

SCHEME & SYLLABI **for** **BACHELOR OF VOCATION** **In** **Web Development**

(w.e.f. session 2026-2027)

(As per NEP 2020 & UGC Curriculum and Credit Framework for Undergraduate Programmes – CCFUP)

(Choice Based Credit System with Multiple Entry & Exit and NSQF/NCrF Alignment)



COMMUNITY COLLEGE OF SKILL DEVELOPMENT

J. C. BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCA, FARIDABAD
SECTOR-6, FARIDABAD, HARYANA-121006

J. C. Bose University of Science and Technology, YMCA, Faridabad

(formerly YMCA University of Science and Technology)

A State Govt. University established vide State Legislative Act No. 21 of 2009

SECTOR-6, FARIDABAD, HARYANA-121006

VISION

“J.C. Bose University of Science and Technology, YMCA, Faridabad aspires to be a nationally and internationally acclaimed leader in technical and higher education in all spheres which transforms the life of students through integration of teaching, research and character building.”

MISSION

- To contribute to the development of science and technology by synthesizing teaching, research and creative activities.
- To provide an enviable research environment and state-of-the-art technological exposure to its scholars.
- To develop human potential to its fullest extent and make them emerge as world class leaders in their professions and enthuse them towards their social responsibilities.

Community College of Skill Development (CCSD)

VISION

“To be a centre of excellence in vocational and skill-based higher education that produces competent, self-reliant and industry-ready professionals with sound technical skills, ethical values and a spirit of innovation and lifelong learning.”

MISSION

- To impart quality vocational education integrating theory, hands-on practice and on-the-job training aligned with NSQF/NCrF and industry standards.
- To strengthen employability and entrepreneurship through competency-based, outcome-oriented and skill-intensive curricula.
- To foster multiple entry and exit pathways that empower learners to progress seamlessly across academic and vocational qualifications.

ABOUT THE COMMUNITY COLLEGE OF SKILL DEVELOPMENT (CCSD)

The Community College of Skill Development (CCSD) at J.C. Bose University of Science and Technology, YMCA, Faridabad, was established to advance the national skill development agenda through industry-aligned, competency-based vocational education under the National Skills Qualifications Framework (NSQF) and the National Credit Framework (NCrF). CCSD offers Bachelor of Vocation (B.Voc.), Diploma and Post-Graduate Diploma programmes that blend academic rigour with extensive practical training, laboratory work, projects, internships and on-the-job training (OJT) in partnership with industry and Sector Skill Councils.

ABOUT THE PROGRAMME

The B.Voc. Web Development programme is designed in accordance with NEP 2020, UGC Curriculum and Credit Framework for Undergraduate Programmes (CCFUP), and the National Credit Framework (NCrF) to develop industry-ready professionals in the field of web technologies. The programme integrates theoretical knowledge with practical training, laboratory work, projects, internships and On-the-Job Training (OJT), enabling students to acquire competencies in web design, front-end and back-end development, database management, software testing and full-stack web application development. The curriculum is aligned with industry requirements and emerging digital technologies, providing multiple entry-exit options, enhanced employability and entrepreneurial opportunities in the rapidly evolving digital economy.

TABLE 1 PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1	To equip students with strong practical and hands-on skills in web design, front-end development, back-end development, database management, cloud deployment, DevOps practices and full-stack web technologies to make them industry-ready and employable.
PEO2	To develop the ability to design, develop, test, deploy and maintain secure, responsive and scalable web applications that meet industry and societal needs.
PEO3	To inculcate teamwork, communication, leadership and entrepreneurial skills with high regard for professional ethics, digital responsibility and social values.
PEO4	To foster a mind-set of lifelong learning, adaptability to emerging web technologies, AI-assisted development tools and cloud-native application development, and seamless academic-vocational progression through multiple entry and exit pathways.

TABLE 2 PROGRAMME OUTCOMES (POs)

PO1	Vocational & Technical Skills: Apply practical, professional and procedural knowledge to design, develop, test and maintain web applications in routine and non-routine work environments.
PO2	Problem Solving: Identify, analyse and solve web development and software application problems using appropriate programming, database and web technologies.
PO3	Modern Tool Usage: Select and apply modern web development frameworks, databases, cloud platforms, AI-powered development tools and DevOps ecosystems, version control systems and software development tools to accomplish vocational tasks.
PO4	User-Centric Design & Quality: Design responsive, accessible and user-friendly web applications while adhering to quality standards, security practices and industry requirements.
PO5	Communication & Teamwork: Communicate effectively, document technical work, and function efficiently as an individual and as a member of multidisciplinary development teams.
PO6	Ethics & Professional Conduct: Practise professional ethics, cybersecurity awareness, constitutional and human values, and demonstrate accountability and integrity in digital environments.
PO7	Entrepreneurship & Management: Apply project management, digital marketing, freelancing ecosystems, startup incubation and entrepreneurial principles to plan, organize and manage web-based projects and technology ventures.
PO8	Lifelong Learning & Employability: Engage in self-directed and lifelong learning, adapt to emerging technologies, and progress across NSQF/NCrF qualification levels.

TABLE 3 PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1	Ability to design, develop and deploy responsive and interactive web applications using HTML, CSS, JavaScript, React, Node.js, databases and modern web development frameworks.
PSO2	Ability to develop secure, scalable and user-centric full-stack web solutions while maintaining high standards of quality, usability, ethics, cybersecurity and social responsibility.

TABLE 4 SUSTAINABLE DEVELOPMENT GOALS (SDGs) ADDRESSED

SDG 4	Quality Education — inclusive, equitable quality education, digital literacy and lifelong learning opportunities.
SDG 5	Gender Equality – promoting inclusive participation in digital technologies and entrepreneurship.
SDG 8	Decent Work and Economic Growth — productive employment, entrepreneurship and digital economy workforce development.
SDG 9	Industry, Innovation and Infrastructure — innovation, digital transformation, resilient technological infrastructure and sustainable industrial growth.
SDG 12	Responsible Consumption and Production — efficient utilization of digital resources, sustainable computing practices and responsible technology use.
SDG 17	Partnerships for the Goals — collaboration among academia, industry, government and society for technology-driven sustainable development.

TABLE 5 COURSE CODES AND DEFINITIONS (UGC CCFUP CATEGORIES)

L	Lecture
T	Tutorial
P	Practical
DSC	Discipline Specific Course (core vocational/technical)
DSC Lab	Discipline Specific Laboratory / Workshop
MDC	Multidisciplinary Course
AEC	Ability Enhancement Course (language & communication)
VAC	Value Added Course
SEC	Skill Enhancement Course
OJT	On-Job Training / Industrial Training
Project	Project / Field Work
MOOC	Massive Open Online Course (SWAYAM/NPTEL)

J. C. BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCA, FARIDABAD
COMMUNITY COLLEGE OF SKILL DEVELOPMENT (CCSD)
SCHEME OF STUDIES & EXAMINATIONS
THREE-YEAR BACHELOR OF VOCATION (B.Voc.) PROGRAMME IN
Web Development
SEMESTER I – VI (w.e.f. Session 2026-27) (As per NEP 2020 & UGC CCFUP)

TABLE 6**Semester Wise Credit Distribution**

Semester	DSC	AEC	MDC	VAC	SEC	Project	Total
I	14		3	3			20
II	14		3	3			20
III	16	4					20
IV	16		2			2	20
V					20		20
VI					20		20
Total Credits	60	4	8	6	40	2	120

Note:

- a) A student has to earn at least 3 credits during the duration of the degree by passing at least one MOOC course of a minimum 12-week duration (carrying at least 3 credits) through the SWAYAM / NPTEL platform.
- b) A student has to earn 1 credit for the Tree Plantation Activity.

MANDATORY INDUCTION PROGRAMME

When new students enter the institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. A mandatory Induction Programme for the B.Voc. students entering the institution shall be conducted right at the start. Normal classes will begin only after the Induction Programme is over. There is no fixed time limit prescribed for the programme; its duration may be decided by the College/Department as appropriate. Its purpose is to make students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding within the batch as well as between faculty and students, and develop awareness, sensitivity and understanding of the self, the people around them, society at large, and nature.

Tentative activities which may be planned in this Induction Programme are as follows:

- Physical Activity
- Creative Arts
- Universal Human Values
- Literary Activities
- Proficiency Modules
- Lectures by Eminent People
- Visits to Local Area / Industry

- Familiarization to the College / Trade & Innovations

GUIDELINES FOR TREE PLANTATION AND CARE

As approved in the Academic Council, Tree Plantation is a mandatory activity for every student admitted to J. C. Bose University of Science and Technology, YMCA, Faridabad.

