Publication

Lab Syllabus:

Minimum 8 practicals based on the Syllabus:.

Syllabus: for Semester I, Bachelor of Computer Application

Course Code: 26BC18TP0102

Course: Digital Systems

L: 3 Hrs P: 2 Hr, Per Week

Total Credits: 4

Course Outcomes:

On successful completion of the course, the student shall be able to:

1. Explain fundamentals of computers including signals, hardware components, memory, storage, and I/O devices.
2. Apply number systems, boolean algebra, and logic simplification techniques.
3. Analyze and implement logic circuits using basic/universal gates and K-map/tabulation methods.
4. Design and evaluate combinational circuits.
5. Understand and analyze sequential circuits.

Syllabus:

Unit I: Introduction to Computers: Digital and Analog signals, Block diagram of a computer hardware, Generation of Computers, Types of computers, Memory concepts and classification, Storage devices: Input devices and Output devices.

Unit II: Number Systems and Boolean Algebra: Number system: Decimal, Binary, Octal, Hexadecimal, Number system conversions, Binary arithmetic basics, Boolean algebra and laws, De-Morgan's law, simplification of Boolean expressions.

Unit III: Logic Gates and Simplification Techniques: basic and universal gates, Implementation of Boolean expressions using gates, Simplification method: K-map and Tabulation method: Quine-McCluskey method.

Unit IV: Combination circuit: Half Adder and Full Adder, Half Subtractor and Full Subtractor, Binary parallel adder and carry propagation, magnitude comparator, decoder and encoder, multiplexer and demultiplexer, design of code converter.

Unit V: Types of flip flop S-R, D, J-K, T flip flop, Counter: Synchronous counters, asynchronous counter, and shift register.

Text Books:

1. A. Anand Kumar; Fundamental of Digital Electronics; Second Edition, PHI, 2016
2. Morris Mano; Digital Logic Design; Fourth edition, McGraw Hill, 2018
3. P. K. Sinha & Priti Sinha, Computer Fundamentals, BPB Publications
4. M. Morris Mano, Digital Logic and Computer Design, Pearson
5. V. Rajaraman, Fundamentals of Computers, PHI Learning

References:

1. S.K. Basanadra, Computers Today, Galgotia Publications, (1e) 2010.
2. M. Mano, Digital Logic and Computer Design, (1e), Pearson Education India, 2017.
3. R. P. Jain, Modern Digital Electronics, (3e), Tata McGraw-Hill Education, 2003.

Lab Components

- Study of computer hardware, memory, storage, and I/O devices.
- Number system conversions and binary arithmetic.
- Verification of Boolean laws and De Morgan's theorem.
- Implementation of logic gates and simplification using K-map/tabulation.
- Design of combinational circuits (adders, multiplexers, encoders/decoders).
- Implementation of flip-flops, counters, and shift registers.

Syllabus: for Semester II, Bachelor of Computer Application

Course Code: 26BC18TH0103

Course: Cyber Laws & Ethics

L: 2 Hrs, P: 0Hr, Per Week

Total Credits: 2

Course Outcomes:

On successful completion, of course student will able to learn:

1. To analyze the role of ethics in IT organization.
2. Analyze ethical and legal issues related to workforce practices such as contingent workers, H-1B visa workers, and outsourcing in IT organizations.
3. To interpret various intellectual property rights,
4. To identify privacy and protection issues in Information Technology field.
5. To describe the ways of precaution and prevention of Cyber Crime as well as Human Rights.

Syllabus:

Unit I:

Ethics in the business world & IT professional malpractices, Introduction to firewalls, IDS System, Distortion and fabrication of information

Unit II :

Ethics of IT Organisation: Contingent Workers, H- IB Workers, Whistle-blowing, Protection for Whistle-blowers, Handling Whistle- blowing situation, Digital divide.

Unit III :

Intellectual Property: Copyrights, Patents, Trade Secret Laws, Key Intellectual Property Issues, Plagiarism,

Unit IV:

Privacy: The right of Privacy, Protection, Key Privacy and K- Anonymity issues, Identity Theft, Consumer Profiling.

