

ITM UNIVERSITY
CENTRE FOR DISTANCE AND ONLINE EDUCATION
PROGRAMME PROJECT REPORT (PPR)
BACHELOR OF COMPUTER APPLICATIONS
BCA – ODL PROGRAMME
THREE-YEAR UNDERGRADUATE DEGREE
PROPOSED SCHEME OF STUDY – 137 CREDITS

Effective from the academic year 2026–27 (Proposed)

ITM University, Gwalior
Centre for Distance and Online Education


DIRECTOR
Centre for Distance and
Online Education (CDOE)
ITM University Gwalior

PROGRAMME PROJECT REPORT (PPR)

I. Programme Profile

S. No.	Particulars	Proposed Details
1	Degree Awarding Body	ITM University, Gwalior
2	Teaching Institution	ITM University, Gwalior; Centre for Distance and Online Education (CDOE)
3	Name of the Programme	Bachelor of Computer Applications (BCA)
4	Mode of Delivery	Open and Distance Learning (ODL)
5	Minimum Duration	3 Years / 6 Semesters
6	Maximum Duration	As per applicable University regulations
7	Minimum Eligibility	As per approved University admission regulations; detailed criteria subject to institutional confirmation
8	Programme Credits	137
9	Programme Level	Undergraduate / Bachelor's
10	Nature of Target Group	Learners seeking flexible education in computer applications
11	Nature of Programme	Professional / Undergraduate
12	Board of Studies Approval	02 March 2026
13	Academic Council Approval	47th Academic Council, 01 June 2026

Implementation is subject to completion of the prescribed statutory process and applicable regulatory recognition. Programme-specific approval records and operating provisions remain subject to institutional confirmation.

II. Programme Mission and Objectives

The BCA (ODL) programme seeks to make quality education in computer applications accessible to learners who need flexibility in place and pace of study. The programme is intended to develop sound computing fundamentals together with practical programming ability, problem-solving skills and confidence in using contemporary digital technologies. Its design gives particular importance to guided practice, projects and sustained academic support so that distance learners can progressively build both conceptual understanding and application skills.

- Provide learners with a firm grounding in computing, programming, databases, operating systems, networks and software development.
- Develop practical ability through programming exercises, guided laboratory work, project-based learning, mini/major projects and internship or training experiences.
- Give learners meaningful exposure to contemporary areas such as artificial intelligence, machine learning, cloud computing, data analytics, cyber security, digital forensics and full-stack development.
- Strengthen quantitative reasoning, communication, entrepreneurship, professional ethics, civic awareness and workplace readiness.
- Prepare learners for entry-level roles in the IT and digital-services sector and create a sound academic base for MCA and other postgraduate study.
- Encourage independent study habits and lifelong learning, which are especially important for learners studying through ODL.

III. Relevance of the Programme with the HEI's Mission and Goals

The proposed BCA (ODL) is aligned with the University's objective of extending higher-education opportunities through technology-enabled and learner-centred approaches. It offers a flexible route for learners who may not be able to participate in a conventional full-time programme, while retaining the academic breadth expected of a degree in computer applications. The curriculum combines computing foundations with application-oriented courses, communication and quantitative skills, multidisciplinary exposure, projects and emerging technologies.

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CDOE, ITM University, Programme Project Report – BCA ODL

IV. Nature of Prospective Target Group of Learners

- 10+2/equivalent qualified learners seeking a degree in computer applications.
- Working learners and learners requiring flexible study schedules.
- Learners from rural, semi-urban and geographically dispersed locations.
- Learners seeking reskilling/upskilling in programming, web technologies, databases, cloud, data analytics and cyber security.
- Learners intending to pursue MCA or other postgraduate programmes in computing and allied areas.

V. Appropriateness of the Programme to be Conducted in Online Mode

The programme is proposed in Open and Distance Learning (ODL) mode, supported by online teaching and learning resources. Online resources complement self-study, academic counselling and supervised practical assessment within the proposed ODL delivery arrangements.

Computer applications can be taught effectively through ODL when practical learning is planned as carefully as theory. Accordingly, the programme is envisaged as more than a collection of study materials. Learners will work with self-learning material and LMS resources, participate in academic counselling, undertake guided programming and practical activities, complete assignments and projects, and appear in the prescribed theory and practical examinations. Wherever appropriate, virtual or remote tools may supplement scheduled supervised practical work. This blended academic design is intended to provide the structure and interaction that computing learners require while preserving the flexibility of ODL.

Learning Need	ODL Design Response
Conceptual foundations	Unitised SLM, recorded explanations, live academic counselling, discussion forums and self-assessment.
Programming competence	Guided lab manuals, code demonstrations, LMS exercises, practical counselling and supervised practical evaluation.
Problem solving	Assignments, PBL, case problems, quizzes and mini projects.
Professional application	Internship/training, project work, viva voce and portfolio/report evaluation.
Learner isolation	Induction, mentor/counsellor support, announcements, discussion forums, scheduled interaction and grievance channels.

VI. Programme Outcomes (PLOs)

PLO 1: Apply fundamental knowledge of computer applications, programming, databases, operating systems, networks and software systems.

PLO 2: Analyse computing problems and develop algorithmic and data-driven solutions.

PLO 3: Design and implement web, database and software applications using appropriate tools and programming languages.

PLO 4: Use foundational concepts of AI/ML, cloud, analytics, cybersecurity and digital forensics in appropriate contexts.

PLO 5: Demonstrate programming, testing, debugging, documentation and project-development skills.

PLO 6: Communicate technical ideas effectively and work responsibly in teams/projects.

PLO 7: Recognise cyber ethics, civic responsibilities, privacy, security and professional conduct.

PLO 8: Engage in self-directed learning and adapt to rapidly changing computing technologies.

The curriculum is designed to support progression towards entry-level opportunities in software and web development, application and IT support, testing, database-related work, data and analytics support, cloud/cybersecurity support and digital operations. It also provides a foundation for entrepreneurship and for further study, particularly MCA and allied postgraduate programmes. These are intended progression pathways; individual employment outcomes will depend on the learner's competence, experience and prevailing opportunities.


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VII. Instructional Design

Course Curriculum

The Bachelor of Computer Applications is structured as a three-year programme of six semesters. The proposed ODL curriculum progresses from computing foundations and programming to databases, networking, data analytics, cloud computing, machine learning, cyber security, professional communication, projects and supervised internship/training.

L = Lecture, T = Tutorial and P = Practical/Project periods. Learning-hour allocations are subject to the University's approved ODL credit framework.

Learning Materials

- Self-Learning Material: programme-specific print/digital SLM written in self-instructional style with learning objectives, examples, activities, check-your-progress questions, summaries, glossary and references.
- LMS/e-learning: course pages containing e-SLM, presentations, recorded lectures/demonstrations, quizzes, assignments, discussion forums, announcements and supplementary web resources.
- Academic counselling: scheduled synchronous sessions by qualified faculty/academic counsellors, with additional doubt-clearing and asynchronous support.
- Practical learning: structured lab manuals, coding exercises, virtual/remote tools where appropriate, scheduled supervised practical sessions and practical examinations.
- Project-based learning: logic-building project, mini project, minor project, major project and internship/training supported through defined milestones, supervision and viva.
- Engagement monitoring: attendance/participation records for counselling and practical sessions, LMS activity, assignment submission and learner progression data.
- Before counselling: study the assigned SLM unit, attempt embedded self-check questions and note doubts.
- During counselling: concept clarification, worked examples/case discussion and guided problem solving.
- After counselling: complete the LMS quiz/activity and submit the prescribed assignment/lab evidence.
- End of module: attempt a cumulative self-test and review feedback before moving to the next module.

The course learning cycle applies to every course in the detailed syllabus. The Programme Coordinator should verify the availability, academic suitability and accessibility of supplementary MOOC, OER and video resources before each offering. Credit transfer is subject to approved University provisions.

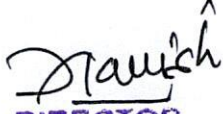
Academic Review

The Programme Coordinator, course faculty and CIQA should review the curriculum, self-learning materials, practical support and assessment evidence periodically. Learner, alumni and industry feedback should inform documented revisions.

Outcome-Based Approach

Course outcomes should be mapped to programme outcomes and assessed through theory, practical and project evidence. Attainment analysis and learner feedback should inform corrective action in subsequent offerings.

Element	ODL Requirement
Course orientation	Welcome note, prerequisites, course map, assessment plan, study schedule and support contacts.
SLM	Module/unit-wise self-learning text with examples, activities, self-checks, summaries and answer guidance.
Video	Prefer short 8–15 minute concept/demonstration videos, captioned where possible, plus selected SWAYAM/NPTEL resources.
Interaction	At least one purposeful discussion/problem clinic per module and scheduled doubt-clearing.
Assessment	Low-stakes quizzes + authentic assignment/lab/project work + term-end assessment as approved.
Practical support	Install/setup guide, lab manual, datasets/code, troubleshooting FAQ and supervised practical evaluation.
Accessibility	Readable PDFs, alt text for meaningful images, captions/transcripts where feasible, keyboard-friendly LMS content.
Academic integrity	Citation guidance, plagiarism/code-similarity expectations, permitted AI-tool use and viva/authentication where relevant.


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VIII. Programme Structure: Bachelor of Computer Applications (3 Years)

Semester I

Course Code	Course Title	Lecture	Tutorial	Practical	Credit
BCAOL 101	Fundamentals of Information Technology	3	0	0	3
BCAOL 102	Web Technology	0	0	4	2
BCAOL 103	Python Programming	0	0	6	3
BCAOL 104	Communication Skills	2	0	2	3
BCAOL 105	Mathematics for Computing	4	0	0	4
BCAOL 106	Digital Productivity Tools	0	0	4	2
BCAOL 107	Aptitude & Reasoning Skills-I	3	0	0	3
Semester Total		12	0	16	20

Semester II

Course Code	Course Title	Lecture	Tutorial	Practical	Credit
BCAOL 201	Programming in C	3	0	4	5
BCAOL 202	Introduction to Artificial Intelligence	3	0	0	3
BCAOL 203	Database Management System	3	0	2	4
BCAOL 204	Probability & Statistics	3	0	0	3
BCAOL 205	Professional Communication Skills-I	2	0	2	3
BCAOL 206	PBL-2: Logic Building Project	0	0	2	1
BCAOL 207	Cyber Ethics & Digital Society	2	0	0	2
Semester Total		16	0	10	21

IX. Semester-wise Scheme of Study – Semesters III and IV

Semester III

Course Code	Course Title	Lecture	Tutorial	Practical	Credit
BCAOL 301	Object-Oriented Programming with Java	3	0	4	5
BCAOL 302	Data Structure & Algorithms	3	0	4	5
BCAOL 303	PBL-3: Mini Project	0	0	4	2
BCAOL 304	Digital Computer Principles	3	0	0	3
BCAOL 305	Entrepreneurship Development	2	0	0	2
BCAOL 306	Operating System	3	0	2	4
BCAOL 307	Indian Constitution & Civic Values	2	0	0	2
Semester Total		16	0	14	23

Semester IV

Course Code	Course Title	Lecture	Tutorial	Practical	Credit
BCAOL 401	Full Stack Development	0	0	6	3
BCAOL 402	Computer Network	4	0	2	5
BCAOL 403	Data Warehousing and Mining	3	0	4	5
BCAOL 404	Cyber Security & Ethical Hacking	3	0	2	4
BCAOL 405	Data Analysis using Python	0	0	6	3
BCAOL 406	Aptitude & Reasoning Skills-II	2	0	0	2
BCAOL 407	Minor Project	0	0	4	2
Semester Total		12	0	24	24



X. Semester-wise Scheme of Study – Semesters V and VI

Semester V

Course Code	Course Title	Lecture	Tutorial	Practical	Credit
BCAOL 501	Machine Learning	4	0	2	5
BCAOL 502	Cloud Computing	3	0	4	5
BCAOL 503	Elective-I	3	0	4	5
BCAOL 504	Advanced Soft Skills & Leadership	3	0	2	4
BCAOL 505	Internship-II*	0	0	4	2
BCAOL 506	Digital Marketing	0	0	6	3
Semester Total		13	0	22	24

Semester VI

Course Code	Course Title	Lecture	Tutorial	Practical	Credit
BCAOL 601	Software Project Management	3	0	4	5
BCAOL 602	Digital Forensics	3	0	0	3
BCAOL 603	Elective-II	3	0	4	5
BCAOL 604	Professional Communication Skills-II	3	0	0	3
BCAOL 605	Making of Modern India	2	0	0	2
BCAOL 606	Major Project-Phase 1	0	0	10	5
BCAOL 607	Internship / Training-I*	0	0	4	2
Semester Total		14	0	22	25

* Internship-II (Semester V) and Internship / Training-I (Semester VI) retain the proposed course titles. Their numbering and sequence remain subject to confirmation by the competent academic authority.

Credit Summary

Semester	Credits
I	20
II	21
III	23
IV	24
V	24
VI	25
Programme Total	137

XI. Discipline Specific Elective (DSE) Basket

DSE	Code	Course	Credit
Elective-I	BCAOL 503A	Mobile Application Development	5
Elective-I	BCAOL 503B	Data Analytics	5
Elective-I	BCAOL 503C	Data Visualization Tools	5
Elective-II	BCAOL 603A	Cyber Law	5
Elective-II	BCAOL 603B	Image Processing	5

Learners select one option from each elective basket. Offerings are subject to academic approval and the availability of learning materials, faculty and practical resources.

Other Approved Learning Opportunities

Semester	Component	L	T	P	Credits / Status
I	NCC-0101 – NCC	1	0	2	*2 optional
II	IKS-0202 – IKS				*2 audit/optional
II	NCC-0202 – NCC	1	0	2	*2 optional
III	NCC-0303 – NCC	1	0	2	*2 optional
IV	IKS-0404 – IKS				*2 audit/optional
IV	NCC-0404 – NCC	1	0	2	*2 optional
V	NCC-0505 – NCC	1	0	2	*2 optional
VI	IKS-0606 – IKS				*2 audit/optional
VI	NCC-0606 – NCC	1	0	2	*2 optional

NCC and IKS are optional/audit components and are excluded from the 137 base credits unless approved as award requirements.

XII. Faculty and Support Staff

Programme delivery requires qualified faculty, academic counsellors, project supervisors, technical staff and administrative support. Individual appointments and staffing allocations are subject to the approved University plan.

Staff Category	Proposed Requirement
Programme Coordinator	Academic planning, course coordination, learner support and monitoring.
Faculty / Course Coordinator	SLM/e-content development, counselling, assessment and course review.
Academic Counsellor	Learner interaction, doubt resolution, tutorials and practical guidance.
Lab/Technical Staff	Programming environment, LMS and practical-session support.
Project Supervisor	Project approval, milestones, mentoring and evaluation.
Administrative/Support Staff	Admissions, records, communication, examinations and grievances.

XIII. Delivery Mechanism

Before each semester begins, the CDOE will publish an academic calendar that gives learners a clear sequence of study and academic activities. Self-paced learning will be supported by scheduled interaction, and courses with a substantial practical component will receive additional laboratory or guided digital support. Projects and internships will be monitored through defined stages so that learners receive feedback during the work rather than only at final evaluation.

Stage	Illustrative Activity
Before semester	Registration, induction, SLM/LMS release, learner handbook
Weeks 1–6	Self-study, counselling, practical guidance, formative activities
Weeks 7–10	Assignments/internal assessment, practical sessions, learner analytics
Weeks 11–14	Advanced units, project/PBL milestones, revision and doubt clearing
End of semester	Term-end theory/practical examination, project viva where applicable
Post examination	Results, grievance/revaluation process, progression counselling

- Pre-admission counselling and transparent programme information
- Learner induction/orientation
- Programme coordinator and course-wise academic counselling
- Academic calendar and timely SLM/LMS access
- Assignment and practical support
- Project/internship supervision
- Library and digital-resource support
- Examination information and result support
- Grievance redressal and escalation mechanism
- Support for learners with disabilities as per applicable policy
- Alumni/progression and career guidance where available

Medium of Instruction: English; approved academic support may be supplemented bilingually.




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XIV. Procedure for Admissions, Curriculum Transaction and Evaluation

Admission Procedure

Admission, document verification, reservation and refund provisions shall follow the approved University admission policy and applicable regulatory requirements.

Duration of the Programme

The normal duration is 3 academic years divided into 6 semesters. The maximum completion period is governed by the approved University regulations.

Eligibility

Eligibility for applicants with 10+2 or an equivalent qualification is governed by the approved University admission regulations. The detailed qualifying criteria remain subject to institutional confirmation.

Fee Structure

Fees and refund provisions are governed by the approved University fee notification. Programme-specific fee amounts remain subject to institutional confirmation.