Instructions for Students:

1. **Tree Plantation:** Each admitted student is required to plant at least 2-5 tree saplings during his/her first or second semester at any place of their choice at/near their home (e.g., parks, grounds, etc.). The student must capture geo-tagged photographs of the planted saplings (with the student present in the photo) and take proper care of their growth.
2. **Submission of Documents:** The student has to submit geo-tagged photographs of the planted saplings on the University ERP platform in the prescribed format, including name of plant, date of plantation and any additional information.
3. **Ongoing Care and Monitoring:** After plantation, every student will take care of these plants and submit updated geo-tagged photos for subsequent years. The plantation document will be submitted once every year for (N-1) times, where N is the total duration of the programme. For example, a student of a 3-year B.Voc. programme has to submit the plantation document for two consecutive years, i.e., up to the pre-final year, indicating the growth and survival of the sapling.
4. **Tree Survival:** The student must ensure the successful survival of at least one tree out of the 2-5 initially planted, to be eligible for the degree.
5. **Verification of Documents:** Verification will be done by the respective teacher-coordinator at each successive year during Practical Examinations towards the end of the semester, as per the notified academic calendar.
6. **Certificate of Achievement:** The certificate for an eligible student will be auto-generated and may be downloaded from the ERP platform after due verification, fulfilling the requirement for degree conferral.

EXIT CRITERIA

For J. C. Bose University of Science and Technology, YMCA, under the NEP 2020 and UGC CCFUP framework, the exit criteria generally require students to secure a minimum of 40% marks in the end-term examinations, in accordance with the University Examination Ordinance. In addition, students must fulfil the prescribed overall credit requirements to be eligible for the different exit options — UG Certificate, UG Diploma or B.Voc. Degree — aligned with the multiple entry and exit provisions of the National Education Policy, the National Skills Qualifications Framework (NSQF) / National Credit Framework (NCrF), and the guidelines of the University Grants Commission. Each year of study is mapped to a corresponding NSQF level: Year 1 → NSQF 4.5, Year 2 → NSQF 5.0, and Year 3 → NSQF 5.5.

TABLE 7 EXIT OPTION DETAILS

S. No.	NSQF Level	Semester	Exit Options	Credits	Additional Credits for Exit	Exit Criteria
1.	4.5	Sem I-II	U.G. Certificate (Web Development)	40	4	Minimum 4–6 weeks of Industrial Internship OR online discipline specific skill courses at the relevant NCRF/NSQF level from NSQF/SSC/SWAYAM/NPTEL/any other recognized certifying agency (comprising either two courses of 2 credits each or one course of 4 credits) OR a Technical Project.
2.	5.0	Sem I–IV	U.G. Diploma (Web Development)	80	4	Minimum 4–6 weeks of Industrial Internship OR online discipline specific skill courses at the relevant NCRF/NSQF level from NSQF/SSC/SWAYAM/NPTEL/any other recognized certifying agency (comprising either two courses of 2 credits each or one course of 4 credits) OR a Technical Project.

Exit Option for U.G. Certificate (Level 4.5): Any student opting for exit after the second semester will get a UG Certificate provided he/she earns 40 credits in the first two semesters and an additional 4 credits based on the exit options as per Table 7. Thus, he/she will be eligible to exit with 44 credits. The Internship Report / Certificate Course / Technical Project would be evaluated by an approved panel of experts.

EMPLOYMENT PATHWAYS AFTER EXIT	
Exit Qualification	U.G. Certificate
NSQF / NCrF Level	4.5
Associated Industry Sectors	IT–ITeS, Software Development, Web Design and Development, Digital Services, E-Commerce, Start-ups and Freelancing
Mapped Job Roles	Web Designer, Front-End Developer (Entry Level), Website Administrator, WordPress Developer, UI/UX Assistant, Web Content Developer, Digital Marketing Executive, Freelancer
Further Progression	Possibility of re-entry into higher semesters through the Academic Bank of Credits (ABC).

Exit Option for U.G. Diploma (Level 5.0): Any student opting for exit after the fourth semester will get a UG Diploma provided he/she earns 40 credits of Semesters I & II, 40 credits of Semesters III & IV, and an additional 4 credits based on the exit options as per Table 7. Thus, he/she will be eligible to exit with 84 credits. The Internship Report / Certificate Course / Technical Project would be evaluated by an approved panel of experts.

EMPLOYMENT PATHWAYS AFTER EXIT	
Exit Qualification	U.G. Diploma
NSQF / NCrF Level	5.0
Associated Industry Sectors	IT–ITeS, Software Development, Web Application Development, E-Commerce, Digital Services, Start-ups and Technology Consulting
Mapped Job Roles	Front-End Developer, Back-End Developer, Junior Full Stack Developer, Web Application Developer, React Developer, API Developer, Software Tester, Technical Support Executive
Further Progression	Possibility of re-entry into higher semesters through the Academic Bank of Credits (ABC).

Criteria for B.Voc. Degree (Level 5.5): A student completing all six semesters will be awarded the B.Voc. Degree on earning 40 credits of Semesters I & II, 40 credits of Semesters III & IV, and 40 credits of Semesters V & VI (Industrial Training / OJT), subject to the MOOC and Tree-Plantation requirements. The full programme therefore carries 120 + 3* (MOOC) + 1# (Tree Plantation) credits.

EMPLOYMENT PATHWAYS AFTER EXIT	
Exit Qualification	B.Voc. Degree
NSQF / NCrF Level	5.5
Associated Industry Sectors	IT–ITeS, Software Development, Web Development, E-Commerce, Digital Services, EdTech, FinTech, Digital Marketing, Start-ups and Technology Consulting
Mapped Job Roles	Full Stack Developer, MERN Stack Developer, Front-End Developer, Back-End Developer, Web Application Developer, React Developer, Node.js Developer, UI/UX Developer, Software Developer, Web Consultant, Entrepreneur/Freelancer
Further Progression	Possibility of progression to higher studies through the Academic Bank of Credits (ABC).

NSQF JOB-ROLE & NATIONAL OCCUPATIONAL STANDARDS (NOS) ALIGNMENT

This section maps each year-end NSQF exit point of the B.Voc. Web Development programme to the appropriate Qualification Pack (QP) / Job Role and aligns the relevant National Occupational Standards (NOS) to specific subjects of the scheme, with brief justifications.

Year 1 → NSQF 4.5, Year 2 → NSQF 5.0, Year 3 → NSQF 5.5.

Year-wise NSQF Alignment (Summary)

Exit Year	NSQF Level	Job Role	QP Code / NQR	Sector / Council	NOS Aligned
Year 1 (Sem I & II)	4.5	Web Technologies	SSC/Q8407	IT-ITeS Sector Skill Council (NASSCOM)	5 NOS
Year 2 (Sem III & IV)	5.0	Software Product Developer	SSC/Q0512	IT-ITeS Sector Skill Council (NASSCOM)	3 NOS
Year 3 (Sem V & VI)	5.5	Full Stack Web Development (aligned with MERN Stack Developer competencies)	ASP/ITS/Q0501*	IT-ITeS Sector	7 NOS

*Note: The Year 3 specialization is aligned with the competencies of the MERN Stack Developer / Full Stack Web Developer role. While the corresponding Qualification Pack (ASP/ITS/Q0501) is currently mapped at NSQF Level 5.0, the programme exit level for the B.Voc. Degree is NSQF/NCrF Level 5.5 in accordance with the higher education credit framework and programme outcomes.

YEAR 1 EXIT — NSQF Level 4.5 (Semesters I & II)

Job Role: Web Technologies
QP Code: SSC/Q8407
NQR / Ref: SSC/Q8407 (NSQF Level 4.5)
Occupation: Web and Mobile
Sector: IT-ITeS (NASSCOM Sector Skill Council)

NOS - Course Alignment

NOS Code	NOS Title	Aligned Course(s)	Justification (Brief)
SSC/N8440	Work Organization and Management for Web Technologies	Introduction to Web Development; Web Development Lab	Develops understanding of web development workflows, project execution, documentation and workplace practices.
SSC/N8441	Communication and Interpersonal Skills for Web Technologies	Digital Marketing; Introduction to Web Development	Enhances communication, teamwork, client interaction and professional behaviour required in web projects.
SSC/N8442	Design Implementation	Web Design and User Experience, UI/UX Design using Figma and Adobe XD Lab, Web Designing using Tailwind and Bootstrap Lab	Develops competencies in user-centric design, wireframing, prototyping and responsive web interface development.
SSC/N8443	Front-End Web Development	JavaScript Programming, Web Designing using Tailwind and Bootstrap Lab, Web Development Lab	Covers front-end technologies, responsive layouts, scripting and interactive web page development.
SSC/N8444	Back-End Web Development	Computer Fundamentals and C Programming, C Programming Lab, Internet and Web Technologies Lab	Provides foundational programming, problem-solving, Internet technologies and web infrastructure concepts that support the acquisition of back-end web development competencies in higher semesters.