Unit V:

Cyber laws and rights in today's digital age, Emergence of Cyberspace, Cyber Jurisprudence, Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber terrorism, cyber tort, Cyber Defamation & hate speech, Cybersquatting, The Indian information technology act 2000 /2008 IT Act.

Text Books:

1. George Reynolds, "Ethics in information Technology", 5th edition, Cengage, Learning Hon C Graff,
2. Cryptography and E-Commerce - A Wiley Tech Brief, Wiley Computer Publisher, 2001.

Reference Books:

1. Michael Cross, Norris L Johnson, Tony Piltzecker, Security, Shroff Publishers and Distributors Ltd.
2. Debora Johnson," Computer Ethic s", 3/e Pearson Education.
3. Sara Baase, "A Gift of Fire: Social, Legal and Ethical Issues, for Computing and the Internet," PHI Public at ions.
4. Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
5. Dr Pramod Kr.Singh, "Laws on Cyber Crimes [Along with IT Act and Relevant Rules]" Book Enclave Jaipur India.

Syllabus: for Semester I, Bachelor of Computer Applications

Course Code: 26BC18PR0104

Course: Office Automation Laboratory

L: 0 Hrs P: 2 Hr, Per Week

Total Credits: 1

Course Outcomes:

On successful completion of the course, the student shall be able to:

1. Understand the features and applications of MS Word, Excel, and PowerPoint.
2. Create professional documents, spreadsheets, and presentations independently.
3. Apply advanced features such as Mail Merge in Word and formulas in Excel.
4. Analyze and present data effectively using charts, tables, and presentation tools.

Syllabus:

MS-WORD

1. Text Manipulation: Write a paragraph about your institution and change the font size and type, Spell check, Aligning and justification of Text
2. Bio data: Prepare a Bio-data.
3. Find and Replace: Write a paragraph about yourself and do the following. Find and Replace -Use Numbering Bullets, Footer and Headers.
 - Tables and manipulation: Creation, Insertion, Deletion (Columns and Rows). Create a marksheet.
 - Mail Merge: Prepare an invitation to invite your friends to your birthday party.

MS-EXCEL

1. Data Sorting-Ascending and Descending (both numbers and alphabets)
2. Mark list preparation for a student
3. Individual Pay Bill preparation.
4. Invoice Report preparation.
5. Drawing Graphs. Take your own table.

MS-POWERPOINT

1. Create a slide show presentation for a seminar.
2. Preparation of Organisation Charts
3. Create a slide show presentation to display percentage of marks in each semester for all Students
4. Use bar chart (X-axis: Semester, Y-axis: % marks).
5. Use different presentation template different transition effect for each slide

Text Book :

Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dreamtech,2005

Reference Books:

1. The Complete Computer Upgrade and Repair Book,3rd edition Cheryl A Schmidt,WILEY Dreamtech
2. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education. PC Hardware and A + Handbook – Kate J. Chas PHI (Microsoft)

Syllabus: for Semester I, Bachelor of Computer Application

Course Code: 26HS02TP0101

Course: Foundation of Business English

L: 2 Hrs, P: 2 Hr, Per Week

Total Credits: 3

Course Outcomes:

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

1. Apply and demonstrate active listening techniques and grammatical rules to construct accurate, coherent, and contextually appropriate communication.
2. Analyse and apply verbal aptitude strategies, business vocabulary, and reading comprehension techniques to interpret written communication effectively.
3. Demonstrate and adapt public speaking techniques and professional etiquette to deliver structured and audience-centric oral communication in workplace scenarios.
4. Evaluate and apply employability communication strategies by actively participating in group discussions, mock interviews, and résumé-building exercises to meet professional standards.
5. Create and justify professional documents using appropriate formats and ethically integrate AI-assisted tools to enhance clarity, accuracy, and effectiveness in communication.