Credit System

The programme comprises 137 credits across 6 semesters. The semester schemes specify the course-wise lecture, tutorial and practical/project components. Learning-hour equivalence is subject to the approved University framework.

Evaluation

The proposed scheme for Semesters I-VI follows a 70:15:15 distribution for End-Term Evaluation, Mid-Term Evaluation and ABC Evaluation in theory courses, with a comparable 70:15:15 pattern for practical/PBL components wherever shown. For ODL delivery, these components should be administered in accordance with the University's approved ODL examination and continuous-assessment provisions, with suitable learner-authentication and practical/project evaluation mechanisms.

Component	ODL Implementation
Continuous/Internal Assessment	Assignments, quizzes, PBL, case work, practical records, project milestones and other approved academic activities.
Term-End Theory Examination	Conducted through approved examination centres/processes under University control.
Practical Examination	Supervised practical performance, lab record and viva, as applicable.
Project/Internship	Report/portfolio, supervisor assessment where applicable, presentation and viva voce.
Pass/Promotion Rules	As per the approved University examination ordinance.

Proposed Assessment Components

Course Type	Recommended Evidence
Theory	Two or more of: assignment/case/problem set, LMS quiz, discussion task, short presentation; weightage as approved.
Theory + Practical	Concept assignment/quiz plus lab record/coding task and supervised practical assessment.
Pure Practical	Lab portfolio, practical tasks, mini application/dashboard, practical viva.
PBL / Project	Proposal, design artefact, milestone reviews, repository/artefact, report, presentation and viva.
Internship / Training	Learning agreement, logbook, mentor/supervisor feedback, report, presentation and viva.

The semester will be organised around a planned cycle of self-study, academic counselling, practical work, assignments/PBL and project activity. Learners will receive an academic calendar indicating the availability of SLM and LMS resources, counselling schedules, assessment windows, practical sessions, project milestones and examination dates. This will allow learners to plan their study while giving the CDOE a clear framework for monitoring academic progress.

XV. Requirement of Laboratory Support and Library Resources

As BCA is an application-oriented programme, the quality of practical support is central to its ODL design. The University should therefore maintain clear evidence of the computing, software, connectivity, LMS and library resources available to enrolled learners, together with a documented plan for conducting and assessing practical work.

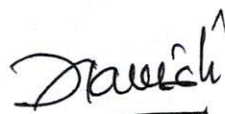
Resource	Minimum Planning Provision in PPR
Computing facilities	Adequate networked computers at Headquarters/approved learner support arrangements, licensed/open-source software and internet connectivity.
Programming stack	C/C++, Python, Java/JDK, DBMS, web development stack, data-analysis tools and other course-specific software.
LMS	Authenticated learner access, content hosting, assignment submission, quizzes, forums, announcements and activity records.
Digital/physical library	Core textbooks, reference books, e-books/e-journals, databases and remote-access arrangements as available.
Practical support	Lab manuals, datasets, sample code, guided demonstrations and scheduled practical counselling/evaluation.
Technical helpdesk	Support for LMS access, passwords, software installation guidance and digital submission issues.

XVI. Cost Estimate of the Programme and Provisions

The programme budget should provide for learning materials, academic delivery, technology, learner support, assessment and quality assurance. Amounts and total allocations remain subject to approval under the University's financial provisions.

Cost Head	Proposed Provision
SLM writing, editing, review and production	Subject to approved institutional budget
E-content / audio-video production	Subject to approved institutional budget
LMS hosting, software and technical support	Subject to approved institutional budget
Faculty / academic counselling	Subject to approved institutional budget
Practical / laboratory support	Subject to approved institutional budget
Learner support and communication	Subject to approved institutional budget
Library and digital resources	Subject to approved institutional budget
Examination and evaluation	Subject to approved institutional budget
Quality assurance / CIQA / academic audit	Subject to approved institutional budget
Administration and contingency	Subject to approved institutional budget
Total Estimated Cost	Subject to approved institutional budget

The financial plan should demonstrate that the programme can sustain good-quality SLM and e-content, academic counselling, practical support, learner services, technology, assessment, quality assurance and periodic revision throughout the period of delivery.



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XVII. Quality Assurance Mechanism

CIQA will review the programme as an integrated academic system: curriculum and syllabus, SLM/e-learning content, counselling and learner engagement, assessment practices, practical/project delivery, learner feedback and outcome data. Findings should lead to documented action-taken measures and periodic revision of course content and learning resources.

- PPR approval through the prescribed statutory process before launch.
- Course design and SLM review by subject experts and instructional-design/editorial review.
- CIQA oversight of ODL processes, learner support, assessment and programme review.
- Periodic curriculum review with stakeholder, learner, alumni and industry inputs as applicable.
- Monitoring of learner participation, assignment completion, examination performance, progression and completion.
- Academic audit of counselling, practical sessions, project supervision and evaluation.
- Feedback-based corrective action with documented action-taken reports.
- Periodic updating of SLM/e-content to reflect changes in computing technologies and tools.
- Compliance review against UGC-DEB requirements before every admission cycle.

Programme monitoring will be an ongoing academic process rather than an end-of-cycle exercise. The Programme Coordinator and CDOE should review enrolment, learner participation, assignment and practical completion, examination performance, progression, grievances, feedback and completion data each semester. Findings should be placed before the CIQA and other appropriate academic bodies so that gaps in content, delivery or learner support can be addressed in a documented manner.

- Map every internal and term-end assessment item to one or more COs.
- Calculate direct CO attainment from assessment performance using University-approved thresholds.
- Use indirect evidence such as course-exit feedback only as supplementary evidence.
- Discuss weak CO attainment in the programme/course review meeting and record corrective action for the next offering.
- Maintain CO-PO mapping and attainment sheets as CIQA/academic-audit evidence.
- Use learner-specific lab records, source files/notebooks and timestamps/version history where available.
- Conduct supervised practical examinations and/or viva voce for practical/project courses.
- Require project learners to maintain milestone evidence and supervisor review records.
- Use plagiarism/code-similarity checks judiciously and verify authorship through demonstration/viva rather than relying on a similarity score alone.
- Define permitted and prohibited uses of generative AI in assignments, coding and reports in the learner handbook and each course brief.

The CDOE should issue a programme-level academic integrity statement covering plagiarism, collusion, contract cheating, code copying, citation, use of external tools and generative AI. Course coordinators should state what AI assistance is permitted for each assessment. High-stakes project/coding work should be authenticated through oral questioning, demonstrations, version history and/or supervised practical assessment.

Approval records, course and SLM reviews, faculty deployment, practical arrangements and CIQA action-taken reports should be maintained as programme evidence. Detailed eligibility, fees, staffing, budget, learning-hour allocations and examination rules remain subject to institutional confirmation.

The distinct proposed codes BCAOL 403 (Data Warehousing and Mining) and BCAOL 404 (Cyber Security & Ethical Hacking), together with the internship numbering, remain subject to confirmation by the competent academic authority.




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XVIII. NEP 2020 / Multiple Entry-Exit Context

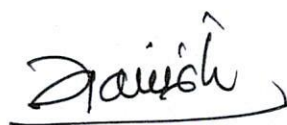
This PPR covers the 3-year, 6-semester BCA award. Any extension, re-entry or progression beyond this six-semester programme requires separate approved nomenclature, curriculum, credit requirements and statutory authorisation.

Any multiple-entry, exit, re-entry or credit-transfer arrangement shall be governed by the applicable approved University provisions. No additional exit award is assumed under this proposal.

XIX. Annexure – Programme Credit Summary

Semester	Focus Area	Credits
I	Fundamentals of IT; Web Technology; Python Programming; Communication Skills; Mathematics for Computing; Digital Productivity Tools; Aptitude & Reasoning-I	20
II	Programming in C; Introduction to AI; DBMS; Probability & Statistics; Professional Communication-I; Logic Building Project; Cyber Ethics & Digital Society	21
III	OOP with Java; Data Structures & Algorithms; Mini Project; Digital Computer Principles; Entrepreneurship; Operating System; Indian Constitution & Civic Values	23
IV	Full Stack Development; Computer Network; Data Warehousing & Mining; Cyber Security & Ethical Hacking; Data Analysis using Python; Aptitude-II; Minor Project	24
V	Machine Learning; Cloud Computing; Elective-I; Advanced Soft Skills & Leadership; Internship-II*; Digital Marketing	24
VI	Software Project Management; Digital Forensics; Elective-II; Professional Communication-II; Making of Modern India; Major Project-Phase 1; Internship/Training-I*	25
Total	3-Year BCA	137

END OF PROGRAMME PROJECT REPORT


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BCA – SEMESTER I

Course Code	Course	L-T-P	Credits
BCAOL 101	Fundamentals of Information Technology	3-0-0	3

Semester / Category: I / CC | Mode: ODL

Course Objective:

Introduce learners to computing concepts and terminology. Build digital-system literacy required for later BCA courses. Develop awareness of networks, Internet, security and emerging technologies.

Course Outcomes:

- CO1. Understand the architecture and role of information technology systems.
 CO2. Explain data representation, hardware, software, operating systems and networks.
 CO3. Use common digital services safely and effectively.
 CO4. Relate emerging technologies to contemporary computing applications.

Course Content:

Module	Content
Module 1: Computing Foundations	Evolution and generations of computers; functional units; CPU, memory and I/O; number systems and data representation; computer classification; performance concepts. Topics include: Binary, octal and hexadecimal representation; bits/bytes/words; CPU registers, cache and memory hierarchy; input-output interfaces; primary vs secondary storage; computer performance measures and common peripheral devices.
Module 2: Software and Operating Systems	System/application software; translators; operating-system functions; files and processes; utilities; open-source software; software licensing. Topics include: Compiler, interpreter, assembler and linker; process and file concepts; GUI/CLI; device drivers; utilities; software installation/update; open-source vs proprietary licensing; basic backup and recovery.
Module 3: Data Communication and Internet	Communication components; LAN/WAN; Internet, web, browsers, search, e-mail, cloud services; basic protocols; digital collaboration. Topics include: OSI/TCP-IP awareness; IP address and DNS concepts; browser-server interaction; HTTP/HTTPS; e-mail protocols; search strategies; cloud storage/collaboration; safe browsing and password hygiene.
Module 4: Digital Society and Emerging IT	Cyber hygiene, privacy, digital identity, e-governance; overview of AI, IoT, cloud, blockchain, data analytics and green computing. Topics include: Digital identity and footprint; privacy and consent; phishing/social engineering awareness; e-governance and digital payments; AI/ML, IoT, cloud, blockchain and data analytics; accessibility and green computing.
Module 5: Systems Integration and Case Analysis	Application of the major concepts to an integrated computing scenario; comparison of alternatives; performance, reliability, security and maintainability considerations; structured case analysis and problem-solving exercises. Topics include: Integrated case analysis of a personal/organizational computing system; hardware-software-network interdependence; reliability, security, performance, maintainability and sustainability trade-offs; structured troubleshooting.

Assessment activities:

Create a labelled block diagram of a computer and explain data flow. • Compare three operating systems and recommend one for a stated use case. • Prepare a digital-safety checklist and analyse a phishing scenario.

Recommended Books

P.K. Sinha & Priti Sinha, Computer Fundamentals, BPB.

V. Rajaraman, Fundamentals of Computers, PHI.

Digital learning resources: NPTEL/SWAYAM: introductory Computer Science / Computer Fundamentals offerings; use the current approved SWAYAM catalogue. NPTEL introductory computing lectures; CEC/SWAYAM digital-literacy videos.




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BCA – SEMESTER I

Course Code	Course	L-T-P	Credits
BCAOL 102	Web Technology	0-0-4	2

Semester / Category: I / CC | Mode: ODL

Course Objective:

Develop practical web-authoring competence. Introduce responsive and accessible front-end design. Build confidence through guided hands-on tasks suitable for ODL learners.

Course Outcomes:

CO1. Create standards-based web pages using HTML and CSS.

CO2. Use responsive layouts, forms and client-side scripting.

CO3. Apply basic accessibility and usability principles.

CO4. Publish and test a small multi-page website.

Course Content:

Module	Content
Module 1: Web Foundations	Internet and WWW; client-server model; URLs, HTTP/HTTPS; browsers and developer tools; HTML document structure; semantic HTML. Topics include: HTTP request-response cycle, status codes and headers; semantic HTML5 structure; hyperlinks, lists, tables, forms, media elements; browser developer tools; accessibility landmarks and basic ARIA awareness.
Module 2: Styling	CSS syntax, selectors, box model, typography, colours, positioning, flexbox/grid; responsive design and media queries. Topics include: CSS cascade, inheritance and specificity; box model; typography; positioning; Flexbox and Grid; responsive breakpoints; media queries; responsive images; reusable classes and component-like styling.
Module 3: Client-side Interaction	JavaScript basics; variables, operators, control structures, functions, arrays; DOM selection and manipulation; events; form validation. Topics include: JavaScript data types, scope, operators, control structures, functions, arrays/objects; DOM traversal/manipulation; events and event propagation; form validation; local storage awareness; debugging with console tools.
Module 4: Web Quality and Deployment	Accessibility basics, usability, cross-browser testing, debugging, performance basics, hosting/deployment and version-control awareness. Topics include: Cross-browser compatibility; usability heuristics; accessibility checks; performance basics; asset optimization; version-control awareness; deployment/hosting concepts; web security basics including HTTPS, input validation and XSS/CSRF awareness.
Module 5: Integrated Digital Portfolio	Application of the tools and techniques through an integrated portfolio task; quality checks, accessibility, collaboration/version control where relevant, documentation and demonstration of the finished digital artefact. Topics include: Integrated multi-page or single-page portfolio; requirement interpretation; navigation design; responsive testing; accessibility validation; code organization; deployment checklist; documentation and demonstration.

Assessment activities:

Build a semantic personal profile page. • Create a responsive three-page website using Flexbox/Grid. • Implement JavaScript form validation and DOM interaction.

Practical and project work:

HTML/CSS page creation • responsive layout • JavaScript DOM • forms • final mini-site.

Recommended Books

Jon Duckett, HTML & CSS: Design and Build Websites, Wiley.

Jennifer Robbins, Learning Web Design, O'Reilly.

Digital learning resources: SWAYAM/NPTEL: Web Technology / Internet Technology courses; select current semester offering. NPTEL web technology lectures; MDN Web Docs learning videos/resources.


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BCA – SEMESTER I

Course Code	Course	L-T-P	Credits
BCAOL 103	Python Programming	0-0-6	3

Semester / Category: I / CC | Mode: ODL

Course Objective:

Build programming logic through an accessible first language. Develop reusable, readable and testable code. Prepare learners for data analysis, AI and later application courses.

Course Outcomes:

CO1. Write correct Python programs using core language constructs.

CO2. Use functions, collections, files, modules and exceptions.

CO3. Apply object-oriented and problem-solving techniques.

CO4. Test and debug small Python applications.

Course Content:

Module	Content
Module 1: Python Basics	Python environment; variables, data types, expressions, input/output; decisions; loops; tracing and debugging. Topics include: Python interpreter/IDE/notebook environment; variables, dynamic typing, numeric/string/Boolean types; operators and precedence; formatted input/output; conditional statements; loops; tracing and debugging.
Module 2: Collections and Functions	Strings, lists, tuples, sets, dictionaries; functions; parameters; recursion basics; comprehensions. Topics include: Lists, tuples, sets and dictionaries; indexing/slicing; mutability; nested collections; functions, parameters, return values, scope, recursion basics, comprehensions and lambda awareness.
Module 3: Files, Modules and Exceptions	Text/CSV files; modules and packages; exception handling; standard library; virtual environments awareness. Topics include: Text/CSV/JSON file handling; pathlib/os basics; modules/packages; imports; standard library; exception hierarchy; try/except/else/finally; custom exceptions; virtual environments and package management awareness.
Module 4: OOP and Applied Python	Classes, objects, inheritance basics; simple problem-solving patterns; testing basics; introductory use of libraries. Topics include: Classes, objects, constructors, instance/class attributes, encapsulation, inheritance and polymorphism basics; regular expressions awareness; testing, logging and reusable module design.
Module 5: Integrated Application Development	Integration of course concepts through a small application; coding standards; testing and debugging; version/documentation practices; security and accessibility considerations where relevant; demonstration and reflective review. Topics include: Small application integrating collections, files and OOP; coding standards, docstrings, validation, exception handling, test cases, version/documentation practice and reflective debugging.

Assessment activities:

Trace and correct five short Python programs. • Write a menu-driven data-processing program. • Build a small file-based application with exception handling.

Practical and project work:

Expressions • control flow • collections • functions • files • exceptions • classes • mini application.

Recommended Books

Allen B. Downey, Think Python, O'Reilly.