YEAR 2 EXIT - NSQF Level 5.0 (Semesters III & IV)

Job Role: Software Product Developer
QP Code: SSC/Q0512
NQR / Ref: Software Product Developer (SSC/Q0512), NSQF Level 5
Occupation: Software Product Development
Sector: IT-ITeS (NASSCOM Sector Skill Council)

NOS - Course Alignment

NOS Code	NOS Title	Aligned Course(s)	Justification (Brief)
SSC/N0514	Develop and Design Software Products and Applications	Database Management System, Backend Development using Node.js and Express, Software Engineering and Version Control, Web Application Development using React JS	Develops competencies in software design, system architecture, database design, requirement analysis, application development and implementation of software solutions.
SSC/N0502	Develop Software Code Based on Specifications	Database and Backend Development Lab, Web Services and API Development Lab, React JS Lab, Software Testing and Quality Assurance, Software Testing and Quality Assurance Lab, Full Stack Web Development Project	Provides hands-on experience in coding, API development, testing, debugging, software integration and deployment of web applications according to specifications.
DGT/VSQ/N0102	Employability Skills	Professional Communication Skills, Business Management and Entrepreneurship Essentials, Full Stack Web Development Project	Develops communication, teamwork, problem-solving, entrepreneurship, workplace ethics and professional skills required in the software industry.

YEAR 3 EXIT — NSQF Level 5.5 (Semesters V & VI)**Job Role: Full Stack Web Developer / MERN Stack Developer**

QP Code: ASP/ITS/Q0501

NQR / Ref: MERN Stack Developer (ASP/ITS/Q0501)

Occupation: Full Stack Web Development

Sector: IT-ITeS

NOS - Course Alignment

NOS Code	NOS Title	Aligned Course(s)	Justification (Brief)
ASP/ITS/N0501	Introduction to MERN Stack Development	Web Application Development using React JS, React JS Lab	Develops competencies in modern front-end frameworks and full-stack application architecture.
ASP/ITS/N0502	JavaScript and TypeScript Fundamentals	React JS Lab, Full Stack Web Development Project	Strengthens programming skills required for dynamic and interactive web applications.
ASP/ITS/N0503	Building Web Applications with React and Next.js	Web Application Development using React JS, React JS Lab	Enables development of responsive, component-based and scalable web applications.
ASP/ITS/N0504	Building with Database: MongoDB for Developers	Full Stack Web Development Project, On-Job Training (OJT)	Develops skills in NoSQL databases, data modelling and database integration.
ASP/ITS/N0505	Node.js for Backend Development	Full Stack Web Development Project, On-Job Training (OJT)	Provides competencies in server-side programming, API development and backend application design.
ASP/ITS/N0506	On-the-Job Training	On-Job Training (OJT) (Semester V)	Facilitates industry exposure and application of acquired skills in real-world environments.
ASP/ITS/N0507	Project	Full Stack Web Development Project, On-Job Training (OJT) (Semester VI)	Demonstrates the ability to design, develop, test and deploy complete web solutions independently.

Rationale for the NSQF 5.5 UG Degree: The NSQF Level 5.5 exit is based on the cumulative competencies acquired across all six semesters of the B.Voc. Web Development programme. In addition to academic and practical learning in Semesters I–IV, students undergo extensive On-Job Training (OJT), industry internship and project work during Semesters V and VI. The Level 5.5 exit therefore reflects advanced professional competency, workplace readiness and industry experience in full-stack web development in accordance with NSQF, NCeF and NEP 2020.

Co-anchor NSQF Roles

Role / QP	Strongest Scheme Link	Rationale
Full Stack Web Developer	Full Stack Web Development Project, On-Job Training	Integrates front-end, back-end, database and deployment skills for complete web application development.
MERN Stack Developer (ASP/ITS/Q0501)	React JS, Node.js & Express, Full Stack Web Development Project	Develops competencies in MongoDB, Express.js, React and Node.js for modern web application development.
Web Application Developer	React JS, Web Services and API Development, Database and Backend Development Lab	Enables design, development, testing and deployment of dynamic web applications.
Front-End Developer	Web Design and User Experience, JavaScript Programming, React JS	Develops expertise in responsive user interfaces, client-side scripting and user experience design.
Back-End Developer	Backend Development using Node.js and Express, Database Management System	Provides competencies in server-side programming, database integration and API development.

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B.Voc. Web Development
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TABLE 8
SCHEME FOR SEMESTER – I

Course Code	Course Title	Teaching Schedule				Teaching Hours			Marks for Sessional	Marks for End Term Examination		Total Marks	Credits	Course Type
		L	T	P	Total	L	P	O/A		Theory	Practical			
WDV-101-V1	Introduction to Web Development	4	0	0	4	60	0	60	40	60		100	4	DSC
WDV-103-V1	Computer Fundamentals and C Programming	4	0	0	4	60	0	60	40	60		100	4	DSC
WDV-109-V1	Web Development Lab	0	0	4	4	0	60	0	25		25	50	2	DSC LAB
WDV-111-V1	C Programming Lab	0	0	4	4	0	60	0	25		25	50	2	DSC LAB
WDV-107-V1	Internet and Web Technologies Lab	0	0	4	4	0	60	0	25		25	50	2	DSC LAB
VAC-201-V1	Indian Knowledge System	3	0	0	3	45	0	45	40	60		100	3	VAC
WDV-105-V1	Discrete Mathematics	3	0	0	3	45	0	45	40	60		100	3	MDC
Total		14	0	12	26	210	180	210	235	240	75	550	20	

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TABLE 9
SCHEME FOR SEMESTER – II

Course Code	Course Title	Teaching Schedule				Teaching Hours			Marks for Sessional	Marks for End Term Examination		Total Marks	Credits	Course Type
		L	T	P	Total	L	P	O/A		Theory	Practical			
WDV-104-V1	Web Design and User Experience	4	0	0	4	60	0	60	40	60		100	4	DSC
WDV-106-V1	JavaScript Programming	4	0	0	4	60	0	60	40	60		100	4	DSC
WDV-112-V1	WordPress and CMS Lab	0	0	4	4	0	60	0	25		25	50	2	DSC LAB
WDV-110-V1	Web Designing using Tailwind and Bootstrap Lab	0	0	4	4	0	60	0	25		25	50	2	DSC LAB
WDV-108-V1	UI/UX Design using Figma and Adobe XD Lab	0	0	4	4	0	60	0	25		25	50	2	DSC LAB
WDV-102-V1	Digital Marketing	3	0	0	3	45	0	45	40	60		100	3	MDC
ESU-205-V1	Environmental Science	3	0	0	3	45	0	45	40	60		100	3	VAC
Total		14	0	12	26	210	180	210	235	240	75	550	20	

Exit Option for U.G. Certificate (Level 4.5): Any student opting for exit after the second semester will get a UG Certificate on earning 40 credits of the first two semesters plus additional 4 credits as per Table 7 (total 44 credits).