Syllabus:

Unit-1 Listening Comprehension and Remedial Grammar:

Listening Comprehension: Active listening, Reasons for poor listening, Barriers to effective listening, Traits of a good listener, Note-making

Remedial Grammar: Common Errors in Indian English, Subject-verb agreement, Tenses

Unit-2: Structural Communication and Reading Comprehension

Verbal Aptitude: Para-jumbles, Analogies, Sentence completion, Syllogisms

Business Vocabulary: Use of power verbs, power adjectives and power adverbs, Common technical affixes, Avoiding corporate jargons

Reading Comprehension: Types and Strategies

Unit -3: Speaking Skills

Public Speaking: Mechanics of Public Speaking, Five-C model of storytelling (audience-centric), principles of effective introductions and welcome addresses, and questioning techniques.

Professional Oral Communication: Meetings, Seeking and giving feedback,

Professional Etiquette: greetings, introductions, politeness strategies, telephone and virtual communication

Unit -4: Communication for Employment

Group Discussions: concepts, types, roles, and evaluation parameters

Résumé Building: structure, content, and formatting techniques

Introduction to Interview Skills: types of interviews, commonly asked questions, and response strategies

Unit-5: Professional Communication

Principles of professional document design

Academic and professional email writing (format, tone, etiquette)

Instruction writing (clarity, sequencing, audience awareness)

Statement of Purpose (SOP): structure and content

Introduction to AI-assisted communication (AI prompts and applications) and Ethical considerations in the use of AI in professional communication

Books

1. *Communication Skills*. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
2. *Practical English Usage*. Michael Swan. OUP. 1995.
3. *Remedial English Grammar*. F.T. Wood. Macmillan.2007
4. *On Writing Well*. William Zinsser. Harper Resource Book. 2001
5. *Study Writing*. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
6. *The AI Prompt Handbook for Business Writing: 50+ Prompts for Professionals, Managers & Entrepreneurs (The AI Prompt Handbook Series)*, Maxwell Striling, 2026

Foundations of Business English Lab

Syllabus

List of practicals

Computer Assisted + Activity Based Language Learning

Practical 1: Everyday Situations: Conversations and Dialogues – Listening Skills

Practical 2: Reading Skills

Practical 3: Everyday Situations: Conversations and Dialogues – Speaking Skills

Practical 4: Pronunciation, Intonation, Stress, and Rhythm

Activity Based Language Learning

Practical 5: Public Speaking

Practical 6: Presentation Skills: Orientation

Practical 7: Presentation Skills: Mock

Practical 8: Group Discussions: Practice

Practical 9: Group Discussions: Mock

Reference Books

1. *Communication Skills*. Sanjay Kumar and Pushp Lata. Oxford University Press.
2. *Practical English Usage*. Michael Swan. OUP. 1995.

Syllabus: for Semester I, Bachelor of Computer Application

Course Code: 26HS03TP0108

Course: Matrices and Calculus

L: 3 Hrs P: 2 Hr, Per Week

Total Credits: 4

Course Outcomes:

On successful completion of the course, the student shall be able to

1. Perform matrix operations and determine properties such as symmetry and orthogonality using both analytical methods and mathematical software.
2. Solve systems of linear equations and compute eigenvalues and eigenvectors; use computational tools to diagonalise matrices and interpret applications in graphics and data representation
3. Compute derivatives and integrals of algebraic, trigonometric, logarithmic, and exponential functions; implement symbolic and numerical differentiation/integration using software.
4. Calculate first and higher-order partial derivatives of multivariable functions and visualise their behaviour using 2D and 3D plots in computational environments.
5. Determine maxima and minima of functions of one and several variables using analytical techniques and apply numerical methods such as gradient descent in optimization problems.

Syllabus:

Module 1

Algebra of matrices, types of matrices, and matrices of order two and three, Properties of determinants, evaluation of determinants, Adjoint and evaluation of inverse of a square matrix using determinants, orthogonal matrices, symmetric matrices.

Module 2

Rank of matrix, Consistency of system of linear equations and its solution, solution of linear system of equations by using inverse and rank concept, linearly dependent and independent vectors, Eigen values and eigenvectors, Diagonalization of matrices

Module 3

Differentiation: Limits of a function, Differentiability, Differentiation of the sum, difference, product, and quotient of two functions, Differentiation of trigonometric, inverse trigonometric, logarithmic, exponential, composite and implicit functions, definite Integration and Indefinite integration.