Reema Thareja, Python Programming Using Problem Solving Approach, Oxford.

Digital learning resources: NPTEL/SWAYAM: The Joy of Computing using Python / Programming, Data Structures and Algorithms Using Python. NPTEL Python programming lecture series and demonstrations.


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BCA – SEMESTER I

Course Code	Course	L-T-P	Credits
BCAOL 104	Communication Skills	2-0-2	3

Semester / Category: I / SEC | Mode: ODL

Course Objective:

Strengthen language and professional communication. Develop confidence for remote collaboration and interviews. Integrate written and oral communication with computing contexts.

Course Outcomes:

CO1. Communicate clearly in academic and workplace contexts.

CO2. Read, summarise and present technical information.

CO3. Write professional e-mail, reports and résumés.

CO4. Demonstrate effective listening, speaking and presentation skills.

Course Content:

Module	Content
Module 1: Foundations	Communication process, barriers, listening, vocabulary, grammar in context, reading strategies. Topics include: Communication process and models; sender-receiver-feedback; barriers; active listening; reading for gist/detail; vocabulary building; grammar in context; note-taking and summarisation.
Module 2: Academic and Technical Writing	Paragraphs, summaries, notes, e-mail, notices, instructions, short technical descriptions and reports. Topics include: Paragraph cohesion; professional e-mail; memo, notice, agenda and minutes; instructions; technical descriptions; summaries and short reports; tone, clarity and reader-centred organization.
Module 3: Oral Communication	Conversation, group discussion, meetings, telephone/video-call etiquette, pronunciation, non-verbal communication. Topics include: Conversation management; pronunciation and fluency; non-verbal communication; group discussion; meetings; telephone/video-call etiquette; active participation and respectful disagreement.
Module 4: Employability Communication	Résumé, cover letter, interview, presentation planning, visual aids, online professional identity and netiquette. Topics include: Résumé and cover letter; interview preparation; STAR responses; presentation planning; slide hierarchy; visual aids; voice modulation; Q&A handling; online professional identity and netiquette.
Module 5: Integrated Professional Communication Practice	Application through workplace scenarios, presentation/interview tasks, collaborative communication, peer feedback, digital professionalism and reflective improvement using a structured rubric. Topics include: Integrated workplace simulation involving e-mail, meeting, short report and presentation; peer feedback; self-evaluation rubric; cross-cultural and inclusive communication; reflective improvement plan.

Assessment activities:

Write and peer-review a professional e-mail. • Record a 3-minute technical explanation and self-evaluate using a rubric. • Prepare a résumé and mock interview response set.

Practical and project work:

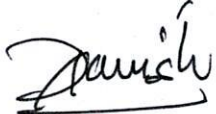
Listening tasks • presentation recording • GD simulation • résumé and interview practice.

Recommended Books

Meenakshi Raman & Sangeeta Sharma, Technical Communication, Oxford.

T.N. Chhabra, Business Communication, Sun India.

Digital learning resources: SWAYAM/NPTEL: Developing Soft Skills and Personality / Technical English offerings. NPTEL soft-skills and communication lecture series.


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BCA – SEMESTER I

Course Code	Course	L-T-P	Credits
BCAOL 105	Mathematics for Computing	4-0-0	4

Semester / Category: I / MD | Mode: ODL

Course Objective:

Provide mathematical foundations for computer applications. Develop logical and abstract reasoning. Prepare learners for algorithms, statistics and data-oriented courses.

Course Outcomes:

CO1. Apply set, relation and function concepts to computing problems.

CO2. Use logic and proof techniques in elementary contexts.

CO3. Solve problems involving matrices, combinatorics and recurrence.

CO4. Model basic computing situations mathematically.

Course Content:

Module	Content
Module 1: Sets, Relations and Functions	Sets, operations, Cartesian products, relations, equivalence/partial order, functions, composition, inverse. Topics include: Set operations and identities; Cartesian products; relations, equivalence and partial order; functions, one-one/onto/bijection, composition and inverse; computing examples.
Module 2: Logic and Proof	Propositions, connectives, truth tables, normal forms, predicates, quantifiers, implication, direct/contradiction/induction basics. Topics include: Propositions, connectives, truth tables, tautology/contradiction, implication/equivalence, normal forms; predicates and quantifiers; rules of inference; direct proof, contradiction and induction basics.
Module 3: Matrices and Algebraic Tools	Matrices, determinants, systems of linear equations, elementary transformations, applications. Topics include: Matrix operations, transpose, determinant, inverse, rank and elementary transformations; systems of linear equations; introductory applications in graphics/data representation.
Module 4: Combinatorics and Recurrence	Counting principles, permutations, combinations, pigeonhole principle, recurrence relations, elementary graph concepts. Topics include: Counting principles, permutations and combinations; pigeonhole principle; recurrence formulation and simple solving; graph terminology, paths, cycles, trees and connectivity awareness.
Module 5: Applied Problem Solving	Integrated problem sets connecting the units; interpretation of results; use of mathematical/reasoning techniques in computing and employability contexts; timed/self-assessment practice with feedback and error analysis. Topics include: Integrated problem solving connecting logic, relations, matrices, combinatorics and graph ideas; modelling of computing scenarios; interpretation, error analysis and timed self-assessment.

Assessment activities:

Solve a logic/truth-table worksheet. • Model a small relation and test its properties. • Solve counting and recurrence problems with written reasoning.

Recommended Books

Kenneth Rosen, Discrete Mathematics and Its Applications, McGraw-Hill.

B.S. Grewal, Higher Engineering Mathematics, Khanna.

Digital learning resources: NPTEL/SWAYAM: Discrete Mathematics / Mathematics for Computer Science. NPTEL Discrete Mathematics lecture series.

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BCA – SEMESTER I

Course Code	Course	L-T-P	Credits
BCAOL 106	Digital Productivity Tools	0-0-4	2

Semester / Category: I / SEC | Mode: ODL

Course Objective:

Develop practical digital productivity for study and work. Enable learners to organise, analyse and present information. Promote collaborative and cloud-enabled work habits.

Course Outcomes:

CO1. Create professional documents, spreadsheets and presentations.

CO2. Use formulas, charts and data tools in spreadsheets.

CO3. Collaborate using cloud-based productivity platforms.

CO4. Apply safe file-management and digital-workflow practices.

Course Content:

Module	Content
Module 1: Documents	Styles, templates, tables, references, mail merge, page layout, accessibility and PDF export. Topics include: Styles, themes and templates; page/section breaks; tables; headers/footers; citations/references; mail merge; track changes/comments; accessibility checks; PDF export and document protection awareness.
Module 2: Spreadsheets	Data entry, relative/absolute references, functions, sorting/filtering, conditional formatting, charts, pivot concepts. Topics include: Relative/absolute/mixed references; logical, text, date and lookup functions; sorting/filtering; data validation; conditional formatting; charts; pivot-table concepts; error checking and spreadsheet hygiene.
Module 3: Presentations	Slide structure, visual hierarchy, diagrams, multimedia, speaker notes, delivery and accessibility. Topics include: Slide master/themes; layout and visual hierarchy; charts/SmartArt/diagrams; multimedia; speaker notes; animation restraint; accessibility; presentation delivery and export/share options.
Module 4: Collaboration	Cloud drives, sharing permissions, versioning, online forms, calendars, collaborative editing, backup and cyber hygiene. Topics include: Cloud-drive organization; sharing roles/permissions; version history; collaborative editing; forms, calendars and online meeting tools; backup/sync; naming conventions; cyber hygiene.
Module 5: Integrated Digital Portfolio	Application of the tools and techniques through an integrated portfolio task; quality checks, accessibility, collaboration/version control where relevant, documentation and demonstration of the finished digital artefact. Topics include: Integrated digital portfolio containing a formatted report, analytical spreadsheet and presentation; consistent branding; accessibility, version control, collaboration evidence and reflective quality review.

Assessment activities:

Prepare a formatted 4-page report with table of contents. • Analyse a supplied dataset using formulas and charts. • Create and deliver a 6-slide presentation from the analysis.

Practical and project work:

Word-processing • spreadsheet formulas/charts • presentation • cloud collaboration.

Recommended Books

Microsoft 365 / LibreOffice official user documentation.

Shelly Cashman Series, Microsoft Office introductory text (latest available edition).

Digital learning resources: SWAYAM/AICTE self-paced digital productivity / office automation courses. Official Microsoft Learn / LibreOffice tutorial videos.


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BCA – SEMESTER I

Course Code	Course	L-T-P	Credits
BCAOL 107	Aptitude & Reasoning Skills-I	3-0-0	3

Semester / Category: I / AEC | Mode: ODL

Course Objective:

Strengthen numerical and logical reasoning. Support employability and competitive-test preparation. Develop accuracy, estimation and structured problem solving.

Course Outcomes:

CO1. Solve fundamental quantitative aptitude problems.

CO2. Apply logical reasoning to patterns and arrangements.

CO3. Interpret basic tables and charts.

CO4. Use time-efficient strategies for objective assessments.

Course Content:

Module	Content
Module 1: Arithmetic	Percentages, ratio/proportion, averages, profit/loss, simple/compound interest. Topics include: Percentages, ratio-proportion, averages, profit-loss-discount, simple/compound interest; estimation and shortcut strategies; error checking.
Module 2: Applied Arithmetic	Time-work, pipes/cisterns, time-speed-distance, mixtures, ages. Topics include: Time and work, pipes/cisterns, time-speed-distance, boats/trains, mixtures/alligation and ages; unit consistency and structured solution methods.
Module 3: Logical Reasoning	Series, analogy, classification, coding-decoding, directions, blood relations, syllogisms. Topics include: Number/letter series, analogy, classification, coding-decoding, direction sense, blood relations, ranking and elementary syllogisms.
Module 4: Data Interpretation	Tables, bar/line/pie charts, caselets; approximation, estimation and timed practice. Topics include: Tables, bar/line/pie charts and simple caselets; ratio/percentage change; approximation; identifying relevant data and avoiding calculation traps.
Module 5: Applied Problem Solving	Integrated problem sets connecting the units; interpretation of results; use of mathematical/reasoning techniques in computing and employability contexts; timed/self-assessment practice with feedback and error analysis. Topics include: Mixed timed practice; question selection strategy, accuracy-speed balance, error log, reflective improvement and placement-style mock assessment.

Assessment activities:

Weekly 20-question timed quiz. • Solve and explain five reasoning puzzles. • Interpret two datasets and justify answers.

Recommended Books

R.S. Aggarwal, Quantitative Aptitude, S. Chand.

R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand.

Digital learning resources: SWAYAM/AICTE employability and quantitative aptitude offerings. NPTEL/SWAYAM employability-skills videos.


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BCA – SEMESTER II

Course Code	Course	L-T-P	Credits
BCAOL 201	Programming in C	3-0-4	5

Semester / Category: II / CC | Mode: ODL

Course Objective:

Build low-level programming understanding and algorithmic thinking. Develop disciplined procedural programming skills. Prepare learners for data structures and systems courses.

Course Outcomes:

CO1. Develop structured C programs using decisions and loops.

CO2. Use functions, arrays, strings, pointers and structures.

CO3. Perform file operations and dynamic memory management.

CO4. Debug and test modular C programs.

Course Content:

Module	Content
Module 1: C Foundations	Program structure, tokens, data types, operators, I/O, decisions, loops, compilation and debugging. Topics include: C program structure; tokens, identifiers, constants, data types, type conversion, operators and precedence; formatted I/O; compilation stages and compiler warnings.
Module 2: Functions and Arrays	Functions, scope, recursion, arrays, strings, searching/sorting basics. Topics include: Nested selection and iteration; break/continue; trace tables; functions, prototypes, parameter passing, scope/storage classes and recursion.
Module 3: Pointers and User-defined Types	Pointers, pointer arithmetic, arrays/pointers, structures, unions, enums, typedef. Topics include: One- and multidimensional arrays; strings and standard string functions; searching/sorting basics; command-line arguments awareness.
Module 4: Dynamic Memory and Files	malloc/calloc/realloc/free; command-line arguments; text/binary files; modular programs. Topics include: Pointers, pointer arithmetic, arrays/pointers, pointer-to-pointer; structures, unions, enum, typedef; structures with pointers; dynamic data structures awareness.
Module 5: Integrated Application Development	Integration of course concepts through a small application; coding standards; testing and debugging; version/documentation practices; security and accessibility considerations where relevant; demonstration and reflective review. Topics include: malloc/calloc/realloc/free; memory leaks and dangling pointers; text/binary files, random access and error handling; modular application, test cases and debugging discipline.

Assessment activities:

Dry-run and debug short C fragments. • Implement array/search/sort functions. • Build a file-based record-management program.

Practical and project work:

Control flow • functions • arrays/strings • pointers • structures • files • final record application.

Recommended Books

E. Balagurusamy, Programming in ANSI C, McGraw-Hill.

Kernighan & Ritchie, The C Programming Language, Pearson.

Digital learning resources: NPTEL/SWAYAM: Problem Solving Through Programming in C. NPTEL C programming demonstrations.


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BCA – SEMESTER II

Course Code	Course	L-T-P	Credits
BCAOL 202	Introduction to Artificial Intelligence	3-0-0	3

Semester / Category: II / CC | Mode: ODL

Course Objective:

Provide a conceptually sound introduction to AI. Connect AI techniques with real applications. Develop responsible-AI awareness before advanced ML courses.

Course Outcomes:

CO1. Explain the goals, history and major approaches of AI.

CO2. Represent and solve elementary search and reasoning problems.

CO3. Differentiate symbolic AI, machine learning and generative AI at an introductory level.

CO4. Discuss responsible and ethical use of AI.

Course Content:

Module	Content
Module 1: AI Foundations	Definitions, history, intelligent agents, problem formulation, applications and limitations. Topics include: AI definitions and history; rational agents; PEAS; environment properties; problem formulation; goal/utility-based agents and representative application domains.
Module 2: Search and Problem Solving	State spaces, uninformed/informed search, heuristics, game-playing overview. Topics include: State-space representation; BFS, DFS, uniform-cost awareness, greedy best-first and A* intuition; heuristics; completeness/optimalty considerations; minimax/game-playing overview.
Module 3: Knowledge and Learning	Knowledge representation, rules, inference, uncertainty overview; supervised/unsupervised/reinforcement learning concepts. Topics include: Propositional/first-order knowledge representation overview; production rules; semantic networks; inference; uncertainty and probabilistic reasoning awareness.
Module 4: Contemporary AI and Ethics	NLP, computer vision, recommender systems, generative AI overview; bias, privacy, explainability, safety and responsible use. Topics include: Supervised, unsupervised and reinforcement learning distinctions; features/labels, train-test idea; neural networks overview; NLP, computer vision and recommender-system examples.
Module 5: Applied Analytics/AI Case Work	End-to-end applied workflow using a suitable dataset/problem; evaluation and interpretation; limitations and error analysis; responsible use, privacy/bias considerations where relevant; communication of findings through a notebook, report or demonstration. Topics include: Generative AI and foundation-model awareness; prompting, hallucination, bias, privacy, explainability, safety, human oversight; applied case analysis and responsible-use principles.

Assessment activities:

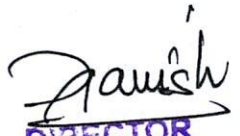
Map an everyday problem to an intelligent-agent model. • Manually compare BFS and heuristic search on a small graph. • Write a responsible-use analysis of a generative-AI scenario.

Recommended Books

Stuart Russell & Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson.

Ela Kumar, Artificial Intelligence, I.K. International.

Digital learning resources: NPTEL/SWAYAM: Artificial Intelligence: Search Methods for Problem Solving / Introduction to Machine Learning (selected introductory weeks). NPTEL AI lecture series; SWAYAM introductory AI videos.


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BCA – SEMESTER II

Course Code	Course	L-T-P	Credits
BCAOL 203	Database Management System	3-0-2	4

Semester / Category: II / CC | Mode: ODL

Course Objective:

Build sound database design and SQL skills. Develop understanding of integrity, transactions and data management. Prepare learners for data warehousing and application development.

Course Outcomes:

CO1. Model data using ER and relational concepts.

CO2. Write SQL for data definition, manipulation and querying.

CO3. Apply normalization and transaction concepts.

CO4. Design and implement a small relational database.