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TABLE 10
SCHEME FOR SEMESTER – III

Course Code	Course Title	Teaching Schedule				Teaching Hours			Marks for Sessional	Marks for End Term Examination		Total Marks	Credits	Course Type
		L	T	P	Total	L	P	O/A		Theory	Practical			
	Database Management System	4	0	0	4	60	0	60	40	60		100	4	DSC
	Backend Development using Node.js and Express	4	0	0	4	60	0	60	40	60		100	4	DSC
	Software Engineering and Version Control	4	0	0	4	60	0	60	40	60		100	4	DSC
	Database and Backend Development Lab	0	0	4	4	0	60	0	25		25	50	2	DSC LAB
	Web Services and API Development Lab	0	0	4	4	0	60	0	25		25	50	2	DSC LAB
	Professional Communication Skills	4	0	0	4	60	0	60	40	60		100	4	AEC
Total		16	0	8	24	240	120	240	210	240	50	500	20	

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TABLE 11
SCHEME FOR SEMESTER – IV

Course Code	Course Title	Teaching Schedule				Teaching Hours			Marks for Sessional	Marks for End Term Examination		Total Marks	Credits	Course Type
		L	T	P	Total	L	P	O/A		Theory	Practical			
	Web Application Development using React JS	4	0	0	4	60	0	60	40	60		100	4	DSC
	Software Testing and Quality Assurance	4	0	0	4	60	0	60	40	60		100	4	DSC
	Operating Systems and Web Server Fundamentals	4	0	0	4	60	0	60	40	60		100	4	DSC
	React JS Lab	0	0	4	4	0	60	0	25		25	50	2	DSC LAB
	Software Testing and Quality Assurance Lab	0	0	4	4	0	60	0	25		25	50	2	DSC LAB
	Full Stack Web Development Project	0	0	4	4	0	60	0	25		25	50	2	Project
	Business Management and Entrepreneurship Essentials	2	0	0	2	30	0	30	40	60		100	2	MDC
Total		14	0	12	26	210	180	210	235	240	75	550	20	

Exit Option for U.G. Diploma (Level 5.0): Any student opting for exit after the fourth semester will get a UG Diploma on earning 40 + 40 credits of the first four semesters plus additional 4 credits as per Table 7 (total 84 credits).

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TABLE 12
SCHEME FOR SEMESTER – V

Course Code	Course Title	Schedule	Credits	Marks for Sessional	Marks for End Term Examination	Total Marks
	Industrial Training / On-Job Training (OJT)	600	17	150	350	500
	Program Elective - I	0	03	40	60	100
Total		600	20	190	410	600

List of Program Elective - I Courses

Course Code	Course Title
	Software Engineering
	Cloud Computing
	Software Project Management
	Software Testing and Quality Assurance
	Object Oriented System Development

Note: During Semester Vth, the student undergoes full-time Industrial Training / OJT in industry, supplemented by a Training Report and a Seminar/Presentation.

Procedure for Evaluation of Industrial Training:

(A) End-Term (350 Marks): Training Report 100; Training Seminar 100; Training Viva 150.

(B) Continuous Assessment (150 Marks): Assessment by Internal Faculty 50; Assessment by Industrial Guide 100.

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TABLE 13
SCHEME FOR SEMESTER – VI

Course Code	Course Title	Schedule	Credits	Marks for Sessional	Marks for End Term Examination	Total Marks
	Industrial Training / On-Job Training (OJT)	600	17	150	350	500
	Program Elective -II	0	03	40	60	100
Total		600	20	190	410	600

List of Program Elective - II Courses

Course Code	Course Title
	DevOps
	Distributed Systems
	Enterprise Application Development
	Software Architecture
	Generative AI for Software Development

During Semester VIth, the student undergoes full-time Industrial Training / OJT in industry, supplemented by a Training Report and a Seminar/Presentation. The full-year OJT in Vth and VIth semester consolidates NSQF 5.5 competency.

Procedure for Evaluation of Industrial Training:

(A) End-Term (350 Marks): Training Report 100; Training Seminar 100; Training Viva 150.

(B) Continuous Assessment (150 Marks): Assessment by Internal Faculty 50; Assessment by Industrial Guide 100.

DETAILED SYLLABI

INTRODUCTION TO WEB DEVELOPMENT

WDD-101-V1

No of Credits: 4**Sessional: 40****Marks****L T P Total****4 0 0 4****Theory: 60 Marks****Total: 100 Marks****Course Objective:**

To provide first-year vocational students with a practical understanding of websites, web applications and Internet technologies used in modern digital environments. The course introduces the fundamentals of web development, website architecture, client-server communication, web technologies, development tools and emerging trends. It prepares students for advanced front-end, back-end and full-stack web development courses while developing awareness of industry practices, web security and professional standards.

Course Outcomes (COs):

At the end of the course, the student shall be able to:

- CO1:** Explain the fundamentals of the Internet, World Wide Web, websites, web applications and the role of web technologies in the digital economy.
- CO2:** Describe the architecture and working of websites, web browsers, web servers, domain names and hosting environments.
- CO3:** Explain and differentiate various web technologies, development tools, frameworks and software used in modern web development.
- CO4:** Apply basic web development concepts, development workflows, web security principles and professional practices for designing and managing web projects.

CO-PO Mapping:

Course Outcomes (Cos)	PO1 (Voc/Tech)	PO2 (Prob. Solving)	PO3 (Tool Usage)	PO4 (Quality / Security)	PO5 (Comm/Team)	PO6 (Ethics)	PO7 (Entre/Mgmt)	PO8 (Lifelong)
CO1	3	2	1	1	1	–	–	2
CO2	3	2	2	2	1	–	–	2
CO3	3	2	3	2	1	–	1	2
CO4	3	2	2	3	1	1	1	3

Correlation: 1 = Low, 2 = Medium, 3 = High; “–” = No correlation.

CO-PSO Mapping:

Course Outcomes (Cos)	PSO1 (Web Application Development)	PSO2 (Full Stack Web Solutions)
CO1	2	1
CO2	2	1
CO3	3	2
CO4	2	3

Course Contents:**Unit 1: Introduction to Web Development and Internet Fundamentals**

Evolution of the Internet and World Wide Web; websites and web applications; static and dynamic websites; Overview of popular web browsers and search engines; web development life cycle; role of web technologies in business, education, e-commerce and digital services; overview of front-end, back-end and full-stack development; introduction to web standards and W3C.

Unit 2: Website Architecture and Web Infrastructure

Client-server architecture; web browsers and web servers; HTTP and HTTPS protocols; URLs and domain names; DNS fundamentals; website hosting concepts; website deployment overview; cloud-based hosting platforms; introduction to web security and secure communication.

Unit 3: Web Technologies and Development Tools

Overview of HTML, CSS and JavaScript; introduction to responsive web design; content management systems (CMS); introduction to web development frameworks and libraries; code editors and integrated development environments (IDEs); version control concepts; introduction to Git and GitHub; web development workflow.

Unit 4: Modern Web Development Practices and Emerging Trends

Website planning and requirement analysis; UI/UX fundamentals; accessibility and usability principles; website testing and debugging concepts; cybersecurity awareness for web developers; search engine optimization (SEO) basics; introduction to cloud computing and website hosting; overview of version control and GitHub; awareness of low-code and no-code platforms; introduction to Generative AI tools for web development; emerging trends in web technologies; career opportunities in web development, freelancing and entrepreneurship.

Textbooks & References

1. Uttam K. Roy, "Web Technologies", Oxford University Press.
2. Achyut S. Godbole & Atul Kahate, "Web Technologies", McGraw Hill Education.
3. Kogent Learning Solutions, "Web Technologies: HTML, CSS, JavaScript, PHP, Java, JSP, XML and AJAX", Dreamtech Press.
4. Deitel & Deitel, "Internet and World Wide Web: How to Program", Pearson Education.
5. Jon Duckett, "HTML and CSS: Design and Build Websites", Wiley Publications.
6. Jon Duckett, "JavaScript and jQuery", Wiley Publications.

Suggested Tutorial / Sessional Assignments

1. Prepare a report on the evolution of the Internet and major milestones in web development.
2. Identify and classify five popular websites as static or dynamic websites.
3. Draw and explain the client-server architecture of a web application.
4. Compare web browsers and list their key features.
5. Create a chart showing the relationship between domain names, DNS and web hosting.
6. Survey different web development tools and compare their features.
7. Create a GitHub account and prepare a report on repository creation and basic version control operations.
8. Study a popular website and identify front-end and back-end technologies used.
9. Prepare a presentation on the role of cloud computing in modern web development.
10. Explore any Generative AI tool used for web development and submit a brief report on its applications and limitations.
11. Prepare a comparative report on three popular website hosting providers and their services.

COMPUTER FUNDAMENTALS AND C PROGRAMMING

WDD-103-V1

No of Credits: 4
L T P Total
4 0 0 4

Sessional: 40 Marks
Theory: 60 Marks
Total: 100 Marks

Course Objective:

To provide first-year vocational students with a strong foundation in computer systems, operating systems, programming concepts and problem-solving techniques using the C programming language. The course introduces fundamental computing concepts, program development methodologies, algorithms and basic programming skills required for web development and software application development.