Module 4

Partial Differentiation: Partial derivatives, higher order partial derivatives, Euler's Theorem, Deduction of Euler's theorem, Chain rule

Module 5

Application of Derivative: Monotonic increasing and decreasing functions, Maxima, and minima of functions of one variable, Maxima, and minima of functions of several variables, Lagrange's method for finding Maxima and Minima.

Lab Syllabus:

Exp. No.	Name of Experiments
1	To use mathematical software as an advance calculator .
2	2D Plotting and data visualization
3	3D-plotting and data visualization
4	Matrix Computations and Eigenvalue Analysis
5	Linear Algebra with Various applications (computer Graphix , image processing)
6	Differential Calculus Techniques for Modelling Engineering behavior.
7	Applied optimization (Maxima, minima and Gradient descent method)
8	Curve Fitting to identify trends and patterns within dataset .

Textbooks:

1. Thomas Finney, Calculus, Pearson Low price edition, 2018
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,2010.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
6. Paul Zimmermann, Computational Mathematics with Sagemath , siam publisher.

Syllabus: for Semester I, Bachelor of Computer Application

Course Code: 26HS01TP0102

Course: Environmental Science

L: 01 Hrs P: 02 Hr, Per Week

Total Credits: 02

Course Outcome:

After completion of this unit, students would be able to:

1. Explain sustainability principles, climate change impacts, and environmental regulations, and analyze the role of data analytics in addressing global environmental challenges.
2. Apply concepts of green computing and circular economy to evaluate IT infrastructure, e-waste management, and emerging environmental impacts of modern technologies.
3. Apply chemical principles and analytical techniques to safely analyze solutions and environmental samples for sustainable resource management and public health.

Syllabus:

Unit 1: Sustainability & Digital Transformation

Sustainability Engineering: Introduction to the five pillars of sustainability and the 17 UN Sustainable Development Goals (SDGs).

Climate Change & Big Data: The role of data analytics in predicting climate patterns and tracking carbon footprints, Ozone layer depletion, Global warming and Air pollution.

Environment-Related Legislation: Digital compliance, Carbon Credits, Carbon sink, carbon taxes, and international agreements like the Paris Accord in the context of IT industries.

Unit 2: Green Computing & Circular Economy

Green IT Infrastructure: Energy-efficient data centers, green networking, and "Sustainable AI" (reducing the carbon cost of training large models).

E-Waste & Circularity: Life cycle assessment (LCA) of hardware; "Right to Repair" movement, waste management, recycling and circular economy.

Emerging Threats: Environmental impact of mining materials for high-tech devices (Nano-materials & Micro-plastics).

Text Books:

1. Shikha Agrawal, Engineering Chemistry: Fundamentals and Applications, Cambridge University Press.
2. Dr. Rajshree Khare, A Textbook of Engineering Chemistry (AICTE), S.K. Kataria & Sons.
3. S. S. Dara, A Textbook of Engineering Chemistry, S. Chand Publications.
4. M Afshar Alam, Sapna Jain, Hena Parveen, Green Computing Approach Towards Sustainable Development, Wiley Interscience Publications.

Reference Books:

1. E-waste recycling and management: present scenarios and environmental issues, Khan, Anish, and Abdullah M. Asiri. 2019, Springer, Vol. 33. ISBN: 978-3-030-14186-8.
2. Hans-Eckhardt Schaefer, Nanoscience: The Science of the Small in Physics, Engineering, Chemistry, Biology and Medicine, Springer-Verlag Berlin Heidelberg.

List of Experiments:

Any Eight Experiments from the following:

- 1) Safe Handling of Hazardous Chemicals for Sustainable Communities (SDGs: 3, 12, 13)
- 2) Preparation of Standard Solutions for Sustainable Water Chemistry (SDGs: 4, 9)
- 3) Statistical Analysis of Acid–Base Neutralization for Green Decision-Making (Neutralization of acid against base and graph preparation using software) (SDGs: 4, 9, 12, 13)
- 4) Copper Estimation from PCB E-Waste for Resource Recovery (SDGs: 12, 14)
- 5) Chromium Estimation from E-Waste for Water and Health Safety (SDGs: 3, 6, 12)
- 6) Estimation of Fe (II) Ions from E-Waste Rust for Sustainable Resource Management (Fe (II) ions using 1,10-Phenanthroline method) (SDGs: 12, 15, 3, 9)
- 7) Analysis of Beverage Acidity for Consumer Health Safety and Sustainable Production Compliance (Aligns with SDG 3 & 12)
- 8) Determination and Computational Analysis of AQI Data for Indian Cities. (SDG: 3, 11, 13, 9)
- 9) Estimation of Dissolved Oxygen in Wastewater for Clean Water Sustainability. (SDG: 3, 11, 14, 6)
- 10) Data-Driven Modeling of Organic Pollutant Adsorption on Activated Charcoal for Sustainable Wastewater Treatment. (SDG 6,9,12,13)

Suggested Books/Reference Books:

1. S. S. Dara, A Textbook on Experiments and Calculations in Engineering Chemistry, S. Chand Publications.
2. J. B. Yadav, Advanced Practical Physical Chemistry, Krishna's Prakashan Media (P) Limited.
3. J. Elias, Collection of Interesting General Chemistry Experiments, Universities Press Publications.
4. V. K. Ahluwalia, S. Dhingra and A. Gulati, College Practical Chemistry, Universities Press Publications.

Syllabus: for Semester II, Bachelor of Computer Application

Course Code: 26BC18TP0201

Course: Data Structures

L: 4 Hrs P: 2 Hr, Per Week

Total Credits: 5

Course Outcomes:

On successful completion of the course, student shall be able to

1. Apply arrays, sorting, and searching techniques to design solutions for real-world computational problems.
2. Utilize linked list data structures to develop efficient solutions for dynamic data management problems.
3. Implement stack-based mechanisms and select suitable algorithms based on problem requirements and stack properties.
4. Apply queue and tree data structures to model, analyze, and solve computational problems effectively.
5. Analyze problems to identify appropriate graph and hashing techniques, develop algorithms, and implement them in code.

Syllabus:

Unit-I

Introduction to Data Structures: Definition, Concept of data types, Abstract Data Type. Arrays implementation in memory, Types of arrays, Applications of Arrays.

Sorting & Searching: General Background, Different Sorting & Searching Techniques and their complexities.

Unit-II

Linked List - Concept of Linked Lists, Types, Operations on Linked lists, concept of Doubly Linked List, Header Linked List. Applications of Linked List: Reversing and Concatenation of Two Linked Lists.

Unit-III

Stacks: Definition and example, primitive operations on Stacks, Arithmetic expressions - (Infix, Post-fix and Prefix), Evaluating post-fix expression, converting an expression from infix to post-fix, Applications of Stacks.

Unit-IV

Queues - Definition and examples of queues, primitive operations, Types of Queues.

Trees: Definition and Basic Terminology of trees, Binary Tree, Binary Search Tree, Tree Traversal.

Unit-V

Graphs and digraphs: Representations and traversals like Depth First Search Technique and Breadth First Search Technique.

Hashing: Introduction to Hashing, Different Hashing Techniques and Collision Handling Mechanisms.

Text Books:

1. Schaum's Outlines Data structure: Seymour Lipschutz, Tata McGraw Hill 2nd Edition.
2. Classical Data Structure: Samanta, PHI.

3. Data Structures and Program Design: Robert Kruse, PHI.

Reference Books:

1. How to solve it by Computers: R G Dromey, PHI.
2. Science of Programming: David Greece: Springer Verlag New York Pub.
3. Fundamentals of Data Structures: Elis Horowitz, SartajSahani, Galgotia Publications.
4. Data Structures using C/C++: Tanenbaum, PHI.