Course Content:

Module	Content
Module 1: Database Foundations	DBMS concepts, architecture, data models, ER modelling, keys, constraints. Topics include: DBMS architecture; schema/instance; data independence; ER/EER modelling, weak entities, cardinality and participation; keys and integrity constraints; ER-to-relational mapping.
Module 2: Relational Model and SQL	Relational algebra basics; DDL, DML, joins, subqueries, views, functions and constraints. Topics include: Relational algebra; SQL DDL/DML; joins, nested queries, set operations, grouping/aggregation, views and constraints; stored procedures/triggers awareness.
Module 3: Database Design	Functional dependencies, normalization through BCNF overview, schema refinement. Topics include: Functional dependencies, attribute closure; partial/transitive dependency; lossless and dependency-preserving decomposition; normalization from 1NF through BCNF.
Module 4: Transactions and Administration	ACID, concurrency, locking overview, recovery, indexing basics, security, backup and database applications. Topics include: Transactions and ACID; schedules and serializability; locks/two-phase locking; deadlock awareness; logging, checkpoints and recovery concepts.
Module 5: Systems Integration and Case Analysis	Application of the major concepts to an integrated computing scenario; comparison of alternatives; performance, reliability, security and maintainability considerations; structured case analysis and problem-solving exercises. Topics include: B+ tree/hash indexing; query-processing/optimization overview; roles/privileges, authorization and backup; NoSQL categories and relational-vs-NoSQL decision criteria.

Assessment activities:

Create an ER model from a case study. • Write SQL queries of increasing complexity. • Normalize a supplied relation and justify each decomposition.

Practical and project work:

Create schema • constraints • CRUD • joins/subqueries • views • transactions • mini database.

Recommended Books

Ramez Elmasri & Shamkant Navathe, Fundamentals of Database Systems, Pearson.

Korth, Silberschatz & Sudarshan, Database System Concepts, McGraw-Hill.

Digital learning resources: NPTEL/SWAYAM: Introduction to Database Systems / Database Management System. NPTEL DBMS lecture series.


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BCA – SEMESTER II

Course Code	Course	L-T-P	Credits
BCAOL 204	Probability & Statistics	3-0-0	3

Semester / Category: II / MD | Mode: ODL

Course Objective:

Develop statistical literacy for computing and analytics. Build foundations for machine learning and data analysis. Emphasise interpretation alongside calculation.

Course Outcomes:

CO1. Summarise data using descriptive statistics.

CO2. Apply basic probability and random-variable concepts.

CO3. Use common probability distributions.

CO4. Interpret correlation, regression and elementary inference.

Course Content:

Module	Content
Module 1: Descriptive Statistics	Data types, frequency distributions, central tendency, dispersion, moments, skewness and visualisation. Topics include: Data types and measurement scales; frequency distributions; mean/median/mode; range, variance, standard deviation, coefficient of variation; quartiles, skewness and visualization.
Module 2: Probability	Sample spaces, conditional probability, Bayes theorem, independence, counting applications. Topics include: Sample space, events, addition/multiplication laws, conditional probability, independence and Bayes theorem; counting applications.
Module 3: Random Variables and Distributions	Discrete/continuous variables; expectation; binomial, Poisson and normal distributions. Topics include: Discrete/continuous random variables; probability mass/density/distribution functions; expectation and variance; binomial, Poisson and normal distributions.
Module 4: Statistical Relationships and Inference	Correlation, simple regression, sampling concepts, confidence intervals and hypothesis-testing overview. Topics include: Covariance and correlation; Pearson correlation; simple linear regression, least-squares idea and interpretation; association vs causation.
Module 5: Applied Problem Solving	Integrated problem sets connecting the units; interpretation of results; use of mathematical/reasoning techniques in computing and employability contexts; timed/self-assessment practice with feedback and error analysis. Topics include: Population/sample, sampling distributions awareness, standard error, confidence interval and hypothesis-testing concepts; interpretation of p-values and Type-I/II errors at introductory level.

Assessment activities:

Compute and interpret descriptive statistics for a small dataset. • Solve conditional probability/Bayes problems. • Interpret correlation/regression output from a supplied example.

Recommended Books

S.C. Gupta & V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand.

Sheldon Ross, A First Course in Probability, Pearson.

Digital learning resources: NPTEL/SWAYAM: Probability and Statistics / Introduction to Statistical Hypothesis Testing. NPTEL Probability and Statistics lecture series.



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BCA – SEMESTER II

Course Code	Course	L-T-P	Credits
BCAOL 205	Professional Communication Skills-I	2-0-2	3

Semester / Category: II / AEC | Mode: ODL

Course Objective:

Advance workplace communication beyond foundational language skills. Develop collaboration, documentation and presentation competence. Prepare learners for internships and project teamwork.

Course Outcomes:

CO1. Write clear professional correspondence and reports.

CO2. Participate effectively in online and face-to-face meetings.

CO3. Deliver structured presentations.

CO4. Apply professional etiquette in digital workplaces.

Course Content:

Module	Content
Module 1: Workplace Writing	Professional e-mail, memos, notices, agendas, minutes and tone. Topics include: Professional tone and audience analysis; e-mail, memo, notice, agenda/minutes and action items; digital etiquette and response-time norms.
Module 2: Reports and Documentation	Short reports, proposals, technical instructions, summaries, citations and plagiarism awareness. Topics include: Technical report structure; executive summary; proposals; instructions; process description; citation/referencing; plagiarism awareness and source evaluation.
Module 3: Meetings and Collaboration	Meeting roles, online meeting etiquette, negotiation basics, teamwork and conflict communication. Topics include: Online/offline meetings, facilitation, teamwork, active listening, feedback, negotiation and conflict communication; intercultural/inclusive communication.
Module 4: Presentations and Employability	Presentation design, storytelling, Q&A, professional profile, interview communication. Topics include: Presentation storytelling, visual evidence, technical-to-nontechnical translation, Q&A, résumé/profile improvement and interview communication.
Module 5: Integrated Professional Communication Practice	Application through workplace scenarios, presentation/interview tasks, collaborative communication, peer feedback, digital professionalism and reflective improvement using a structured rubric. Topics include: Integrated workplace communication portfolio: meeting documents, status report, presentation and reflective note; peer/faculty review using structured rubric.

Assessment activities:

Draft an agenda, minutes and follow-up e-mail. • Prepare a two-page technical report with references. • Deliver a recorded 5-minute presentation and reflection.

Practical and project work:

Email/report writing • online meeting simulation • recorded presentation.

Recommended Books

Meenakshi Raman & Sangeeta Sharma, Technical Communication, Oxford.

Lesikar et al., Business Communication, McGraw-Hill.

Digital learning resources: NPTEL/SWAYAM: Soft Skills / Effective Writing / Technical Communication offerings. NPTEL communication and soft-skills lecture series.

BCA – SEMESTER II

Course Code	Course	L-T-P	Credits
BCAOL 206	PBL-2: Logic Building Project	0-0-2	1

Semester / Category: II / PW | Mode: ODL

Course Objective:

Connect early programming concepts with problem-based learning. Develop planning, iteration and presentation habits. Encourage independent learning and peer feedback.

Course Outcomes:

CO1. Translate a simple problem into requirements and logic.

CO2. Use flowcharts/pseudocode and modular decomposition.

CO3. Implement a small working solution.

CO4. Document and demonstrate the solution.

Course Content:

Module	Content
Module 1: Problem Selection	Problem identification, scope, user story, inputs/outputs and constraints. Topics include: Problem identification; stakeholder/user need; scope and measurable objectives; inputs/outputs, constraints and assumptions; feasibility.
Module 2: Solution Design	Flowcharts, pseudocode, decomposition, data choices and test cases. Topics include: Algorithm decomposition; flowcharts and pseudocode; data choices; modular design; acceptance criteria and test-case planning.
Module 3: Implementation	Incremental coding, debugging, versioning basics and peer review. Topics include: Incremental implementation; coding conventions; basic version/file organization; debugging; peer review and mentor feedback.
Module 4: Demonstration	Testing, short report, README/user guide, presentation and viva. Topics include: Functional testing; boundary/error cases; defect log; iteration and user feedback; evidence capture.
Module 5: Integration, Documentation and Viva	Consolidation of the approved work; validation against objectives; documentation and evidence portfolio; ethics and academic integrity; presentation/demonstration; reflective learning; viva voce and future-work plan. Topics include: Final README/user guide, source files, test evidence, short report, live demonstration, presentation and individual viva/reflection.

Assessment activities:

Submit problem statement and flowchart. • Peer-review another learner's design. • Demonstrate the working solution with test cases.

Practical and project work:

One guided logic-building project • minimum milestones: proposal, design, prototype, test report, demo.

Recommended Books

Robert C. Martin, Clean Code, Pearson (selected beginner-friendly principles).

Course-specific lab/manual prepared by CDOE.

Digital learning resources: Relevant SWAYAM programming course selected according to project language. Instructor-created walkthrough videos and NPTEL programming demonstrations.




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BCA – SEMESTER II

Course Code	Course	L-T-P	Credits
BCAOL 207	Cyber Ethics & Digital Society	2-0-0	2

Semester / Category: II / VAC | Mode: ODL

Course Objective:

Develop responsible and ethical technology use. Create awareness of cyber risks, privacy and digital rights. Prepare learners to make reasoned decisions in technology contexts.

Course Outcomes:

CO1. Explain ethical issues in digital environments.

CO2. Recognise privacy, intellectual-property and cyber-safety concerns.

CO3. Evaluate online behaviour using ethical principles.

CO4. Practice responsible digital citizenship.

Course Content:

Module	Content
Module 1: Digital Society	Digital identity, inclusion, platforms, digital footprints, information quality and misinformation. Topics include: Digital society, digital divide and inclusion; digital identity, footprints, reputation and platform-mediated life; misinformation and information-quality awareness.
Module 2: Ethics and Professional Conduct	Ethical frameworks, professional responsibility, codes of conduct, algorithmic impacts. Topics include: Ethical frameworks; values, professional responsibility, conflicts of interest, codes of conduct and responsible technology design.
Module 3: Privacy, IP and Security	Personal data, consent, surveillance, copyright, plagiarism, software piracy, cyber hygiene. Topics include: Privacy, consent, surveillance, personal data and confidentiality; copyright, fair use awareness, software licensing, plagiarism and piracy.
Module 4: Responsible Technology	Social media ethics, AI ethics, accessibility, sustainability, case studies and digital citizenship. Topics include: Cyber hygiene, passwords/MFA, phishing/social engineering, cyberbullying, identity misuse, safe transactions and responsible social-media behaviour.
Module 5: Contemporary Issues and Case Analysis	Application of course concepts to contemporary cases; evidence-based interpretation; ethical/civic dimensions; structured discussion and reflective writing connecting the subject with professional and digital life. Topics include: AI/algorithmic ethics, accessibility, sustainability and environmental impacts; case analysis using stakeholder, rights, harm and responsibility perspectives.

Assessment activities:

Analyse an online privacy notice. • Case analysis on plagiarism/copyright. • Create a responsible-digital-citizenship infographic and reflection.

Recommended Books

Herman Tavani, Ethics and Technology, Wiley.

Deborah G. Johnson, Computer Ethics, Pearson.

Digital learning resources: SWAYAM courses on Cyber Security, Cyber Law, Ethics and Values; use current approved catalogue. NPTEL cyber-security/cyber-ethics lectures; CEC digital citizenship videos.


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BCA – SEMESTER III

Course Code	Course	L-T-P	Credits
BCAOL 301	Object-Oriented Programming with Java	3-0-4	5

Semester / Category: III / CC | Mode: ODL

Course Objective:

Develop object-oriented modelling and programming competence. Build reusable and maintainable Java code. Prepare learners for enterprise/mobile/software-development concepts.

Course Outcomes:

CO1. Develop Java programs using classes and objects.

CO2. Apply inheritance, interfaces, polymorphism and exception handling.

CO3. Use collections, files and basic GUI/event concepts.

CO4. Design and test a small object-oriented application.

Course Content:

Module	Content
Module 1: Java Foundations and Classes	JDK/JVM, syntax, data types, control flow, arrays, classes, objects, constructors, encapsulation. Topics include: JDK/JVM/JRE; compilation and bytecode; variables, operators, control flow, arrays; classes, objects, constructors, this/static/final and encapsulation.
Module 2: OOP Mechanisms	Inheritance, overriding, polymorphism, abstract classes, interfaces, packages and access control. Topics include: Inheritance, method overloading/overriding, runtime polymorphism, abstract classes, interfaces, packages and access modifiers.
Module 3: Robust Java	Exceptions, strings, generics overview, collections, file I/O, basic multithreading concepts. Topics include: Exception hierarchy, try/catch/finally, custom exceptions; strings; generics awareness; collections List/Set/Map, iterators/comparators and lambda/stream awareness.
Module 4: Application Development	Event-driven programming/GUI overview, JDBC introduction, testing and small layered application. Topics include: File and NIO basics; object serialization awareness; threads and synchronization concepts; event-driven GUI basics.
Module 5: Integrated Application Development	Integration of course concepts through a small application; coding standards; testing and debugging; version/documentation practices; security and accessibility considerations where relevant; demonstration and reflective review. Topics include: JDBC connection, prepared statements and transactions; testing/logging awareness; integrated object-oriented application with layered structure and documentation.

Assessment activities:

Model a real-world domain using classes. • Implement inheritance/interface exercises. • Build a small Java application with collections, files or JDBC.

Practical and project work:

Classes • inheritance/interfaces • exceptions • collections • file I/O • JDBC/GUI mini application.

Recommended Books

Herbert Schildt, Java: The Complete Reference, McGraw-Hill.

Cay Horstmann, Core Java, Pearson.

Digital learning resources: NPTEL/SWAYAM: Programming in Java / Object Oriented System Development using UML, Java and Patterns. NPTEL Java lecture and coding demonstrations.



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BCA – SEMESTER III

Course Code	Course	L-T-P	Credits
BCAOL 302	Data Structure & Algorithms	3-0-4	5

Semester / Category: III / CC | Mode: ODL

Course Objective:

Develop algorithmic problem-solving ability. Connect abstract data structures with implementations. Prepare learners for advanced software and data courses.

Course Outcomes:

CO1. Implement fundamental linear and non-linear data structures.

CO2. Analyse basic algorithm time and space complexity.

CO3. Apply searching, sorting and traversal algorithms.

CO4. Select appropriate structures for stated problems.

Course Content:

Module	Content
Module 1: Algorithm Analysis and Linear Structures	Complexity basics; arrays; linked lists; stacks; queues; applications. Topics include: Abstract data types; algorithm correctness; time/space complexity; Big-O/Theta/Omega; empirical benchmarking; arrays and linked-list variants.
Module 2: Trees	Binary trees, BST, traversals, heaps and priority queues; balanced-tree awareness. Topics include: Stacks and queues, circular/deque concepts, recursion stack; applications in expression processing, scheduling and backtracking awareness.
Module 3: Graphs and Hashing	Graph representations, BFS/DFS, shortest-path overview; hashing and collision handling. Topics include: Binary trees, traversals, BST operations, AVL/balancing awareness, heaps and priority queues.
Module 4: Searching and Sorting	Linear/binary search; bubble, selection, insertion, merge, quick and heap sort; comparison and use cases. Topics include: Hash functions, load factor, chaining/open addressing; graph adjacency matrix/list, BFS/DFS, connectedness and topological sorting.
Module 5: Applications and Current Developments	Integration of the principal concepts through contemporary applications and case studies; guided problem solving; ethical/professional considerations; reflective self-assessment and communication of learning. Topics include: Searching and sorting; merge/quick/heap sort; shortest-path and MST overview; divide-and-conquer, greedy and dynamic-programming problem patterns.

Assessment activities:

Compare complexity of two alternative solutions. • Implement stack/queue/list operations. • Implement tree traversal and graph BFS/DFS; benchmark two sorting methods.

Practical and project work:

Lists/stacks/queues • trees • graphs • hashing • searching • sorting • complexity experiments.

Recommended Books

Mark Allen Weiss, Data Structures and Algorithm Analysis, Pearson.

Narasimha Karumanchi, Data Structures and Algorithms Made Easy.

Digital learning resources: NPTEL/SWAYAM: Programming, Data Structures and Algorithms Using Python / Data Structures and Algorithms. NPTEL DSA lecture series.


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BCA – SEMESTER III

Course Code	Course	L-T-P	Credits
BCAOL 303	PBL-3: Mini Project	0-0-4	2

Semester / Category: III / PW | Mode: ODL

Course Objective:

Integrate programming and database/web concepts. Develop teamwork, self-management and documentation. Provide authentic ODL learning through milestone-based mentoring.

Course Outcomes:

- CO1. Plan a small software project from a defined need.
- CO2. Create requirements, design and test artefacts.
- CO3. Develop a functional prototype using an approved technology stack.
- CO4. Present, document and defend project decisions.