Course Outcomes (COs):

At the end of the course, the student shall be able to:

- CO1:** Explain the fundamentals of computer systems, hardware, software, operating systems and data representation.
- CO2:** Apply problem-solving techniques, algorithms and flowcharts for developing simple computer programs.
- CO3:** Develop C programs using variables, operators, control structures, arrays and functions to solve basic computational problems.
- CO4:** Demonstrate programming skills using structured programming concepts, debugging techniques and coding best practices.

CO-PO Mapping:

Course Outcomes (Cos)	PO1 (Voc/Tech)	PO2 (Prob. Solving)	PO3 (Tool Usage)	PO4 (Quality / Security)	PO5 (Comm/Team)	PO6 (Ethics)	PO7 (Entre/Mgmt)	PO8 (Lifelong)
CO1	3	2	1	2	1	–	–	2
CO2	3	3	2	1	1	–	–	2
CO3	3	3	3	2	1	–	1	2
CO4	3	2	2	3	1	1	1	3

Correlation: 1 = Low, 2 = Medium, 3 = High; “–” = No correlation.

CO-PSO Mapping:

Course Outcomes	PSO1 (Web Application Development)	PSO2 (Full Stack Web Solutions)
CO1	2	1
CO2	2	1
CO3	3	2
CO4	2	3

Course Contents:

Unit 1: Computer Fundamentals and Digital Systems

Introduction to computers and their applications; characteristics of computers; hardware and software concepts; input, output, storage and processing devices; memory hierarchy; operating systems and their functions; number systems (binary, decimal, octal and hexadecimal); data representation; introduction to computer networks, Internet and World Wide Web; overview of software development and programming languages.

Unit 2: Problem Solving and Program Design

Problem-solving concepts; algorithms and flowcharts; problem analysis, algorithm design, flowcharting and program development life cycle; introduction to C programming language; structure of a C program; character set, tokens and keywords; variables, constants and data types; input and output statements; operators and expressions; type conversion and operator precedence.

Unit 3: Control Structures and Modular Programming

Decision-making statements (if, if-else, nested if, switch); looping statements (for, while, do-while); break and continue statements; arrays and strings; functions and their advantages; function declaration, definition and calling; recursion basics; scope and lifetime of variables; storage classes.

Unit 4: Advanced Programming Concepts and Good Coding Practices

Pointers and their applications; structures and unions; basic file handling concepts; debugging and error handling; coding standards and documentation practices; introduction to integrated development environments (IDEs); program testing and validation; overview of programming applications in web development, software systems and automation tools; career opportunities in software and web development.

Textbooks & References

1. E. Balagurusamy, "Programming in ANSI C", McGraw Hill Education.
2. Yashavant Kanetkar, "Let Us C", BPB Publications.
3. Reema Thareja, "Computer Fundamentals and Programming in C", Oxford University Press.
4. P. K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications.
5. Anita Goel & Ajay Mittal, "Computer Fundamentals", Pearson Education.
6. Ashok N. Kamthane, "Programming with ANSI and Turbo C", Pearson Education.

Suggested Tutorial / Sessional Assignments

1. Prepare a report on the evolution and generations of computers.
2. Draw and explain the functional block diagram of a computer system.
3. Convert numbers between binary, decimal, octal and hexadecimal number systems.
4. Develop algorithms and flowcharts for simple real-life problems.
5. Write a C program to perform basic arithmetic operations.
6. Write a C program using conditional statements for grading and decision-making problems.
7. Develop a menu-driven C program using switch-case statements.
8. Write C programs using arrays and strings for basic data processing.
9. Create user-defined functions for mathematical operations and demonstrate their use.
10. Debug a faulty C program and prepare a report identifying and correcting errors.
11. Prepare a comparative report on different IDEs used for C programming and software development.

WEB DEVELOPMENT LAB WDD-107-V1

No of Credits: 2**Sessional: 25****Marks****L T P Total****0 0 4 4****Practical: 25 Marks****Total: 50 Marks****Course Objective:**

To provide practical exposure to web development fundamentals, website design and development tools, HTML and CSS technologies, responsive web design principles and modern web development environments. The laboratory enables students to create, organize, validate and deploy basic websites using industry-standard tools and practices.

Course Outcomes (COs):

At the end of the course, the student shall be able to:

CO1: Demonstrate the use of web browsers, development tools and web development environments.

CO2: Create and organize web pages using HTML and CSS technologies.

CO3: Apply website structure, navigation, responsive design and content organization techniques in web projects.

CO4: Develop, validate and deploy basic websites following good design and documentation practices.

CO-PO Mapping:

Course Outcomes (Cos)	PO1 (Voc/Tech)	PO2 (Prob. Solving)	PO3 (Tool Usage)	PO4 (Quality / Security)	PO5 (Comm/Team)	PO6 (Ethics)	PO7 (Entre/Mgmt)	PO8 (Lifelong)
CO1	3	1	3	1	1	–	–	2
CO2	3	2	3	2	1	–	–	2
CO3	3	2	3	2	1	–	1	2
CO4	3	2	3	3	1	1	1	3

Correlation: 1 = Low, 2 = Medium, 3 = High; “–” = No correlation.

CO–PSO Mapping:

Course Outcomes (COs)	PSO1 (Web Application Development)	PSO2 (Full Stack Web Solutions)
CO1	2	1
CO2	3	1
CO3	3	2
CO4	3	2

List of Practical:

1. Study and configure a web development environment using Visual Studio Code and browser developer tools.
2. Create a basic HTML webpage displaying personal information.
3. Design webpages using headings, paragraphs, text formatting tags and lists.
4. Create webpages using hyperlinks for internal and external navigation.
5. Insert images and multimedia elements in webpages.
6. Design webpages using HTML tables.
7. Apply CSS using inline, internal and external style sheets.
8. Design webpages using CSS colors, fonts, backgrounds and text properties.
9. Create webpage layouts using CSS box model concepts.
10. Design responsive webpages using CSS media queries and responsive design principles.
11. Create navigation menus and multi-page website structures.
12. Design webpages using CSS positioning, Flexbox and layout techniques.
13. Design a student profile website using HTML and CSS.
14. Design a business or service-oriented website.
15. Create a personal portfolio website containing profile, skills, projects and contact information.
16. Organize website files using appropriate folder structures and naming conventions.
17. Validate webpages using HTML and CSS validation tools.

18. Analyze and improve website responsiveness using browser developer tools.
19. Create a GitHub account, upload website files and publish a website using GitHub Pages.
20. Mini Project: Design, develop and deploy a responsive website on a selected theme.

Suggested Mini Project Themes

- Personal Portfolio Website
- College Information Website
- Small Business Website
- Restaurant Website
- Travel & Tourism Website
- NGO Website
- Healthcare Information Portal
- Event Management Website

Textbooks & References:

1. Jon Duckett, "HTML and CSS: Design and Build Websites", Wiley Publications.
2. Thomas A. Powell, "HTML & CSS: The Complete Reference", McGraw Hill Education.
3. Jennifer Robbins, "Learning Web Design", O'Reilly Media.
4. Deitel & Deitel, "Internet and World Wide Web: How to Program", Pearson Education.
5. Mozilla Developer Network (MDN) Web Docs – HTML, CSS and Web Development Reference.

C PROGRAMMING LAB WDD-109-V1

No of Credits: 2**L T P Total****0 0 4 4****Sessional: 25 Marks****Practical: 25 Marks****Total: 50 Marks****Course Objective:**

To provide practical exposure to problem-solving and programming using the C language. The laboratory enables students to develop programming skills through hands-on exercises involving variables, operators, control structures, arrays, functions, pointers and file handling concepts.

Course Outcomes (COs):

At the end of the course, the student shall be able to:

CO1: Develop simple C programs using variables, operators and input/output statements.

CO2: Implement decision-making and looping constructs to solve computational problems.

CO3: Develop modular programs using arrays, strings and functions.

CO4: Apply advanced programming concepts such as pointers, structures and file handling in C programs.

CO-PO Mapping:

Course Outcomes (Cos)	PO1 (Voc/Tech)	PO2 (Prob. Solving)	PO3 (Tool Usage)	PO4 (Quality / Security)	PO5 (Comm/Team)	PO6 (Ethics)	PO7 (Entre/Mgmt)	PO8 (Lifelong)
CO1	3	2	3	1	1	–	–	2
CO2	3	3	3	1	1	–	–	2
CO3	3	3	2	2	1	–	1	2
CO4	3	2	3	3	1	1	1	3

Correlation: 1 = Low, 2 = Medium, 3 = High; “–” = No correlation.