Lab Syllabus:

Minimum 10 practicals and assignments based on but not limited to the following topics:

1. Abstract Datatypes and Arrays
2. Sorting and Searching Techniques
3. Linked list
4. Stacks
5. Queues
6. Trees
7. Hashing Techniques

Syllabus: for Semester II, Bachelor of Computer Application

Course Code:26BC18TP0202

Course: Object Oriented Programming

L: 4 Hrs, P: 2 Hr, Per Week

Total Credits: 5

Course Outcomes:

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

1. Apply the fundamental concepts of object-oriented programming, including abstraction, encapsulation, inheritance, polymorphism, and the Java execution environment (JDK, JRE, JVM), in developing Java-based applications.
2. Develop the ability to design and implement Java programs using classes and objects, constructors, access specifiers, arrays, wrapper classes, strings, and packages.
3. Apply advanced object-oriented concepts, such as method overloading, inheritance, method overriding, interfaces, abstract classes, and runtime polymorphism for building modular applications.
4. Handle runtime errors effectively and perform file operations, using exception handling mechanisms and Java I/O streams for robust program development.
5. Utilise generics and the collections framework, including ArrayList, TreeSet, HashMap, and iterators, for developing type-safe and efficient applications.

Syllabus:

Unit I:

Features of Object-Oriented Programming languages, Abstraction, Encapsulation, Inheritance, polymorphism, and late binding. Programming paradigms, Bytecode, JDK, JRE, JVM.

Concept of a class and object, ways of representing objects, access specifiers, constructors and functions.

Unit II:

Concept of overloading: Constructor Overloading, Function Overloading.

Arrays and Array of objects, Wrapper classes (Integer, Double etc.), String Class, creating packages, importing packages.

Unit III:

Concept of inheritance, methods of derivation, use of super keyword and final keyword in inheritance, overriding, run time polymorphism, abstract classes and methods, Interface, implementation of interface, static and non-static members.

Unit IV:

Exceptions: Types of exception, use of try-catch block, handling multiple exceptions, using finally, throw and throws clause, user-defined exceptions.

Introduction to streams, byte streams, character streams, file handling in Java.

Unit V:

Generics: type-safety, generic class with two type parameters, bounded generics, wildcard, and generic method.

Collection classes: ArrayList, TreeSet, HashMap, Iterator, ListIterator, Collections class, Comparator, Comparable.

Text Books :

1. Herbert Schildt; JAVA The Complete Reference; Ninth Edition, Tata McGraw- Hill Publishing Company Limited.
2. E. Balagurusamy; Programming with Java; Seventh Edition, Tata McGraw- Hill Publishing Company Limited.

Reference Books :

1. Herbert Schildt and Dale Skrien; Java Fundamentals A Comprehensive Introduction; Tata McGraw- Hill Education Private Ltd, 2013.
2. Core Java Volume I – Fundamentals” by Cay S. Horstmann and Gary Cornell

Lab Syllabus:

Minimum 8 practicals based on but not limited to the following topics in Java Programming Language:

Classes and Objects, Inheritance, Overloading, Polymorphism, Collections, Generics, File Handling

Syllabus: for Semester II, Bachelor of Computer Application

Course Code: 26BC18TP0203

Course: Introduction to Web Programming

L: 2 Hrs, P:2 Hrs, Per Week

Total Credits: 3

Course Outcomes:

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

1. Explain the basic fundamentals of the Internet and the World Wide Web.
2. Describe the architecture and functioning of web servers.
3. Develop web pages using basic HTML markup tags and elements.
4. Design visually appealing and responsive web pages using CSS.
5. Implement interactive and dynamic features in web pages using JavaScript.

Syllabus:

Unit 1:

Basics of Internet and Web The basics of Internet, World Wide Web, Web page, Home page, Web site, Static, Dynamic and Active web page, Overview of Protocols – Simple Mail Transfer Protocol, Gopher, Telnet, Emails, TFTP, Simple Network Management Protocol, Hyper Text Transfer Protocol, Client-server computing concepts.

Unit 2:

Web Client and Web Server, Web Browser, Browsers e.g., Netscape Navigator, Internet Explorer, Mozilla Firefox, ClientSide Scripting Languages- VB Script and JavaScript, Active X control and Plug-ins; Web Server Architecture, Image maps, CGI.