Course Content:

Module	Content
Module 1: Proposal and Requirements	Problem statement, users, scope, functional/non-functional requirements, feasibility. Topics include: Problem statement, stakeholder identification, user stories/use cases, objectives, scope and feasibility.
Module 2: Design	Architecture, data model, UI sketches, modules, test plan, schedule. Topics include: Requirements baseline; architecture, database/data structure choice, UI sketches and test strategy.
Module 3: Build and Test	Iterative implementation, source control, test cases, defect log, mentor review. Topics include: Project plan, task breakdown, milestones, risks, repository/version discipline and supervisor review.
Module 4: Report and Viva	User guide, technical report, demo, presentation, reflection and viva. Topics include: Incremental development, defect tracking, functional/non-functional testing and refinement.
Module 5: Integration, Documentation and Viva	Consolidation of the approved work; validation against objectives; documentation and evidence portfolio; ethics and academic integrity; presentation/demonstration; reflective learning; viva voce and future-work plan. Topics include: Final artefact, report, README/user guide, test evidence, presentation, demonstration, peer reflection and viva.

Assessment activities:

Proposal + requirements submission. • Mid-term prototype demonstration. • Final report, source code, test evidence and viva.

Practical and project work:

One mini project with at least three supervised milestones and final viva.

Recommended Books

Roger Pressman & Bruce Maxim, Software Engineering: A Practitioner's Approach, McGraw-Hill.

Course-specific project handbook prepared by CDOE.

Digital learning resources: Relevant SWAYAM/NPTEL course matched to the selected project domain. Instructor-recorded project clinics; NPTEL software engineering demonstrations.




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BCA – SEMESTER III

Course Code	Course	L-T-P	Credits
BCAOL 304	Digital Computer Principles	3-0-0	3

Semester / Category: III / DSE | Mode: ODL

Course Objective:

Provide hardware foundations for computer applications. Develop ability to reason about digital logic. Support later systems, networks and architecture learning.

Course Outcomes:

- CO1. Explain digital number systems and Boolean algebra.
- CO2. Design elementary combinational and sequential circuits.
- CO3. Describe memory and processor building blocks.
- CO4. Relate digital logic to computer organisation.

Course Content:

Module	Content
Module 1: Number Systems and Logic	Binary/octal/hex, complements, codes, Boolean algebra, gates, simplification, K-maps. Topics include: Binary/octal/hexadecimal systems; complements and codes; Boolean algebra, logic gates and simplification; Karnaugh maps.
Module 2: Combinational Circuits	Adders/subtractors, multiplexers, decoders, encoders, comparators. Topics include: Combinational circuits: adders/subtractors, multiplexers/demultiplexers, decoders/encoders, comparators and code converters.
Module 3: Sequential Circuits	Latches, flip-flops, registers, counters, timing concepts. Topics include: Latches and flip-flops; excitation tables; registers, shift registers, synchronous/asynchronous counters and timing concepts.
Module 4: Computer Building Blocks	Memory hierarchy basics, buses, ALU/control concepts, I/O interfaces and digital-system overview. Topics include: Memory devices and hierarchy awareness; ROM/RAM; buses; ALU and control-unit building blocks; basic CPU organization.
Module 5: Systems Integration and Case Analysis	Application of the major concepts to an integrated computing scenario; comparison of alternatives; performance, reliability, security and maintainability considerations; structured case analysis and problem-solving exercises. Topics include: Integrated digital-system design problems; use of logic simulator where feasible; propagation delay, fan-in/fan-out and reliability awareness.

Assessment activities:

Convert and perform arithmetic across number systems. • Simplify Boolean expressions using K-maps. • Design a small combinational/sequential circuit on paper or simulator.

Recommended Books

M. Morris Mano & Michael Ciletti, Digital Design, Pearson.

Thomas Floyd, Digital Fundamentals, Pearson.

Digital learning resources: NPTEL/SWAYAM: Digital Circuits / Digital Computer Organization. NPTEL Digital Circuits lecture series.


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BCA – SEMESTER III

Course Code	Course	L-T-P	Credits
BCAOL 305	Entrepreneurship Development	2-0-0	2

Semester / Category: III / AEC | Mode: ODL

Course Objective:

Develop entrepreneurial awareness among computing learners. Connect technology skills with innovation and self-employment. Introduce business planning, finance and support ecosystems.

Course Outcomes:

CO1. Explain entrepreneurial mindset and opportunity recognition.

CO2. Develop a basic business model and value proposition.

CO3. Estimate elementary market, cost and revenue assumptions.

CO4. Present a concise venture pitch responsibly.

Course Content:

Module	Content
Module 1: Entrepreneurial Mindset	Entrepreneurship, traits, innovation, intrapreneurship, social entrepreneurship, failure and learning. Topics include: Entrepreneurial mindset, creativity and innovation; entrepreneur vs manager/intrapreneur; social entrepreneurship; learning from failure.
Module 2: Opportunity and Customer	Problem discovery, customer segments, value proposition, market research, competition. Topics include: Opportunity identification, problem interviews, customer segments, jobs/pains/gains, value proposition and elementary market research.
Module 3: Business Model and Finance	Business Model Canvas, revenue/cost, pricing, break-even basics, funding sources and startup support. Topics include: Business Model Canvas; revenue streams, cost structure, pricing, unit economics and break-even intuition; startup finance sources.
Module 4: Launch and Growth	MVP, digital marketing, IP awareness, legal/ethical considerations, pitch deck and scaling. Topics include: MVP, prototyping, validation, go-to-market, digital channels, intellectual-property awareness, legal/ethical considerations.
Module 5: Applied Business/Entrepreneurial Case	Integration through a small venture/campaign case; customer or stakeholder analysis; planning and metrics; ethical and legal considerations; concise pitch/report and reflection on assumptions and evidence. Topics include: Pitch deck, storytelling, traction metrics, networking, incubation/startup ecosystem, scaling risks and reflective venture plan.

Assessment activities:

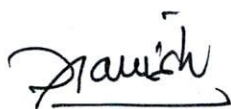
Interview two potential users and summarise needs. • Prepare a one-page Business Model Canvas. • Record a 3-minute venture pitch with assumptions.

Recommended Books

Robert D. Hisrich et al., Entrepreneurship, McGraw-Hill.

Alexander Osterwalder & Yves Pigneur, Business Model Generation, Wiley.

Digital learning resources: SWAYAM/NPTEL: Entrepreneurship / Innovation, Business Models and Entrepreneurship. NPTEL entrepreneurship lecture series.


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BCA – SEMESTER III

Course Code	Course	L-T-P	Credits
BCAOL 306	Operating System	3-0-2	4

Semester / Category: III / CC | Mode: ODL

Course Objective:

Build conceptual understanding of resource management. Connect theory with practical OS observations. Prepare learners for systems, networking and security courses.

Course Outcomes:

CO1. Explain major operating-system services and structures.

CO2. Analyse process scheduling and synchronization problems.

CO3. Explain memory, file and storage management.

CO4. Use basic operating-system commands and observe system behaviour.

Course Content:

Module	Content
Module 1: OS and Processes	OS functions, structures, system calls; processes, threads, states, CPU scheduling. Topics include: OS functions and structures; kernel/user mode; interrupts and system calls; processes, PCB, states, context switching and threads.
Module 2: Concurrency and Deadlocks	Synchronization, critical section, semaphores/monitors concepts, deadlocks and handling. Topics include: Scheduling criteria and FCFS, SJF, Priority, Round Robin; synchronization, race conditions, critical section, mutex/semaphore/monitor concepts.
Module 3: Memory Management	Paging, segmentation, virtual memory, page replacement and allocation. Topics include: Deadlock conditions, resource-allocation graphs, prevention/avoidance/detection; Banker's algorithm awareness.
Module 4: Files, I/O and Security	File systems, directories, disk scheduling, I/O, protection/security, Linux/Windows overview. Topics include: Contiguous allocation, paging, segmentation, TLB, page tables, virtual memory, page replacement and thrashing awareness.
Module 5: Systems Integration and Case Analysis	Application of the major concepts to an integrated computing scenario; comparison of alternatives; performance, reliability, security and maintainability considerations; structured case analysis and problem-solving exercises. Topics include: File systems, directories, allocation, disk scheduling, I/O buffering; protection/access control; Linux/Windows observations; virtualization/container overview.

Assessment activities:

Compare CPU scheduling algorithms on a supplied workload. • Solve page-replacement exercises. • Use Linux commands to inspect processes, memory and file permissions.

Practical and project work:

Linux shell/process commands • scheduling simulation • memory/page replacement • permissions/file system exercises.

Recommended Books

Abraham Silberschatz et al., Operating System Concepts, Wiley.

William Stallings, Operating Systems: Internals and Design Principles, Pearson.

Digital learning resources: NPTEL/SWAYAM: Operating System Fundamentals / Introduction to Operating Systems. NPTEL Operating Systems lecture series.


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BCA – SEMESTER III

Course Code	Course	L-T-P	Credits
BCAOL 307	Indian Constitution & Civic Values	2-0-0	2

Semester / Category: III / VAC | Mode: ODL

Course Objective:

Develop constitutional literacy and civic responsibility. Connect rights and duties with contemporary social/digital contexts. Promote democratic, ethical and inclusive citizenship.

Course Outcomes:

- CO1. Explain foundational features of the Indian Constitution.
- CO2. Identify fundamental rights, duties and directive principles.
- CO3. Describe key institutions and democratic processes.
- CO4. Relate constitutional values to responsible citizenship and digital society.

Course Content:

Module	Content
Module 1: Constitutional Foundations	Making of Constitution, Preamble, salient features, federalism, citizenship. Topics include: Constituent Assembly, making of the Constitution, Preamble, salient features, citizenship and federal character.
Module 2: Rights, Duties and DPSP	Fundamental Rights, remedies, Directive Principles, Fundamental Duties. Topics include: Fundamental Rights, reasonable restrictions, constitutional remedies, Directive Principles and Fundamental Duties.
Module 3: Institutions	Parliament, Executive, Judiciary, Centre-State relations, constitutional bodies, local government. Topics include: Parliament, President/Prime Minister/Council of Ministers, Supreme Court/High Courts and judicial review; separation/checks and balances.
Module 4: Civic Values	Democracy, secularism, equality, social justice, electoral participation, digital citizenship and contemporary constitutional issues. Topics include: Centre-State relations, Finance/Election/other constitutional bodies; Panchayati Raj and urban local governance.
Module 5: Contemporary Issues and Case Analysis	Application of course concepts to contemporary cases; evidence-based interpretation; ethical/civic dimensions; structured discussion and reflective writing connecting the subject with professional and digital life. Topics include: Constitutional values in contemporary citizenship: equality, secularism, social justice, democratic participation, digital rights/responsibilities and case discussion.

Assessment activities:

- Explain one Fundamental Right through a current-life scenario. • Prepare a comparison chart of major constitutional institutions.
- Reflect on civic responsibility in social-media participation.

Recommended Books

D.D. Basu, Introduction to the Constitution of India, LexisNexis.

M. Laxmikanth, Indian Polity, McGraw-Hill (selected chapters).

Digital learning resources: SWAYAM/CEC/UGC courses on Constitutional Studies / Indian Government and Politics. CEC/SWAYAM videos on the Constitution of India.


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BCA – SEMESTER IV

Course Code	Course	L-T-P	Credits
BCAOL 401	Full Stack Development	0-0-6	3

Semester / Category: IV / CC | Mode: ODL

Course Objective:

Integrate front-end, server and database skills. Emphasise project-based practical learning. Develop deployment, testing and API literacy.

Course Outcomes:

- CO1. Develop responsive front-end interfaces.
- CO2. Build server-side routes/APIs using an approved stack.
- CO3. Connect applications to persistent data storage.
- CO4. Deploy and document a small full-stack application.

Course Content:

Module	Content
Module 1: Front-end Foundations	Semantic HTML, CSS responsive design, JavaScript ES concepts, DOM, forms, fetch/API use. Topics include: Semantic HTML/CSS/JavaScript refresher; component-based UI concepts, state, events, routing and responsive/accessibility practices.
Module 2: Front-end Application Structure	Components/modules, state concepts, client-side routing overview, validation and accessibility. Topics include: Front-end data flow; forms and validation; asynchronous fetch; API consumption; loading/error states and reusable components.
Module 3: Back-end and APIs	Server runtime/framework, routing, REST concepts, middleware, authentication concepts, error handling. Topics include: Server-side runtime/framework; routes/controllers; REST resource design; middleware; input validation; authentication/authorization concepts.
Module 4: Data, Testing and Deployment	Database integration, CRUD, testing basics, security hygiene, environment configuration, deployment and documentation. Topics include: Relational/NoSQL persistence; CRUD, schema/model validation, ORM awareness; secure data handling and environment configuration.
Module 5: Integrated Application Development	Integration of course concepts through a small application; coding standards; testing and debugging; version/documentation practices; security and accessibility considerations where relevant; demonstration and reflective review. Topics include: Testing, logging, container/deployment awareness, CI/CD basics, performance/security checklist and integrated full-stack project.

Assessment activities:

Build a responsive front end from a supplied brief. • Create a CRUD REST API. • Integrate front end + API + database and deploy/demo.

Practical and project work:

Responsive UI • JS/fetch • REST API • DB CRUD • authentication concept demo • deployment project.

Recommended Books

David Flanagan, JavaScript: The Definitive Guide, O'Reilly.

Ethan Brown, Web Development with Node and Express, O'Reilly (or equivalent approved stack text).

Digital learning resources: NPTEL/SWAYAM: Web Technology / Modern Application Development offerings. NPTEL web-development lectures; official framework documentation videos.


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BCA – SEMESTER IV

Course Code	Course	L-T-P	Credits
BCAOL 402	Computer Network	4-0-2	5

Semester / Category: IV / CC | Mode: ODL

Course Objective:

Develop foundational networking competence. Combine protocol theory with practical configuration. Prepare learners for cloud, cybersecurity and distributed applications.

Course Outcomes:

- CO1. Explain layered network architectures and protocols.
- CO2. Analyse addressing, routing and transport concepts.
- CO3. Configure and troubleshoot basic network scenarios.
- CO4. Explain common network services and security controls.

Course Content:

Module	Content
Module 1: Network Foundations	OSI/TCP-IP, physical media, switching, framing, Ethernet, error/flow control. Topics include: OSI/TCP-IP models; signals/media awareness; Ethernet framing, MAC addressing, switching, VLAN concepts and error detection.
Module 2: Network Layer	IPv4/IPv6 basics, subnetting, ARP/ICMP, routing concepts and algorithms. Topics include: IPv4 subnetting/VLSM, IPv6 format, ARP, ICMP, NAT and routing tables; static vs dynamic routing; distance-vector/link-state concepts.
Module 3: Transport and Applications	TCP/UDP, reliability, congestion overview; DNS, HTTP, e-mail, DHCP and common services. Topics include: TCP/UDP, ports/sockets, connection establishment, flow/congestion control and reliability.
Module 4: Wireless, Management and Security	Wi-Fi basics, network devices, troubleshooting tools, firewalls/VPN concepts, secure protocols. Topics include: DNS, HTTP/HTTPS, SMTP/IMAP, DHCP and application services; Wi-Fi architecture and wireless security basics.
Module 5: Applied Case Studies and Professional Practice	Integrated case studies connecting architecture, operations, risk, security, legal/ethical responsibilities and current practice; guided troubleshooting/analysis where applicable; preparation of a concise technical or compliance report. Topics include: Firewalls, ACLs, VPN and segmentation; packet capture; ping/traceroute/nslookup/dig; structured troubleshooting and cloud-networking awareness.

Assessment activities:

Subnetting worksheet and addressing plan. • Analyse packet flow for a web request. • Use simulator/commands to configure and troubleshoot a small network.

Practical and project work:

Packet capture/analysis • IP/subnetting • simulator topology • ping/traceroute/DNS • basic routing/security.

Recommended Books

James Kurose & Keith Ross, Computer Networking: A Top-Down Approach, Pearson.

Behrouz Forouzan, Data Communications and Networking, McGraw-Hill.

Digital learning resources: NPTEL/SWAYAM: Computer Networks and Internet Protocol. NPTEL Computer Networks lecture series.


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BCA – SEMESTER IV

Course Code	Course	L-T-P	Credits
BCAOL 403	Data Warehousing and Mining	3-0-4	5

Semester / Category: IV / CC | Mode: ODL

Course Objective:

Connect database knowledge with analytics. Develop hands-on experience with warehouse/mining workflows. Prepare learners for data analytics and machine learning.

Course Outcomes:

CO1. Explain data warehouse architecture and dimensional modelling.

CO2. Perform elementary ETL and OLAP operations.

CO3. Apply basic classification, clustering and association techniques.

CO4. Evaluate data-mining results using suitable measures.