CO–PSO Mapping:

Course Outcomes (COs)	PSO1 (Web Application Development)	PSO2 (Full Stack Web Solutions)
CO1	2	1
CO2	2	1
CO3	3	2
CO4	3	2

List of Practical:

1. Write a C program to display a welcome message.
2. Write a C program to perform arithmetic operations on two numbers.
3. Write a C program to calculate area and perimeter of basic geometric shapes.
4. Write a C program to find the largest of three numbers using conditional statements.
5. Write a C program to check whether a number is even or odd.
6. Write a C program to generate multiplication tables using loops.
7. Write a C program to find factorial of a number.
8. Write a C program to generate Fibonacci series.
9. Write a C program to check whether a number is prime.
10. Write a C program to perform matrix addition.
11. Write a C program to sort elements of an array.
12. Write a C program to search an element in an array.
13. Write a C program to perform string operations.
14. Write a C program using user-defined functions for mathematical calculations.
15. Write a recursive function to calculate factorial or Fibonacci series.
16. Write a C program demonstrating pointer operations.
17. Write a C program using structures to store student information.
18. Write a C program to read and write data using files.
19. Write a menu-driven C program using switch-case statements.
20. Mini Project

Suggested Mini Project Themes

- Student Record Management System
- Library Management System
- Inventory Management System
- Employee Information System
- Banking Transaction Simulator
- Calculator System
- Hotel Billing System
- Attendance Management System

Textbooks & References:

1. E. Balagurusamy, "Programming in ANSI C", McGraw Hill Education.
2. Yashavant Kanetkar, "Let Us C", BPB Publications.
3. Reema Thareja, "Computer Fundamentals and Programming in C", Oxford University Press.
4. Ashok N. Kamthane, "Programming with ANSI and Turbo C", Pearson Education.
5. Byron Gottfried, "Programming with C", Schaum's Outline Series.
6. Brian W. Kernighan & Dennis M. Ritchie, "The C Programming Language", Pearson Education.

INTERNET AND WEB TECHNOLOGIES LAB

WDD-111-V1

No of Credits: 2
L T P Total
0 0 4 4

Sessional: 25 Marks
Practical: 25 Marks
Total: 50 Marks

Course Objective:

To provide practical exposure to Internet technologies, web services, website hosting concepts and online resources used in modern web applications. The laboratory enables students to understand Internet infrastructure, domain and hosting concepts, web accessibility, website security awareness and web-based services.

Course Outcomes (COs):

At the end of the course, the student shall be able to:

CO1: Demonstrate the use of Internet services, web browsers and online resources.

CO2: Explain domain names, DNS, website hosting and Internet infrastructure concepts.

CO3: Apply website accessibility, performance evaluation and security awareness practices.

CO4: Analyze and publish web-based content using Internet technologies and hosting services.

CO-PO Mapping:

Course Outcomes (COs)	PO1 (Voc/Tech)	PO2 (Prob. Solving)	PO3 (Tool Usage)	PO4 (Quality / Security)	PO5 (Comm/Team)	PO6 (Ethics)	PO7 (Entre/Mgmt)	PO8 (Lifelong)
CO1	3	1	3	1	1	–	–	2
CO2	3	2	3	2	1	–	–	2
CO3	3	2	3	2	1	–	1	2
CO4	3	2	3	3	1	1	1	3

Correlation: 1 = Low, 2 = Medium, 3 = High; “–” = No correlation.

CO–PSO Mapping:

Course Outcomes	PSO1 (Web Application Development)	PSO2 (Full Stack Web Solutions)
CO1	2	1
CO2	3	1
CO3	3	2
CO4	3	2

List of Practical:

1. Study various Internet services and applications.
2. Explore popular web browsers and compare their features.
3. Study the structure of URLs and web addresses.
4. Explore domain names and DNS resolution concepts.
5. Study IP addresses and Internet connectivity tools.
6. Use search engines effectively and perform advanced web searches.
7. Compare different website hosting providers and services.
8. Study domain registration and website hosting procedures.
9. Explore cloud-based website hosting platforms.
10. Study HTTPS, SSL certificates and secure web communication.
11. Create and configure professional email accounts.
12. Explore online collaboration and web communication tools.
13. Embed Google Maps and external web resources into webpages.
14. Study website accessibility guidelines and testing tools.
15. Analyze website loading speed using online performance testing tools.
16. Study website security awareness and safe browsing practices.
17. Explore Content Management Systems (CMS) and their applications.
18. Prepare a comparative study of static and dynamic websites.
19. Publish a simple informational webpage using a hosting platform.
20. Mini Project: Website Analysis, Hosting and Deployment Report.

Suggested Mini Project Themes

- Website Hosting Analysis Report
- Educational Website Review
- E-Commerce Website Evaluation
- Accessibility Audit of a Website
- Website Performance Analysis
- Government Portal Study
- Tourism Website Analysis
- NGO Website Evaluation

Textbooks & References:

1. Uttam K. Roy, Web Technologies, Oxford University Press.
2. Achyut S. Godbole & Atul Kahate, Web Technologies, McGraw Hill Education.
3. Deitel & Deitel, Internet and World Wide Web: How to Program, Pearson Education.
4. Kogent Learning Solutions, Web Technologies, Dreamtech Press.

INDIAN KNOWLEDGE SYSTEM VAC-201-V1

No of Credits: 3
L T P Total
3 0 0 3

Sessional: 40 Marks
Theory: 60 Marks
Total: 100 Marks

Course Objective:

The course aims to provide an understanding of the foundations of Indian Knowledge Systems, highlight India's contributions in diverse fields of knowledge, familiarize students with traditional approaches to holistic development and ethical living, and emphasize the relevance of Indian knowledge traditions in contemporary education, professions, and society.

Course Outcomes (COs):

At the end of the course, the student shall be able to:

CO1: Explain the origin, scope, and foundational principles of Indian Knowledge Systems.

CO2: Describe contributions of ancient India in science, mathematics, astronomy, and linguistics traditions.

CO3: Examine Indian approaches to health, architecture, environment, and sustainable living practices.

CO4: Apply principles of Indian ethics, governance, and management traditions in personal and professional life.

CO-PO Mapping:

Course Outcomes (Cos)	PO1 (Voc/Tech)	PO2 (Prob. Solving)	PO3 (Tool Usage)	PO4 (Quality / Security)	PO5 (Comm/Team)	PO6 (Ethics)	PO7 (Entre/Mgmt)	PO8 (Lifelong)
CO1	1	2	–	1	1	2	–	3
CO2	1	2	–	1	1	1	–	3
CO3	1	2	–	2	1	2	1	3
CO4	1	2	–	2	2	3	2	3

Correlation: 1 = Low, 2 = Medium, 3 = High; "–" = No correlation.

CO–PSO Mapping:

Course Outcomes (Cos)	PSO1 (Web Application Development)	PSO2 (Full Stack Web Solutions)
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	1

Course Contents:

Unit 1: Foundations of Indian Knowledge Systems

Concept, meaning and significance of Indian Knowledge Systems; sources of Indian knowledge including Vedas, Upanishads, Puranas and Epics; overview of major philosophical systems (Darshanas); fundamental principles and relevance of IKS in modern education and society.

Unit 2: Indian Knowledge Traditions in Science, Mathematics and Linguistics

Scientific traditions in ancient India; contributions of Aryabhata, Brahmagupta and Baudhayana; arithmetic, geometry, trigonometry and Vedic mathematics; Indian astronomy; Panini's contribution to linguistics; introduction to Vakyashastra and Pramanashastra.

Unit 3: Indian Traditions in Health, Wellness, Architecture and Sustainable Living

Indian perspective of psychology and holistic development; Ashtanga Yoga and Rasa Siddhanta; introduction to Ayurveda and preventive healthcare; principles of Vastushastra and traditional architecture; ancient Indian city planning and sustainable living practices.

Unit 4: Indian Knowledge Systems in Governance and Management

Indian economic thought in Arthashastra and Nitishastra; leadership, motivation and financial management in Indian traditions; ethics and value-based governance; indigenous entrepreneurship and community economy.