Unit 3 :

Introduction to HTML Introduction to HTML, Essential Tags, Tags and Attributes, Text Styles and Text Arrangements, Text, Effects, Exposure to Various Tags (DIV, MARQUEE, NOBR, DFN, HR, LISTING, Comment, IMG), Color and Background of Web Pages, Lists and their Types, Attributes of Image Tag, Hypertext, Hyperlink and Hypermedia, Links, Anchors and URLs, Links to External Documents, Different Section of a Page and Graphics, Footnote and eMailing, Creating Table, Frame, Form and Style Sheet.

Unit 4 :

Introduction to CSS: Introduction to CSS, Block and Inline Elements, Inline Styles, using internal and external CSS, How CSS rules cascade, inheritance, CSS3 Basics: CSS selectors, Layout and Positioning : Layout: layout with float, fixed width layout, liquid layout, layout grids, images: controlling size of images in CSS, gradients, Media Queries.

Unit 5 :

JavaScript Objects, Methods, Events and Functions, Tags, Operators, Data Types, Literals and Type Casting in JavaScript, Programming Constructs, Array and Dialogue Boxes. DOM Introduction, DOM Methods, DOM Document, DOM Events, JavaScript Window Screen, JavaScript Window Location, JavaScript Window Navigator, JavaScript Popup Boxes

Textbooks:

1. The Complete Reference – HTML & CSS Fifth Edition – Mc Graw Hill.
2. Learning Web Design, 4th Edition by Jennifer Robbins – O'Reilly.

Minimum 8 practical's based on the above Syllabus.

Syllabus: for Semester II, Bachelor of Computer Application

Course Code: 26BC18TH0204

Course: Computer Architecture and Organisation

L: 3 Hrs, P: 0Hr, Per Week

Total Credits: 3

Course Outcomes:

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

1. Explain the basic structure and instruction set architecture of a computer system.
2. Perform arithmetic operations using integer and floating-point representations.
3. Analyze processing unit design, control unit, and performance enhancement techniques.
4. Evaluate memory organisation and hierarchy design.
5. Explain input-output organisation and data transfer mechanisms.

Syllabus:

UNIT I:

Basic Structure of Computers:

Functional units of a computer. Instructions set the architecture of a CPU- Instruction sequencing, addressing modes, and instruction set classification, subroutine & parameter passing, expanding opcode, RISC and CISC, Performance metrics: CPU time, clock cycles, CPI (Cycles Per Instruction), basic performance equation.

UNIT II:

Data Representation & Arithmetic:

Signed number representations and their operations, Overflow and underflow detection, design of Fast Adders, Multiplication- shift and add, booth's Algorithm, bit-pair recoding, Integer Division- restoring and non-restoring division. Floating point numbers: representation, guard bits and rounding, arithmetic.

UNIT III:

Basic Processing & Performance Enhancement:

Bus architecture, Instruction execution cycle, Sequencing of control signals, Hardwired control unit, Microprogrammed control unit, Pipelining: Concept, throughput, speedup, Pipeline hazards: Data hazard, Control hazard, Structural hazard, Introduction to Parallel Computing: SISD, SIMD, MISD, MIMD, Introduction to higher-order and multicore processors

UNIT IV:

Memory System Design:

Semiconductor memories: RAM, SRAM, DRAM, ROM and its types, Memory hierarchy, Cache memory, Mapping techniques (Direct, Associative, Set-associative), Cache performance: Hit ratio, miss penalty, Memory interleaving, Multi-module memory, Introduction to Virtual Memory (basic idea of paging).

UNIT V:

Input/output Organization:

I/O mapped I/O and memories mapped I/O, interrupt and interrupt handling mechanisms, vectored interrupts and Priority Interrupts, synchronous and asynchronous data transfer, Bus Arbitration, Direct Memory Access (DMA).

Text Books :

1. V.C. Hamacher, Z.G. Vranesic and S.G. Zaky; Computer Organisation; 5th edition; McGrawHill,2002.
2. W. Stallings; Computer Organization & Architecture; PHI publication; 2001.
3. J. P. Hayes; Computer Architecture & Organization; 3rd edition; McGraw-Hill; 1998.

Reference Books :

1. M Mano; Computer System and Architecture; PHI publication; 1993.
2. A.S. Tanenbaum; Structured Computer Organization; Prentice Hall of India Ltd.