Course Content:

Module	Content
Module 1: Data Warehousing	Operational vs analytical systems, architecture, ETL, data quality, metadata. Topics include: Operational vs analytical systems; warehouse characteristics and architecture; staging area; ETL/ELT, data profiling, quality, lineage and metadata.
Module 2: Dimensional Modelling and OLAP	Facts/dimensions, star/snowflake schemas, cubes, roll-up/drill-down/slice/dice. Topics include: Dimensional modelling: grain, facts, dimensions, surrogate keys, star/snowflake schemas, slowly changing dimensions and conformed dimensions.
Module 3: Data Mining Foundations	Preprocessing, similarity, association rules, classification and evaluation. Topics include: OLAP cubes, hierarchies, roll-up, drill-down, slice, dice and pivot; materialised aggregates and performance awareness.
Module 4: Clustering and Applications	Clustering concepts, outliers, text/web mining overview, ethics/privacy and case studies. Topics include: Data preprocessing; association rules with support/confidence/lift; classification workflow, confusion matrix and overfitting awareness.
Module 5: Applied Analytics/AI Case Work	End-to-end applied workflow using a suitable dataset/problem; evaluation and interpretation; limitations and error analysis; responsible use, privacy/bias considerations where relevant; communication of findings through a notebook, report or demonstration. Topics include: Clustering, similarity/distance, outlier awareness, text/web mining overview; privacy, bias, interpretability and responsible analytics.

Assessment activities:

Design a star schema for a business case. • Perform data cleaning and simple OLAP analysis. • Run one classification/clustering/association exercise and interpret results.

Practical and project work:

ETL/data cleaning • dimensional model • OLAP • association • classification • clustering using approved tool/Python.

Recommended Books

Jiawei Han, Micheline Kamber & Jian Pei, Data Mining: Concepts and Techniques, Morgan Kaufmann.

Paulraj Ponniah, Data Warehousing Fundamentals, Wiley.

Digital learning resources: NPTEL/SWAYAM: Data Mining / Data Warehousing and Data Mining. NPTEL Data Mining lecture series.


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BCA – SEMESTER IV

Course Code	Course	L-T-P	Credits
BCAOL 404	Cyber Security & Ethical Hacking	3-0-2	4

Semester / Category: IV / DSE | Mode: ODL

Course Objective:

Develop defensive cybersecurity awareness and skills. Provide controlled, authorised practical exposure to security tools. Emphasise ethics, law, documentation and risk reduction.

Course Outcomes:

CO1. Explain common cyber threats, vulnerabilities and defensive controls.

CO2. Apply basic secure configuration and vulnerability-assessment concepts in authorised labs.

CO3. Interpret elementary cryptographic and authentication mechanisms.

CO4. Demonstrate ethical, legal and responsible security practice.

Course Content:

Module	Content
Module 1: Security Foundations	CIA triad, risk, threat modelling, malware/social engineering, security policies and ethics. Topics include: Security principles, assets, threats, vulnerabilities, attack surface, risk assessment and defence-in-depth; ethics and legal authorization.
Module 2: System and Network Security	Hardening, authentication, access control, patching, firewalls, IDS/IPS concepts, secure protocols. Topics include: Authentication/MFA, access control, password/key hygiene, cryptography concepts, system hardening, patching and endpoint controls.
Module 3: Web and Application Security	Common web vulnerabilities at conceptual/defensive level, secure coding, input validation, session/security headers. Topics include: Network segmentation, firewalls, IDS/IPS concepts, VPN/TLS, Wi-Fi security and secure protocols; packet/log inspection.
Module 4: Assessment and Incident Response	Vulnerability assessment in isolated labs, logging, incident lifecycle, evidence handling overview, reporting and remediation. Topics include: OWASP-style web vulnerabilities, input validation, session/access-control risks, secure coding and dependency vulnerability awareness.
Module 5: Applied Case Studies and Professional Practice	Integrated case studies connecting architecture, operations, risk, security, legal/ethical responsibilities and current practice; guided troubleshooting/analysis where applicable; preparation of a concise technical or compliance report. Topics include: Authorized vulnerability assessment in isolated labs; CVSS awareness; logging/SIEM concepts; incident response, remediation, reporting and responsible disclosure.

Assessment activities:

Create a threat model for a small web application. • Audit security settings in an isolated lab VM and propose remediation. • Analyse a sanitised incident log and write a short incident report.

Practical and project work:

Isolated VM hardening • password/access-control exercises • packet/log analysis • safe vulnerability scanning • secure coding checks.

Recommended Books

William Stallings, Computer Security: Principles and Practice, Pearson.

Michael E. Whitman & Herbert Mattord, Principles of Information Security, Cengage.

Digital learning resources: NPTEL/SWAYAM: Introduction to Cyber Security / Ethical Hacking (defensive and authorised-lab components only). NPTEL cyber-security lecture series; OWASP educational videos/resources.


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BCA – SEMESTER IV

Course Code	Course	L-T-P	Credits
BCAOL 405	Data Analysis using Python	0-0-6	3

Semester / Category: IV / SEC | Mode: ODL

Course Objective:

Develop practical data-analysis workflow skills. Connect statistics with Python tools. Emphasise reproducibility, interpretation and communication.

Course Outcomes:

- CO1. Load, clean and transform datasets using Python.
- CO2. Perform exploratory analysis and visualisation.
- CO3. Compute descriptive statistics and simple analytical summaries.
- CO4. Communicate reproducible findings through notebooks/reports.

Course Content:

Module	Content
Module 1: Data Analysis Environment	Jupyter/notebooks, NumPy basics, pandas Series/DataFrame, importing data. Topics include: Jupyter/notebook workflow; NumPy arrays, vectorization and pandas Series/DataFrame; CSV/Excel/JSON import and data provenance.
Module 2: Cleaning and Transformation	Missing values, duplicates, types, filtering, grouping, merging and reshaping. Topics include: Missing values, duplicates, types, dates/categories; filtering, sorting, grouping, merge/join/concat and reshaping.
Module 3: Exploration and Visualisation	Descriptive statistics, distributions, relationships, matplotlib-based charts, good visual practice. Topics include: Descriptive statistics, distribution/outlier exploration and correlation; exploratory question formation.
Module 4: Applied Analysis	Time/category analysis basics, correlation, simple regression awareness, reproducible notebook and narrative reporting. Topics include: Matplotlib-based visualization; chart selection, labels/annotation, accessibility, misleading-visual avoidance and narrative explanation.
Module 5: Integrated Application Development	Integration of course concepts through a small application; coding standards; testing and debugging; version/documentation practices; security and accessibility considerations where relevant; demonstration and reflective review. Topics include: Simple regression/classification awareness; reproducible notebook, random seeds/environment notes, privacy/ethics and final analytical findings brief.

Assessment activities:

Clean a deliberately messy dataset. • Create an exploratory-analysis notebook with at least five justified visualisations. • Prepare a one-page findings brief from a dataset.

Practical and project work:

NumPy • pandas import/clean/group/merge • matplotlib visualisation • EDA notebook • final dataset analysis.

Recommended Books

Wes McKinney, Python for Data Analysis, O'Reilly.

Jake VanderPlas, Python Data Science Handbook, O'Reilly.

Digital learning resources: NPTEL/SWAYAM: Python for Data Science / Data Analytics with Python. NPTEL Python for Data Science videos.



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ITM University Gwalior

BCA – SEMESTER IV

Course Code	Course	L-T-P	Credits
BCAOL 406	Aptitude & Reasoning Skills-II	2-0-0	2

Semester / Category: IV / AEC | Mode: ODL

Course Objective:

Extend Semester-I aptitude competence. Support placement and postgraduate entrance readiness. Develop disciplined timed-practice habits.

Course Outcomes:

CO1. Solve advanced quantitative and logical-reasoning problems.

CO2. Interpret multi-variable data efficiently.

CO3. Apply verbal/analytical reasoning to placement-style questions.

CO4. Manage time and accuracy in mixed aptitude tests.

Course Content:

Module	Content
Module 1: Advanced Quantitative	Number properties, algebraic reasoning, progressions, geometry/mensuration basics. Topics include: Number properties, divisibility, remainders, HCF/LCM, algebraic simplification and equations; estimation strategies.
Module 2: Advanced Reasoning	Seating/arrangements, puzzles, statement-assumption/conclusion, data sufficiency. Topics include: Progressions, geometry/mensuration basics, time-work, time-speed-distance and percentage/rate mixtures at advanced practice level.
Module 3: Data Interpretation	Combined charts, caselets, missing data, percentage change, ratios and approximation. Topics include: Seating/arrangements, puzzles, statement-assumption/conclusion, cause-effect, logical deduction and data sufficiency.
Module 4: Placement Practice	Mixed timed sets, verbal reasoning, error analysis, strategy and mock tests. Topics include: Combined tables/charts/caselets, missing data, percentage change, ratios and approximation under time constraints.
Module 5: Applied Problem Solving	Integrated problem sets connecting the units; interpretation of results; use of mathematical/reasoning techniques in computing and employability contexts; timed/self-assessment practice with feedback and error analysis. Topics include: Placement-style mixed mocks, question triage, speed-accuracy strategy, error categorization and personalized improvement plan.

Assessment activities:

Two timed mixed aptitude tests. • Solve and explain three advanced puzzles. • Maintain an error log and improvement plan.

Recommended Books

Arun Sharma, How to Prepare for Quantitative Aptitude, McGraw-Hill.

R.S. Aggarwal, Verbal & Non-Verbal Reasoning, S. Chand.

Digital learning resources: SWAYAM/AICTE employability and aptitude courses. SWAYAM/NPTEL employability-skills videos.



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BCA – SEMESTER IV

Course Code	Course	L-T-P	Credits
BCAOL 407	Minor Project	0-0-4	2

Semester / Category: IV / PW | Mode: ODL

Course Objective:

Integrate learning from Semesters I–IV. Strengthen independent problem solving and project discipline. Provide authentic evidence of practical competence.

Course Outcomes:

CO1. Define and scope a modest computing problem.

CO2. Apply an appropriate development/data methodology.

CO3. Build, test and document a working solution.

CO4. Present outcomes and reflect on limitations and future work.

Course Content:

Module	Content
Module 1: Initiation	Problem definition, literature/market scan, scope, objectives, ethics and feasibility. Topics include: Problem formulation, user/stakeholder need, scope, objectives, literature/technology scan and feasibility.
Module 2: Design	Requirements, architecture/data design, UI/prototype, project plan and test strategy. Topics include: Requirements, architecture/data model, UI/prototype, project plan, technology selection, risk/ethics/security review.
Module 3: Implementation and Validation	Iterative build, mentor reviews, testing, issue tracking and improvement. Topics include: Incremental implementation, repository/version evidence, mentor reviews, issue tracking and change management.
Module 4: Documentation and Viva	Report, code/data repository, user documentation, presentation, demo and viva. Topics include: Testing strategy, functional/non-functional tests, defect evidence, usability/performance/security checks and refinement.
Module 5: Integration, Documentation and Viva	Consolidation of the approved work; validation against objectives; documentation and evidence portfolio; ethics and academic integrity; presentation/demonstration; reflective learning; viva voce and future-work plan. Topics include: Final artefact, report, deployment/user guide, presentation, live demonstration, viva and reflection on limitations/future work.

Assessment activities:

Proposal and project plan. • Mid-project review with evidence of implementation. • Final report, artefact, test evidence, presentation and viva.

Practical and project work:

One supervised minor project with proposal, review, final demo and viva.

Recommended Books

Roger Pressman & Bruce Maxim, Software Engineering: A Practitioner's Approach.

CDOE Minor Project Handbook (to be approved).

Digital learning resources: Domain-specific SWAYAM/NPTEL MOOC selected with supervisor approval. Recorded project clinics and domain-specific NPTEL videos.




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BCA – SEMESTER V

Course Code	Course	L-T-P	Credits
BCAOL 501	Machine Learning	4-0-2	5

Semester / Category: V / CC | Mode: ODL

Course Objective:

Develop practical introductory machine-learning competence. Connect statistics/data analysis with predictive modelling. Promote correct evaluation and responsible interpretation.

Course Outcomes:

CO1. Explain core supervised and unsupervised learning concepts.

CO2. Prepare data and train elementary ML models.

CO3. Evaluate models using appropriate metrics.

CO4. Recognise overfitting, bias and responsible-ML concerns.

Course Content:

Module	Content
Module 1: ML Foundations	Learning paradigms, workflow, features/labels, train-validation-test, preprocessing and leakage. Topics include: ML problem formulation; supervised/unsupervised/reinforcement paradigms; features/labels, train-validation-test split, preprocessing, pipelines and leakage.
Module 2: Supervised Learning	Linear/logistic regression, k-NN, decision trees, basic ensemble awareness; classification/regression metrics. Topics include: Linear/logistic regression, k-NN and Naive Bayes; assumptions, regularisation intuition and classification/regression metrics.
Module 3: Unsupervised Learning	Clustering, dimensionality-reduction overview, anomaly concepts. Topics include: Decision trees, random forests, ensemble concepts, cross-validation and hyperparameter-tuning awareness; imbalance and feature engineering.
Module 4: Model Improvement and Responsibility	Cross-validation, regularisation concepts, feature engineering, pipelines, explainability/bias basics and deployment awareness. Topics include: k-means and hierarchical clustering; PCA/dimensionality-reduction overview; anomaly detection concepts and cluster evaluation.
Module 5: Applied Analytics/AI Case Work	End-to-end applied workflow using a suitable dataset/problem; evaluation and interpretation; limitations and error analysis; responsible use, privacy/bias considerations where relevant; communication of findings through a notebook, report or demonstration. Topics include: Explainability/feature importance, fairness/bias, privacy, model cards, reproducibility, deployment awareness and end-to-end applied case.

Assessment activities:

Compare baseline models on a supplied dataset. • Evaluate a classifier with confusion matrix and metrics. • Write a short model card covering data, metrics, limitations and ethical risks.

Practical and project work:

Data preprocessing • regression • classification • clustering • evaluation/cross-validation • mini ML notebook.

Recommended Books

Tom Mitchell, Machine Learning, McGraw-Hill.

Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, O'Reilly.

Digital learning resources: NPTEL/SWAYAM: Introduction to Machine Learning / Machine Learning. NPTEL Machine Learning lecture series.




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BCA – SEMESTER V

Course Code	Course	L-T-P	Credits
BCAOL 502	Cloud Computing	3-0-4	5

Semester / Category: V / CC | Mode: ODL

Course Objective:

Build cloud-computing conceptual and practical literacy. Connect networks, systems and application deployment. Develop awareness of cost, security, reliability and sustainability.

Course Outcomes:

CO1. Explain cloud service/deployment models and virtualization.

CO2. Use basic cloud compute, storage and networking services in guided labs.

CO3. Explain containers, scalability and cloud security fundamentals.

CO4. Design a simple cloud solution for a stated requirement.

Course Content:

Module	Content
Module 1: Cloud Foundations	Characteristics, IaaS/PaaS/SaaS, public/private/hybrid, virtualization, regions/zones and shared responsibility. Topics include: Cloud characteristics, IaaS/PaaS/SaaS, public/private/hybrid/multi-cloud; regions/zones, shared responsibility and virtualization.
Module 2: Core Services	Compute, storage, networking, identity/access, databases, monitoring and pricing concepts. Topics include: Compute instances, autoscaling concepts, object/block/file storage, virtual networks/subnets/routing, load balancing, DNS and managed databases.
Module 3: Cloud-native Concepts	Containers, orchestration overview, serverless, autoscaling, APIs and DevOps/CI-CD awareness. Topics include: Containers, registries, orchestration overview, serverless/FaaS, API gateways, messaging/event-driven services and CI/CD awareness.
Module 4: Security, Reliability and Architecture	IAM, encryption, backup/DR, high availability, cost optimisation, sustainability and reference architectures. Topics include: IAM roles/policies, least privilege, encryption/key management, secrets, logs/metrics/alerts, backup and disaster recovery.
Module 5: Applied Case Studies and Professional Practice	Integrated case studies connecting architecture, operations, risk, security, legal/ethical responsibilities and current practice; guided troubleshooting/analysis where applicable; preparation of a concise technical or compliance report. Topics include: High availability, reliability, performance, migration approaches, cost models, tagging/budgets, FinOps awareness and cloud sustainability.

Assessment activities:

Map a conventional application to cloud services. • Complete guided compute/storage/IAM lab in an approved sandbox. • Design a simple cloud architecture with security and cost considerations.

Practical and project work:

Sandbox account/approved simulator: VM/compute, storage, IAM, networking, container/serverless demonstration, architecture exercise.

Recommended Books

Rajkumar Buyya et al., Mastering Cloud Computing, McGraw-Hill.

Thomas Erl et al., Cloud Computing: Concepts, Technology & Architecture, Pearson.

Digital learning resources: NPTEL/SWAYAM: Cloud Computing; Google Cloud Computing Foundations. NPTEL Cloud Computing lecture series and guided cloud demonstrations.