Textbooks & References:

1. Mahadevan, B., Bhat, V. R., & Pavana, R. N. (2022), Introduction to Indian Knowledge System: Concepts and Applications, PHI Learning Pvt. Ltd., New Delhi.
2. Radhakrishnan, S. (2009), Indian Philosophy (Vol. I & II). Oxford University Press, New Delhi.
3. Kapoor, Kapil & Singh, Avadhesh Kumar (Eds.), (2019). Indian Knowledge Systems: Knowledge Traditions and Practices of India, Indian Institute of Advanced Study, Shimla.
4. Kangle, R. P. (Ed. & Trans.). (2010 Reprint), The Kautiliya Arthashastra (Parts I–III), Motilal Banarsidass Publishers Pvt. Ltd., Delhi.
5. Daegens, Bruno. (2007), Mayamatam: Indian Treatise on Housing, Architecture and Iconography, Indira Gandhi National Centre for the Arts, New Delhi.
6. Dave, N. V. (2002), Vedanta and Management: Relevance of Vedantic Concepts in Modern Management Practices, Deep & Deep Publications Pvt. Ltd., New Delhi.
7. Rao, S. Balachandra. (2000), Indian Astronomy: An Introduction, Universities Press (India) Pvt. Ltd., Hyderabad.
8. Ramasubramanian, K., Sriram, M. S., & Srinivas, M. D. (2011), Tantrasangraha with Detailed Mathematical Explanatory Notes. Hindustan Book Agency, New Delhi.
9. Bhate, Saroja. (2002), Panini's Grammar: An Overview. Sahitya Akademi, New Delhi.
10. Ramachandrudu, P. (2010), Glimpses into Kautilya's Arthashastra, Sanskrit Academy, Hyderabad.
11. Tirthaji Maharaj, Jagadguru Swami Sri Bharati Krishna. (1965), Vedic Mathematics, Motilal Banarsidass Publishers Pvt. Ltd., Delhi.

DISCRETE MATHEMATICS WDD-105-V1

No of Credits: 3
L T P Total
3 0 0 3

Sessional: 40 Marks
Theory: 60 Marks
Total: 100 Marks

Course Objective:

To provide students with the fundamental mathematical concepts required in computer science and web development. The course introduces logic, sets, relations, functions, counting techniques and graph concepts that support problem-solving, programming, database systems and software development.

Course Outcomes (COs):

At the end of the course, the student shall be able to:

- CO1:** Apply logical reasoning and propositional logic for problem-solving and computational thinking.
- CO2:** Demonstrate understanding of sets, relations and functions used in computer science applications.
- CO3:** Solve counting and combinatorial problems using basic counting principles and probability concepts.
- CO4:** Explain graph and tree structures and their applications in computer networks, databases and software systems.

CO-PO Mapping:

Course Outcomes (Cos)	PO1 (Voc/Tech)	PO2 (Prob. Solving)	PO3 (Tool Usage)	PO4 (Quality / Security)	PO5 (Comm/Team)	PO6 (Ethics)	PO7 (Entre/Mgmt)	PO8 (Lifelong)
CO1	2	3	1	1	1	–	–	2
CO2	2	3	1	1	1	–	–	2
CO3	2	3	1	1	1	–	1	2
CO4	3	3	2	1	1	–	–	3

Correlation: 1 = Low, 2 = Medium, 3 = High; “–” = No correlation.

CO–PSO Mapping:

Course Outcomes (Cos)	PSO1 (Web Application Development)	PSO2 (Full Stack Web Solutions)
CO1	2	1
CO2	2	1
CO3	2	2
CO4	3	2

Course Contents:

Unit 1: Logic and Propositional Calculus

Introduction to discrete mathematics; logical statements and propositions; logical operators; truth tables; tautology and contradiction; logical equivalence; implication and converse; applications of logic in computing and programming.

Unit 2: Sets, Relations and Functions

Sets and set operations; Venn diagrams; Cartesian products; relations and their properties; equivalence relations; functions and types of functions; applications of relations and functions in databases and software systems.

Unit 3: Counting Techniques and Probability

Principle of counting; permutations and combinations; basic probability concepts; simple probability problems and applications in password generation, authentication systems and data analysis.

Unit 4: Graph Theory and Trees

Introduction to graphs; types of graphs; graph representation; paths and connectivity; trees and binary trees;

applications of graphs in computer networks, social networks, website navigation and search engines.

Textbooks & References:

1. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw Hill.
2. J. P. Tremblay & R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw Hill.
3. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, PHI Learning.
4. Seymour Lipschutz & Marc Lipson, Discrete Mathematics, Schaum's Outline Series.
5. V. K. Balakrishnan, Schaum's Outline of Discrete Mathematics, McGraw Hill.
6. J. K. Sharma, "Discrete Mathematics for Computer Science", Macmillan Education.

Suggested Tutorial / Sessional Assignments:

1. Construct truth tables for common logical expressions.
2. Solve problems based on logical equivalences and implications.
3. Draw Venn diagrams for real-world set operations.
4. Identify relations and functions from practical computing examples.
5. Solve permutation and combination problems related to passwords and security codes.
6. Calculate probabilities in simple web-user behaviour scenarios.
7. Represent a computer network using graph structures.
8. Draw and analyse website navigation structures using trees.
9. Study graph applications in social media networks.
10. Prepare a report on the role of discrete mathematics in computer science and web development.

WEB DESIGN AND USER EXPERIENCE

WDD-104-V1

No of Credits: 4**Sessional: 40****Marks****L T P Total****4 0 0 4****Theory: 60 Marks****Total: 100 Marks****Course Objective:**

To provide students with the knowledge and skills required to design visually appealing, user-friendly and accessible websites. The course introduces web design principles, user experience (UX), user interface (UI) design, responsive web design, wireframing and usability concepts essential for modern web applications.

Course Outcomes (COs):

At the end of the course, the student shall be able to:

CO1: Explain the principles of web design, visual communication and user-centered design.

CO2: Apply UI/UX design concepts, usability principles and accessibility guidelines in website design.

CO3: Design responsive website layouts using modern web design methodologies and best practices.

CO4: Evaluate and improve website usability, user experience and design quality through testing and feedback.

CO-PO Mapping:

Course Outcomes (Cos)	PO1 (Voc/Tech)	PO2 (Prob. Solving)	PO3 (Tool Usage)	PO4 (Quality / Security)	PO5 (Comm/Team)	PO6 (Ethics)	PO7 (Entre/Mgmt)	PO8 (Lifelong)
CO1	3	2	1	2	1	–	–	2
CO2	3	2	2	3	1	1	–	2
CO3	3	3	3	3	1	–	1	2
CO4	3	2	2	3	2	1	1	3

Correlation: 1 = Low, 2 = Medium, 3 = High; “–” = No correlation.

CO–PSO Mapping:

Course Outcomes (Cos)	PSO1 (Web Application Development)	PSO2 (Full Stack Web Solutions)
CO1	2	1
CO2	3	2
CO3	3	2
CO4	2	3

Course Contents:**Unit 1: Fundamentals of Web Design and Visual Communication**

Introduction to web design; evolution of website design; principles of visual communication; design thinking concepts; elements of design (color, typography, images, icons and layouts); principles of design (balance, contrast, alignment, proximity and consistency); branding and visual identity in websites.

Unit 2: User Interface and User Experience Design

Introduction to UI and UX; user-centered design process; user research and user personas; information architecture; navigation design; wireframes and mock-ups; usability principles; accessibility guidelines (WCAG); designing for diverse users and devices.

Unit 3: Responsive Web Design and Prototyping

Responsive web design concepts; mobile-first design approach; adaptive layouts; grids and flexible design systems; website structure and page layout planning; prototyping concepts; introduction to design tools and workflows; overview of Figma, Adobe XD and collaborative design platforms; design documentation and collaboration.

Unit 4: Website Evaluation and Emerging Design Trends

Usability testing methods; heuristic evaluation; user feedback and website analytics; website performance and user satisfaction; SEO-friendly design principles; design ethics and privacy considerations; dark mode and responsive design trends; introduction to AI-assisted design tools; emerging trends in UI/UX design; portfolio development and career opportunities in UI/UX and web design.

Textbooks & References:

1. Jesse James Garrett, "The Elements of User Experience", New Riders.
2. Steve Krug, "Don't Make Me Think", New Riders.
3. Ben Frain, "Responsive Web Design with HTML5 and CSS", Packt Publishing.
4. Jennifer Tidwell, "Designing Interfaces", O'Reilly Media.
5. Jon Duckett, "HTML and CSS: Design and Build Websites", Wiley Publications.
6. Alan Cooper, Robert Reimann & David Cronin, "About Face: The Essentials of Interaction Design", Wiley.