Syllabus: for Semester II, Bachelor of Computer Application

Course Code:26HS02TH0207 Course: Foundational Literature of Indian Civilization

L: 02 Hrs P: 00 Hr, Per Week

Total Credits: 02

Course outcome:

At the end of the course the students will be able to achieve the following:

1. Understand the Indian knowledge system and its scientific approach
2. Get introduced to the Vedic corpus and recognize the multi-faceted nature of the knowledge contained in the Vedic corpus
3. Understand the salient features of the philosophical systems of the Vedic and non-Vedic schools
4. Develop an understanding about the foundation of Vedic Mathematics

Syllabus:

Unit 1: Overview of Indian Knowledge System: Importance of ancient knowledge, defining IKS, Historicity of IKS, Some unique aspects of IKS.

Unit 2: The Vedic corpus: Introduction of Vedas, four Vedas, divisions of four Vedas, six Vedangas, Distinct features of Vedic life.

Unit 3: Indian Philosophical systems: Development and unique features, Vedic schools of philosophy, *Samkhya* and *Yoga* School of philosophy, *Nayay* and *Vaisesika* school of philosophy, *Purva-mimamsa* and *Vedanta* schools of Philosophy, Non-vedic philosophies: Jainism, Buddhism, and other approaches

Unit 4: Vedic Maths -1: Introduction of Vedic Mathematics, Bodhyan geometry, circular functions, inverse circular functions.

Unit -5: Vedic Maths –2: Multiplication of polynomials by *nikhilam* and *urdhvatiryagbhyam* sutra. Verification by *Gunitasamuccayah*. Division of two polynomials using *parāvartya yojayet*. HCF and LCM of two polynomials using *ādyamādyenāntyamantyena* and *ānurūpyeṇa*. Factorization of polynomials up-to degree 3 using *ānurūpyeṇa*, *Lopasthāpanābhyām*, *ādyamādyenāntyamantyena*.

Text Books :

1. B. Mahadevan, Vinayak Rajat Bhar, Nagendra Pavana R. N., “Introduction to Indian Knowledge System: Concepts and Applications” PHI, 2022
2. S.C. Chatterjee and D.M. Datta, *An introduction to Indian Philosophy*, University of Calcutta, 1984

Syllabus: for Semester II, Bachelor of Computer Application

Course Code: 26HS03TH0218

Course: Foundation of Probability and Statistics

L: 3 Hrs, P: 0 Hr Per Week

Total Credits: 3

Course Outcomes:

On successful completion of the course, student shall be able to

1. Identify and differentiate between discrete and continuous random variables, and interpret probabilities obtained from standard probability distributions.
2. Solve the problems related with binomial, Poisson and normal distributions.
3. Find mean, mode, median, quartiles for analysis of data.
4. Grasp the fundamental concepts of curve fitting like regression techniques, model selection, and the use of different types of curves or functions to approximate data.
5. Understand the fundamental concept of hypothesis testing, significance levels, p-values, and the basic logic behind hypothesis testing.

Syllabus:

Module 1 (8 hours)

Probability of an event, addition and multiplication theorems of probability, conditional probability, independent events, Baye's theorem, random variable, types of random variable and probability distribution of a random variable.

Module 2 (8 hours)

Expectation, Variance, standard deviation, Bernoulli trials, binomial distribution, Poisson distribution and Normal (Gaussian) distribution.

Module 3: (8 Lectures)

Calculation of mean, median, mode of grouped and ungrouped data calculation of standard deviation, variance and mean deviation for grouped and ungrouped data, quartile, interquartile range and methods for finding outliers.

Module 4: (8 hours)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves, correlation and regression – Rank correlation.

Module 5: (8 Lectures)

Sampling Distributions, Point and Interval Estimations, Testing of Hypothesis for single mean and proportion.

Text / Reference Books:

1. M R. Spiegel , Theory and Problems of probability and statistics :,2nded :,Schaum series
2. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
3. Maurtis Kaptein, Statistics for data science, An introduction to probability, statistics and Data Analysis, Springer 2022.
4. Jay L Devore, Probability and Statistics for Engineering and sciences, 8th edition, Cenage learning.