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BCA – SEMESTER V

Course Code	Course	L-T-P	Credits
BCAOL 503 – A	Mobile Application Development	3-0-4	5

Semester / Category: V / DSE - Elective I | Mode: ODL

Course Objective:

Develop practical mobile-app development competence. Apply UI, data and API concepts in a constrained device context. Promote privacy, accessibility and testing.

Course Outcomes:

CO1. Design mobile user interfaces for common interaction patterns.

CO2. Build a small mobile application using an approved framework.

CO3. Use local/network data and device capabilities responsibly.

CO4. Test, package and document a mobile application.

Course Content:

Module	Content
Module 1: Mobile Platforms and UI	Mobile ecosystem, project structure, layouts/components, navigation, responsive/adaptive UI. Topics include: Mobile ecosystem; native vs cross-platform; project structure; activities/screens/components; layout and responsive/adaptive UI principles.
Module 2: Application Logic	State, lifecycle, events, forms, validation and reusable components. Topics include: Navigation, lifecycle/state, events, forms, validation and reusable UI components; accessibility and localization awareness.
Module 3: Data and Services	Local storage/database, REST APIs, JSON, permissions and selected device services. Topics include: Local storage/database, preferences, file storage and offline-first concepts; JSON and data serialization.
Module 4: Quality and Release	Testing/debugging, performance, security/privacy, accessibility, packaging and deployment overview. Topics include: REST API consumption, asynchronous calls, permissions, camera/location/notification/device-service awareness and privacy.
Module 5: Integrated Application Development	Integration of course concepts through a small application; coding standards; testing and debugging; version/documentation practices; security and accessibility considerations where relevant; demonstration and reflective review. Topics include: Testing/debugging, performance/battery considerations, security, packaging/signing, store/release awareness and final app demonstration.

Assessment activities:

Prototype three mobile screens and navigation. • Build a CRUD/data-driven mobile app. • Test on emulator/device and submit release checklist.

Practical and project work:

UI/navigation • local storage • API consumption • permissions • testing • final mobile mini-app.

Recommended Books

Reto Meier, Professional Android, Wrox (or current framework-equivalent text).

Official Android/Flutter/React Native documentation for approved stack.

Digital learning resources: SWAYAM/NPTEL mobile computing/application development offerings where available. Official platform tutorial videos plus NPTEL Mobile Computing lectures.


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BCA – SEMESTER V

Course Code	Course	L-T-P	Credits
BCAOL 503 – B	Data Analytics	3-0-4	5

Semester / Category: V / DSE - Elective I | Mode: ODL

Course Objective:

Develop end-to-end analytics thinking. Integrate data preparation, statistics and visual communication. Build decision-oriented interpretation skills.

Course Outcomes:

CO1. Frame analytical questions from business/problem contexts.

CO2. Prepare and explore structured data.

CO3. Apply descriptive and elementary predictive analytical methods.

CO4. Communicate findings using appropriate visualisations and narratives.

Course Content:

Module	Content
Module 1: Analytics Process	Problem framing, data sources, quality, lifecycle, ethics and reproducibility. Topics include: Analytics lifecycle, problem framing, stakeholder questions, data sources, quality, governance, ethics and reproducibility.
Module 2: Descriptive Analytics	Data preparation, descriptive statistics, segmentation, KPI design and exploratory analysis. Topics include: Cleaning, transformation, descriptive statistics, segmentation, KPI definitions and exploratory data analysis.
Module 3: Predictive Foundations	Correlation, regression/classification overview, evaluation and common pitfalls. Topics include: Correlation, regression/classification concepts, train-test logic, model metrics and common analytical pitfalls.
Module 4: Communication and Decision Support	Dashboards, visualisation principles, storytelling, recommendations, limitations and case studies. Topics include: Dashboards, visualization principles, cohort/funnel/time-series awareness and decision-oriented storytelling.
Module 5: Applied Analytics/AI Case Work	End-to-end applied workflow using a suitable dataset/problem; evaluation and interpretation; limitations and error analysis; responsible use, privacy/bias considerations where relevant; communication of findings through a notebook, report or demonstration. Topics include: Integrated business/organizational case; recommendation development, uncertainty/limitations, privacy and communication to non-technical stakeholders.

Assessment activities:

Define KPIs for a case study. • Prepare and analyse a dataset using an approved analytics tool. • Build a dashboard/report and present evidence-based recommendations.

Practical and project work:

Data cleaning • EDA • KPI analysis • basic model • dashboard/report.

Recommended Books

Camm et al., Business Analytics, Cengage.

Wes McKinney, Python for Data Analysis, O'Reilly.

Digital learning resources: NPTEL/SWAYAM: Data Analytics with Python / Business Analytics for Management Decision.
NPTEL data analytics and visualisation lectures.



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BCA – SEMESTER V

Course Code	Course	L-T-P	Credits
BCAOL 503 – C	Data Visualization Tools	3-0-4	5

Semester / Category: V / DSE - Elective I | Mode: ODL

Course Objective:

Develop visual data-literacy and dashboard skills. Emphasise communication rather than decorative graphics. Expose learners to contemporary visualisation tools.

Course Outcomes:

CO1. Select appropriate visual encodings for different data types.

CO2. Create clear static and interactive visualisations.

CO3. Build a basic dashboard using an approved tool.

CO4. Critique visualisations for accuracy, accessibility and ethics.

Course Content:

Module	Content
Module 1: Visualisation Principles	Data types, perception, encodings, chart selection, scales, colour, annotation and misleading graphics. Topics include: Data types, visual perception and pre-attentive attributes; chart-selection principles, scales, axes, colour, annotation and misleading graphics.
Module 2: Data Preparation for Visualisation	Cleaning, aggregation, calculated fields, hierarchies and data models. Topics include: Data cleaning/aggregation for visualization; calculated fields, hierarchies, joins/relationships and simple data-model concepts.
Module 3: Dashboards and Interactivity	Filters, parameters, drill-down, maps, KPI cards, layout and storytelling. Topics include: Interactive dashboards: filters, parameters, drill-down, tooltips, KPI cards, maps and layout hierarchy.
Module 4: Quality and Publication	Accessibility, performance, sharing, governance, reproducibility and dashboard critique. Topics include: Dashboard performance, accessibility, colour-blind-safe choices, mobile layouts, sharing/publishing and governance.
Module 5: Applied Analytics/AI Case Work	End-to-end applied workflow using a suitable dataset/problem; evaluation and interpretation; limitations and error analysis; responsible use, privacy/bias considerations where relevant; communication of findings through a notebook, report or demonstration. Topics include: Visual storytelling, narrative sequence, audience adaptation, usability testing, peer critique and final interactive dashboard presentation.

Assessment activities:

Redesign three misleading charts. • Create an interactive dashboard from a supplied dataset. • Conduct a peer usability/accessibility review.

Practical and project work:

Chart selection • calculated fields • dashboard • filters/drill-down • storytelling • accessibility review.

Recommended Books

Cole Nussbaumer Knaflic, Storytelling with Data, Wiley.

Andy Kirk, Data Visualisation, Sage.

Digital learning resources: SWAYAM/NPTEL: Data Visualization / Data Analytics offerings; supplement with approved tool learning paths. NPTEL visualisation lectures; official Power BI/Tableau learning videos.



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BCA – SEMESTER V

Course Code	Course	L-T-P	Credits
BCAOL 504	Advanced Soft Skills & Leadership	3-0-2	4

Semester / Category: V / AEC | Mode: ODL

Course Objective:

Prepare learners for collaborative technology workplaces. Develop leadership, emotional intelligence and professional behaviour. Support internship and project readiness.

Course Outcomes:

CO1. Demonstrate self-management and professional interpersonal skills.

CO2. Apply teamwork, conflict-resolution and negotiation techniques.

CO3. Use situational leadership concepts in project settings.

CO4. Reflect on professional growth through evidence and feedback.

Course Content:

Module	Content
Module 1: Self and Professional Effectiveness	Self-awareness, emotional intelligence, time/stress management, growth mindset. Topics include: Self-awareness, emotional intelligence, strengths/values, growth mindset, time management, resilience and stress management.
Module 2: Teams and Collaboration	Team roles, trust, feedback, conflict, inclusion and remote teamwork. Topics include: Team roles, psychological safety, trust, active listening, feedback, collaboration tools and remote-team etiquette.
Module 3: Leadership and Decision Making	Leadership styles, motivation, delegation, ethical decisions and situational leadership. Topics include: Conflict styles, negotiation, influence, motivation, delegation and situational leadership.
Module 4: Career Effectiveness	Negotiation, networking, professional presence, interview leadership scenarios and personal development plan. Topics include: Ethical decision making, inclusion, cross-cultural leadership, stakeholder communication and meeting facilitation.
Module 5: Integrated Professional Communication Practice	Application through workplace scenarios, presentation/interview tasks, collaborative communication, peer feedback, digital professionalism and reflective improvement using a structured rubric. Topics include: Professional networking, personal brand, interview leadership scenarios, career planning and evidence-based personal development plan.

Assessment activities:

Complete a self-assessment and development plan. • Role-play a team conflict and submit reflection. • Lead a short virtual team task and obtain peer feedback.

Practical and project work:

Role plays • virtual team exercise • presentation • mock interview/negotiation.

Recommended Books

Stephen P. Robbins & Timothy Judge, Organizational Behavior, Pearson (selected chapters).

Dale Carnegie, How to Win Friends and Influence People, Simon & Schuster (selected applications).

Digital learning resources: NPTEL/SWAYAM: Developing Soft Skills and Personality / Leadership and Team Effectiveness. NPTEL soft skills, leadership and teamwork videos.


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BCA – SEMESTER V

Course Code	Course	L-T-P	Credits
BCAOL 505	Internship-II*	0-0-4	2

Semester / Category: V / PW | Mode: ODL

Course Objective:

Provide structured exposure to professional practice. Connect curriculum with authentic workplace problems. Develop employability evidence through portfolio and reflection.

Course Outcomes:

CO1. Apply academic learning in a supervised work/practice setting.

CO2. Maintain professional records of assigned tasks and learning.

CO3. Demonstrate workplace communication, ethics and reliability.

CO4. Reflect on skills gained and areas for improvement.

Course Content:

Module	Content
Module 1: Preparation	Organisation/domain orientation, learning agreement, ethics, safety, confidentiality and objectives. Topics include: Learning agreement; organization/domain orientation; internship objectives; confidentiality, ethics, safety and expected professional conduct.
Module 2: Workplace Practice	Assigned tasks, weekly log, mentor interaction, professional communication and problem solving. Topics include: Assigned tasks, weekly activity log, mentor meetings, time/task management and workplace communication.
Module 3: Evidence and Reflection	Portfolio, artefacts where permitted, challenges, skills mapping and supervisor feedback. Topics include: Application of technical skills, problem solving, documentation and collaboration; evidence capture subject to organizational permission.
Module 4: Report and Viva	Structured internship report, presentation, reflective account and viva. Topics include: Midpoint review, supervisor feedback, skills gap identification and improvement actions.
Module 5: Integration, Documentation and Viva	Consolidation of the approved work; validation against objectives; documentation and evidence portfolio; ethics and academic integrity; presentation/demonstration; reflective learning; viva voce and future-work plan. Topics include: Final report, permitted work samples/portfolio, supervisor evaluation, presentation, reflective competence mapping and viva.

Assessment activities:

Approved internship learning agreement. • Weekly logbook + midpoint mentor review. • Final report, supervisor feedback and viva.

Practical and project work:

Workplace/approved virtual internship tasks • logbook • supervisor review • final presentation/viva.

Recommended Books

University/CDOE Internship Handbook (to be approved).

Relevant professional/technical references selected by supervisor.

Digital learning resources: Optional domain-specific SWAYAM/NPTEL course may support internship learning; not a substitute for internship. CDOE internship orientation and report-writing videos.


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BCA – SEMESTER V

Course Code	Course	L-T-P	Credits
BCAOL 506	Digital Marketing	0-0-6	3

Semester / Category: V / VAC | Mode: ODL

Course Objective:

Develop practical digital-promotion skills. Connect analytics, content and platform strategy. Enable learners to plan and measure small campaigns.

Course Outcomes:

CO1. Explain major digital marketing channels and customer journeys.

CO2. Create basic content, search, social and e-mail campaign plans.

CO3. Use web/social metrics to evaluate performance.

CO4. Apply ethical, privacy-aware digital marketing practice.

Course Content:

Module	Content
Module 1: Digital Marketing Foundations	Customer journey, personas, value proposition, owned/earned/paid media, campaign objectives. Topics include: Digital strategy, customer journey/funnel, personas, value proposition and owned/earned/paid media.
Module 2: Content, Search and Social	Content strategy, SEO basics, search ads concepts, social platforms, community management. Topics include: Content strategy, editorial calendar, keyword intent, on-page SEO, search ads concepts and campaign structure.
Module 3: E-mail, Web and Conversion	Landing pages, e-mail campaigns, funnels, conversion concepts, A/B testing. Topics include: Social media objectives, content formats, community management, influencer awareness and brand safety.
Module 4: Analytics, Ethics and Planning	KPIs, attribution overview, web/social analytics, privacy/consent, campaign plan and reporting. Topics include: Email segmentation/automation, landing pages, conversion rate optimization, A/B testing and marketing-funnel metrics.
Module 5: Applied Business/Entrepreneurial Case	Integration through a small venture/campaign case; customer or stakeholder analysis; planning and metrics; ethical and legal considerations; concise pitch/report and reflection on assumptions and evidence. Topics include: Web/social analytics, UTM tracking, KPI design, attribution overview, privacy/consent, ethical targeting and integrated campaign plan.

Assessment activities:

Create a persona and customer journey. • Perform a basic SEO/content audit of a public webpage. • Build a campaign plan with KPIs and mock dashboard.

Practical and project work:

Keyword/content exercise • campaign mock-up • e-mail/landing-page prototype • analytics interpretation.

Recommended Books

Dave Chaffey & Fiona Ellis-Chadwick, Digital Marketing, Pearson.

Philip Kotler et al., Marketing 5.0, Wiley (selected chapters).

Digital learning resources: NPTEL/SWAYAM: Digital Marketing / Marketing Management offerings. NPTEL marketing/digital marketing lectures; platform learning-centre videos.


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BCA – SEMESTER VI

Course Code	Course	L-T-P	Credits
BCAOL 601	Software Project Management	3-0-4	5

Semester / Category: VI / CC | Mode: ODL

Course Objective:

Develop management competence for software projects. Integrate software engineering with planning and teamwork. Prepare learners for major project execution.

Course Outcomes:

- CO1. Plan software scope, schedule, resources and risks.
- CO2. Use estimation and project-tracking techniques.
- CO3. Apply agile and traditional project-management concepts.
- CO4. Prepare project artefacts and communicate project status.

Course Content:

Module	Content
Module 1: Project Foundations	Project lifecycle, stakeholders, scope, WBS, feasibility, governance and ethics. Topics include: Project characteristics, lifecycle, stakeholders, business case, scope statement, WBS and governance.
Module 2: Estimation and Scheduling	Size/effort concepts, estimation methods, network planning, Gantt, milestones and resource allocation. Topics include: Size/effort estimation concepts; function-point/LOC awareness; scheduling, dependencies, critical path, Gantt and resource allocation.
Module 3: Risk, Quality and Configuration	Risk register, quality planning, reviews/testing relationship, configuration/change management. Topics include: Risk identification/analysis, risk register, quality planning, reviews, configuration/change management and project documentation.
Module 4: Agile and Project Control	Scrum/Kanban concepts, backlog, sprint planning, metrics, status reporting, closure and lessons learned. Topics include: Agile values; Scrum roles/events/artifacts, backlog, user stories, estimation, Kanban/WIP, hybrid delivery and distributed-team practices.
Module 5: Integration, Documentation and Viva	Consolidation of the approved work; validation against objectives; documentation and evidence portfolio; ethics and academic integrity; presentation/demonstration; reflective learning; viva voce and future-work plan. Topics include: Monitoring and control, earned-value awareness, status reporting, stakeholder communication, closure, retrospective and lessons learned.

Assessment activities:

Create WBS and schedule for a small software project. • Prepare a risk register and mitigation plan. • Run a simulated sprint and submit status report/retrospective.

Practical and project work:

Project plan • estimation/schedule • risk register • agile board • progress report.

Recommended Books

Bob Hughes et al., Software Project Management, McGraw-Hill.

Roger Pressman & Bruce Maxim, Software Engineering, McGraw-Hill.

Digital learning resources: NPTEL/SWAYAM: Software Project Management / Software Engineering. NPTEL Software Engineering and project-management lectures.

BCA – SEMESTER VI

Course Code	Course	L-T-P	Credits
BCAOL 602	Digital Forensics	3-0-0	3

Semester / Category: VI / CC | Mode: ODL

Course Objective:

Introduce legally and ethically sound digital-forensics concepts. Develop evidence-handling and analytical awareness. Connect cybersecurity with incident investigation.

Course Outcomes:

CO1. Explain principles and process of digital forensics.

CO2. Identify common sources of digital evidence.

CO3. Describe acquisition, preservation and analysis concepts.

CO4. Prepare a basic forensic report while maintaining ethics and chain of custody.

Course Content:

Module	Content
Module 1: Forensic Foundations	Digital evidence, forensic process, roles, legal/ethical principles, chain of custody. Topics include: Digital evidence, forensic readiness, investigation lifecycle, legal/ethical boundaries, chain of custody and documentation.
Module 2: Acquisition and Preservation	Volatile/non-volatile evidence, imaging concepts, hashing, write protection, documentation. Topics include: Volatile/non-volatile acquisition concepts; imaging, hashing, write protection, integrity verification and evidence storage.
Module 3: Artefacts and Analysis	File systems overview, deleted files concepts, logs, browser/email/mobile/network artefacts overview. Topics include: File-system concepts, deleted-file awareness, metadata, OS logs, browser/email/application artefacts and timeline fundamentals.
Module 4: Reporting and Incident Context	Timeline concepts, validation, limitations, report structure, expert communication and case studies. Topics include: Network packet/log artefacts, mobile/cloud evidence awareness, time synchronization and attribution limitations.
Module 5: Applied Case Studies and Professional Practice	Integrated case studies connecting architecture, operations, risk, security, legal/ethical responsibilities and current practice; guided troubleshooting/analysis where applicable; preparation of a concise technical or compliance report. Topics include: Correlation, validation, anti-forensics awareness, reporting structure, limitations, expert communication and simulated case analysis.

Assessment activities:

Create a chain-of-custody form for a simulated case. • Interpret supplied hashes/logs/metadata from a sanitised dataset. • Write a short forensic findings report from provided evidence.

Recommended Books

Bill Nelson et al., Guide to Computer Forensics and Investigations, Cengage.

Eoghan Casey, Digital Evidence and Computer Crime, Academic Press.

Digital learning resources: NPTEL/SWAYAM cyber security / digital forensics offerings where available. NPTEL cyber-security lectures; approved forensic-tool demonstration videos.


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BCA – SEMESTER VI

Course Code	Course	L-T-P	Credits
BCAOL 603 – A	Cyber Law	3-0-4	5

Semester / Category: VI / DSE - Elective II | Mode: ODL

Course Objective:

Develop legal awareness for computing professionals. Connect cyber ethics/security with statutory responsibilities. Promote compliant handling of data, content and digital evidence.

Course Outcomes:

CO1. Explain the legal framework relevant to digital transactions and cyber conduct in India.

CO2. Identify common cyber offences and legal issues in electronic evidence.

CO3. Discuss privacy, data protection, IP and intermediary responsibilities at an introductory level.

CO4. Analyse cyber-law cases using structured legal reasoning.

Course Content:

Module	Content
Module 1: Foundations of Cyber Law	Cyberspace, jurisdiction, electronic records/signatures, e-contract concepts and Indian legal framework. Topics include: Cyberspace, jurisdiction and Indian cyber-law framework; electronic records, electronic signatures and e-contract concepts.
Module 2: Cyber Offences and Investigation	Common offences, unauthorised access/fraud/identity misuse concepts, complaint and investigation process overview. Topics include: Cyber offences and incident categories; unauthorized access, identity misuse, fraud, harassment and complaint/investigation process overview.
Module 3: Data, Privacy and Intellectual Property	Privacy/data-protection principles, consent, confidentiality, copyright, trademarks, software/IP issues. Topics include: Privacy and data-protection principles, consent, confidentiality, breach responsibilities and organizational compliance awareness.
Module 4: Platforms and Evidence	Intermediary/platform responsibility overview, electronic evidence concepts, compliance case studies and professional responsibilities. Topics include: Copyright, software licensing, trademarks/domain names and intellectual-property issues in digital environments.
Module 5: Applied Case Studies and Professional Practice	Integrated case studies connecting architecture, operations, risk, security, legal/ethical responsibilities and current practice; guided troubleshooting/analysis where applicable; preparation of a concise technical or compliance report. Topics include: Intermediary/platform responsibility, electronic evidence, professional liability and structured case-law analysis using issue-rule-application-conclusion.

Assessment activities:

Analyse a hypothetical cyber-incident fact pattern. • Prepare a compliance checklist for a small website/app. • Summarise a reported cyber-law judgment in issue-rule-analysis-conclusion format.

Practical and project work:

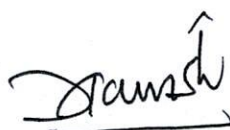
Case analysis • compliance checklist • mock incident documentation • no offensive security activity.

Recommended Books

Karnika Seth, Computers, Internet and New Technology Laws, LexisNexis.

Relevant current bare acts/rules and official government guidance as approved by the University.

Digital learning resources: SWAYAM courses on Cyber Law / Cyber Security and Law; verify current semester offering. CEC/SWAYAM cyber-law lectures; official government cyber-awareness videos.



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BCA – SEMESTER VI

Course Code	Course	L-T-P	Credits
BCAOL 603 – B	Image Processing	3-0-4	5

Semester / Category: VI / DSE - Elective II | Mode: ODL

Course Objective:

Develop foundations of digital image processing. Connect mathematical concepts with visual computing. Prepare learners for computer vision and AI applications.

Course Outcomes:

CO1. Explain digital image representation and basic transformations.

CO2. Apply spatial and frequency-domain enhancement concepts.

CO3. Perform elementary segmentation and morphological operations.

CO4. Implement a small image-processing workflow using Python or an approved tool.

Course Content:

Module	Content
Module 1: Image Fundamentals	Sampling/quantisation, pixels, colour models, histograms and image file concepts. Topics include: Digital image representation, pixels, resolution, sampling/quantization, image formats and colour models.
Module 2: Enhancement and Filtering	Point operations, histogram methods, spatial filters, noise reduction, sharpening; frequency-domain overview. Topics include: Intensity transformations, histograms, smoothing/noise reduction, sharpening and spatial convolution.
Module 3: Segmentation and Morphology	Thresholding, edge detection, region concepts, erosion/dilation/opening/closing. Topics include: Frequency-domain concepts, Fourier transform awareness, filtering and restoration overview.
Module 4: Features and Applications	Basic feature extraction, compression overview, image quality, introductory computer vision applications and ethics. Topics include: Thresholding, edge detection, region segmentation, morphology, connected components and contour analysis.
Module 5: Applied Analytics/AI Case Work	End-to-end applied workflow using a suitable dataset/problem; evaluation and interpretation; limitations and error analysis; responsible use, privacy/bias considerations where relevant; communication of findings through a notebook, report or demonstration. Topics include: Feature extraction, compression overview, quality assessment, introductory computer-vision applications and ethical/privacy considerations.

Assessment activities:

Analyse histograms of contrasting images. • Implement smoothing, sharpening and edge detection. • Build a mini workflow for segmentation or feature extraction.

Practical and project work:

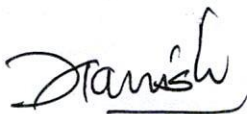
Image I/O • histogram • filtering • edge detection • morphology • segmentation • mini application.

Recommended Books

Rafael C. Gonzalez & Richard Woods, Digital Image Processing, Pearson.

S. Sridhar, Digital Image Processing, Oxford.

Digital learning resources: NPTEL/SWAYAM: Digital Image Processing. NPTEL Digital Image Processing lecture series.


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BCA – SEMESTER VI

Course Code	Course	L-T-P	Credits
BCAOL 604	Professional Communication Skills-II	3-0-0	3

Semester / Category: VI / AEC | Mode: ODL

Course Objective:

Prepare learners for final projects, internships and employment. Strengthen technical documentation and stakeholder communication. Develop persuasive and cross-cultural communication.

Course Outcomes:

CO1. Produce professional technical and project documentation.

CO2. Communicate persuasively with technical and non-technical audiences.

CO3. Handle interviews, meetings and presentations confidently.

CO4. Demonstrate ethical and inclusive communication in distributed teams.

Course Content:

Module	Content
Module 1: Technical Documentation	Requirements summaries, user guides, executive summaries, project reports and documentation standards. Topics include: Advanced technical documentation: SRS summaries, design notes, user guides, project status reports and executive summaries.
Module 2: Persuasive Communication	Proposals, recommendations, evidence, visual communication and stakeholder adaptation. Topics include: Persuasive proposals/recommendations; evidence selection, argument structure, stakeholder adaptation and visual communication.
Module 3: Professional Interaction	Interviews, meetings, negotiation, conflict, cross-cultural and inclusive communication. Topics include: Meetings, facilitation, negotiation, conflict resolution, cross-cultural and inclusive communication in distributed teams.
Module 4: Digital Professional Presence	Portfolio, LinkedIn/profile principles, presentation/viva, remote-work etiquette and communication ethics. Topics include: Technical/HR interviews, portfolio and professional profile; presentation/viva strategy and difficult-question handling.
Module 5: Integrated Professional Communication Practice	Application through workplace scenarios, presentation/interview tasks, collaborative communication, peer feedback, digital professionalism and reflective improvement using a structured rubric. Topics include: Capstone communication portfolio: technical-to-nontechnical translation, project presentation, documentation quality, peer feedback and reflective development.

Assessment activities:

Rewrite a technical explanation for a non-technical audience. • Prepare an executive summary and project status update. • Mock technical interview + final project presentation.

Recommended Books

Meenakshi Raman & Sangeeta Sharma, Technical Communication, Oxford.

Gerald J. Alred et al., Handbook of Technical Writing, Bedford/St. Martin's.

Digital learning resources: NPTEL/SWAYAM: Technical Communication / Soft Skills / Employment Communication. NPTEL communication and soft-skills videos.



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BCA – SEMESTER VI

Course Code	Course	L-T-P	Credits
BCAOL 605	Making of Modern India	2-0-0	2

Semester / Category: VI / VAC | Mode: ODL

Course Objective:

Provide multidisciplinary historical understanding. Develop critical reading and evidence-based interpretation. Connect technology learners with social and national context.

Course Outcomes:

CO1. Outline major social, political and economic developments in modern India.

CO2. Explain selected reform, nationalist and institution-building movements.

CO3. Interpret historical developments using multiple perspectives and evidence.

CO4. Relate historical change to contemporary citizenship and development.

Course Content:

Module	Content
Module 1: Colonial Transformation	Expansion of colonial rule, economy, society, education and early resistance. Topics include: Expansion of colonial rule, administrative/economic transformation, land systems and early resistance.
Module 2: Reform and Nationalism	Social/religious reform, emergence of nationalism, major movements and diverse participation. Topics include: Socio-religious reform movements, education/public sphere, emergence of nationalism and early political organizations.
Module 3: Independence and Partition	Mass movements, constitutional developments, independence and partition. Topics include: Swadeshi, Gandhian mass movements, revolutionary/other strands, workers/peasants/women and diverse regional participation.
Module 4: Nation Building	Constitutional democracy, planned development, social change, science/technology and selected post-independence transformations. Topics include: Constitutional developments, World War context, independence, partition and immediate challenges.
Module 5: Contemporary Issues and Case Analysis	Application of course concepts to contemporary cases; evidence-based interpretation; ethical/civic dimensions; structured discussion and reflective writing connecting the subject with professional and digital life. Topics include: Post-independence nation building: Constitution, democracy, planning, social reform, science/technology, economic change and selected contemporary continuities.

Assessment activities:

Create a timeline with evidence notes. • Compare two historical interpretations of a selected event. • Write a short source-based reflection on science/technology in nation building.

Recommended Books

Bipan Chandra et al., India's Struggle for Independence, Penguin.

Sekhar Bandyopadhyay, From Plassey to Partition and After, Orient BlackSwan.

Digital learning resources: SWAYAM/CEC courses on Modern Indian History / India's Freedom Struggle. CEC/SWAYAM Modern India lecture series.




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BCA – SEMESTER VI

Course Code	Course	L-T-P	Credits
BCAOL 606	Major Project – Phase I	0-0-10	5

Semester / Category: VI / PW-I | Mode: ODL

Course Objective:

Provide a capstone integration experience. Develop research, design, documentation and project-management skills. Create a strong foundation for a complete software/data/system solution.

Course Outcomes:

CO1. Formulate a substantial computing problem and project objectives.

CO2. Conduct a focused literature/technology review.

CO3. Prepare requirements, architecture/design and implementation plan.

CO4. Develop and demonstrate a validated Phase-I prototype.

Course Content:

Module	Content
Module 1: Problem and Review	Problem statement, stakeholder need, literature/technology review, gap, objectives and scope. Topics include: Problem statement, stakeholder/research context, literature/technology review, gap identification, objectives and measurable deliverables.
Module 2: Requirements and Design	SRS/data requirements, architecture, models, UI/data design, ethics/security considerations. Topics include: SRS/research design, architecture, data model, interface design, methodology, security/privacy/ethics and test/evaluation plan.
Module 3: Planning and Prototype	Milestones, risks, tools, repository, prototype/core module implementation and test strategy. Topics include: Milestone schedule, risk register, version-control/repository plan, prototype strategy and supervisor review records.
Module 4: Phase-I Review	Prototype validation, interim report, presentation, viva and Phase-II roadmap where applicable. Topics include: Core implementation/prototype or data/research pipeline, unit/integration tests, experiment logs and evidence of progress.
Module 5: Integration, Documentation and Viva	Consolidation of the approved work; validation against objectives; documentation and evidence portfolio; ethics and academic integrity; presentation/demonstration; reflective learning; viva voce and future-work plan. Topics include: Phase-I report, architecture/design artefacts, prototype demonstration, presentation, viva and clear Phase-II/final-completion roadmap.

Assessment activities:

Proposal + literature/technology review. • SRS/design review with supervisor. • Phase-I prototype, interim report, repository evidence, presentation and viva.

Practical and project work:

Supervised capstone: proposal, SRS/design, prototype, testing evidence, review presentation and viva.

Recommended Books

Roger Pressman & Bruce Maxim, Software Engineering: A Practitioner's Approach.

University/CDOE Major Project Handbook (to be approved).

Digital learning resources: A domain-relevant SWAYAM/NPTEL MOOC may be prescribed by the supervisor as supplementary learning. CDOE project orientation, research-method and documentation videos; domain-specific NPTEL lectures.

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BCA – SEMESTER VI

Course Code	Course	L-T-P	Credits
BCAOL 607	Internship / Training-I*	0-0-4	2

Semester / Category: VI / PW-II | Mode: ODL

Course Objective:

Provide structured industry/practice exposure. Strengthen workplace readiness before graduation. Create evidence of applied competence and professional behaviour.

Course Outcomes:

CO1. Apply computing skills in a supervised professional/training context.

CO2. Demonstrate punctuality, ethics, communication and task ownership.

CO3. Maintain evidence of learning and problem solving.

CO4. Present a reflective account of professional development.

Course Content:

Module	Content
Module 1: Orientation	Learning agreement, organisation/domain, objectives, confidentiality, professional conduct. Topics include: Training/internship learning agreement, organization/domain orientation, objectives, ethics, confidentiality and professional expectations.
Module 2: Guided Practice	Assigned technical/professional tasks, mentor meetings, weekly log and problem solving. Topics include: Assigned technical/professional tasks, weekly log, mentor interaction, communication and time/task management.
Module 3: Competency Evidence	Portfolio, permitted artefacts, skills mapping, supervisor feedback and improvement. Topics include: Application of programming/data/network/cloud/security or other relevant skills; documentation and evidence permitted by host organization.
Module 4: Closure	Report, presentation, reflection, supervisor assessment and viva. Topics include: Midpoint supervisor review, competency mapping, problem/challenge reflection and corrective development plan.
Module 5: Integration, Documentation and Viva	Consolidation of the approved work; validation against objectives; documentation and evidence portfolio; ethics and academic integrity; presentation/demonstration; reflective learning; viva voce and future-work plan. Topics include: Final report, supervisor assessment, allowed portfolio artefacts, presentation, reflective summary and viva/authentication.

Assessment activities:

Learning agreement and orientation quiz. • Weekly log + midpoint review. • Final report, supervisor evaluation, presentation and viva.

Practical and project work:

Supervised internship/training with documented hours/tasks, logbook, mentor review and viva.

Recommended Books

University/CDOE Internship Handbook (to be approved).

Domain references selected jointly by learner and supervisor.

Digital learning resources: Domain-specific SWAYAM/NPTEL course may supplement, but not replace, supervised internship/training. CDOE internship orientation, workplace ethics and report-writing videos.




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