Suggested Tutorial / Sessional Assignments:

1. Analyse the design of three popular websites and identify good UI/UX practices.
2. Create a color palette and typography guide for a website.
3. Develop user personas for an e-commerce website.
4. Design a sitemap for a college or business website.
5. Prepare wireframes for a homepage and contact page.
6. Compare responsive and non-responsive websites.
7. Conduct a usability evaluation of a selected website.
8. Identify accessibility issues in an existing website and suggest improvements.
9. Prepare a report on modern web design trends and UI patterns.
10. Study AI-assisted design tools and document their applications in web design.
11. Create a case study of a website redesign highlighting usability improvements.

JAVASCRIPT PROGRAMMING

WDD-106-V1

No of Credits: 4**Sessional: 40****Marks****L T P Total****4 0 0 4****Theory: 60 Marks****Total: 100 Marks****Course Objective:**

To provide students with a strong foundation in client-side web programming using JavaScript. The course introduces programming concepts, dynamic web page development, event handling, form validation, Document Object Model (DOM) manipulation and modern JavaScript features used in interactive web applications.

Course Outcomes (COs):

At the end of the course, the student shall be able to:

CO1: Explain the fundamentals of JavaScript, its syntax, data types, operators and control structures.

CO2: Develop JavaScript programs using functions, arrays, objects and built-in methods.

CO3: Apply DOM manipulation, event handling and form validation techniques to create interactive web pages.

CO4: Develop dynamic web applications using modern JavaScript concepts and debugging techniques.

CO-PO Mapping:

Course Outcomes (Cos)	PO1 (Voc/Tech)	PO2 (Prob. Solving)	PO3 (Tool Usage)	PO4 (Quality / Security)	PO5 (Comm/Team)	PO6 (Ethics)	PO7 (Entre/Mgmt)	PO8 (Lifelong)
CO1	3	2	1	1	1	–	–	2
CO2	3	3	2	1	1	–	–	2
CO3	3	3	3	2	1	–	1	2
CO4	3	2	3	3	1	1	1	3

Correlation: 1 = Low, 2 = Medium, 3 = High; “–” = No correlation.

CO–PSO Mapping:

Course Outcomes	PSO1 (Web Application Development)	PSO2 (Full Stack Web Solutions)
CO1	2	1
CO2	3	2
CO3	3	2
CO4	2	3

Course Contents:**Unit 1: Introduction to JavaScript and Programming Fundamentals**

Introduction to JavaScript and its role in web development; embedding JavaScript in web pages; variables, constants and data types; operators and expressions; input and output methods; decision-making statements; looping statements; basic debugging concepts.

Unit 2: Functions, Arrays and Objects

Functions and their types; parameters and return values; scope of variables; arrays and array operations; strings and string methods; objects and object properties; built-in JavaScript objects; practical applications in web development.

Unit 3: DOM Manipulation and Event Handling

Introduction to Document Object Model (DOM); selecting and modifying HTML elements; manipulating styles and content; event handling and event types; mouse and keyboard events; form validation techniques; creating interactive web pages using JavaScript.

Unit 4: Modern JavaScript and Web Application Development

JavaScript Objects and Object-Oriented Concepts; Error Handling and Debugging Techniques; JSON and Data Exchange Formats; Introduction to Document Object Model (DOM); Event Handling and Dynamic User Interaction; Form Validation Techniques; Introduction to Modern JavaScript (ES6 Features); Arrow Functions, Template Literals and Destructuring; Introduction to APIs and Fetching Data from Web Services; Overview of JavaScript Frameworks and Libraries; Career Opportunities in Front-End and Full Stack Development.

Textbooks & References:

1. Jon Duckett, “JavaScript and JQuery: Interactive Front-End Web Development”, Wiley Publications.
2. David Flanagan, “JavaScript: The Definitive Guide”, O’Reilly Media.
3. Marijn Haverbeke, “Eloquent JavaScript”, No Starch Press.
4. Nicholas C. Zakas, “Professional JavaScript for Web Developers”, Wiley Publications.
5. Chris Minnick & Eva Holland, “JavaScript for Absolute Beginners”, Que Publishing.
6. Vishal Monpara, “Learning JavaScript”, BPB Publications.

Suggested Tutorial / Sessional Assignments:

1. Write JavaScript programs demonstrating variables, operators and control statements.
2. Develop a simple calculator using JavaScript.
3. Create programs using loops to generate patterns and number series.
4. Perform operations on arrays and strings using JavaScript methods.
5. Create and manipulate JavaScript objects representing real-world entities.
6. Develop a web page that changes content dynamically using DOM manipulation.
7. Implement event handling for mouse and keyboard interactions.
8. Create a registration form with client-side validation.
9. Parse and display JSON data using JavaScript.
10. Explore browser developer tools and debug JavaScript errors.
11. Prepare a report on the role of JavaScript in modern front-end frameworks and web applications.

WORDPRESS AND CMS LAB

WDD-112-V1

No of Credits: 2**L T P Total****Marks****0 0 4 4****Sessional: 25 Marks****Practical: 25****Total: 50 Marks****Course Objective:**

To provide practical exposure to Content Management Systems (CMS) and WordPress website development. The laboratory enables students to create, customize and manage websites using WordPress themes, plugins and content management tools for personal, business and e-commerce applications.

Course Outcomes (COs):

At the end of the course, the student shall be able to:

CO1: Install, configure and manage WordPress and CMS environments.

CO2: Create and customize websites using WordPress themes, pages and content management features.

CO3: Integrate plugins, forms, media and navigation components into WordPress websites.

CO4: Develop and deploy professional websites using WordPress while following usability, security and maintenance practices.

CO-PO Mapping:

Course Outcomes (Cos)	PO1 (Voc/Tech)	PO2 (Prob. Solving)	PO3 (Tool Usage)	PO4 (Quality / Security)	PO5 (Comm/Team)	PO6 (Ethics)	PO7 (Entre/Mgmt)	PO8 (Lifelong)
CO1	3	1	3	2	1	–	–	2
CO2	3	2	3	2	1	–	1	2
CO3	3	2	3	2	1	–	1	2
CO4	3	2	3	3	1	1	1	3

Correlation: 1 = Low, 2 = Medium, 3 = High; “–” = No correlation.

CO–PSO Mapping:

Course Outcomes	PSO1 (Web Application Development)	PSO2 (Full Stack Web Solutions)
CO1	2	1
CO2	3	1
CO3	3	2
CO4	3	2

List of Practicals:

1. Installation and configuration of XAMPP/WAMP server.
2. Installation and setup of WordPress on a local server.
3. Study of WordPress dashboard, settings and user roles.
4. Create and manage pages, posts and categories.
5. Create menus and navigation structures.
6. Upload and manage images, videos and media files.
7. Install and customize WordPress themes.
8. Create a personal portfolio website using WordPress.
9. Create a business website using WordPress.
10. Install and configure useful WordPress plugins.
11. Create contact forms using WordPress plugins.
12. Design custom page layouts using page builders.
13. Configure widgets and sidebars.
14. Implement basic SEO settings in WordPress.
15. Create and manage blogs and news sections.
16. Configure website security and backup plugins.
17. Create an e-commerce website using WooCommerce.
18. Manage products, categories and orders in WooCommerce.
19. Deploy a WordPress website on a hosting platform.

20. Mini Project: Design, develop and deploy a complete WordPress website for a selected application.

Suggested Mini Project Themes

- Personal Portfolio Website
- College Website
- Business Website
- Restaurant Website
- Travel & Tourism Website
- NGO Website
- E-Commerce Store
- Event Management Website

Textbooks & References:

1. Lisa Sabin-Wilson, "WordPress for Dummies", Wiley Publications.
2. Karol Król, "WordPress Complete", Packt Publishing.
3. Brad Williams, David Damstra & Hal Stern, "Professional WordPress", Wiley Publications.
4. Adam Clarke, "SEO 2025", Adam Clarke Publishing.
5. Rachel McCollin, "WordPress Development Quick Start Guide", Packt Publishing.
6. WordPress Official Documentation and Developer Resources.

WEB DESIGNING USING TAILWIND AND BOOTSTRAP LAB

WDD-110-V1

No of Credits: 2**Sessional: 25****Marks****L T P Total****0 0 4 4****Practical: 25 Marks****Total: 50 Marks****Course Objective:**

To provide practical exposure to modern front-end web development using Bootstrap and Tailwind CSS frameworks. The laboratory enables students to design responsive, mobile-friendly and visually appealing websites using pre-built components, utility classes and contemporary web design practices.

Course Outcomes (COs):

At the end of the course, the student shall be able to:

CO1: Install, configure and utilize Bootstrap and Tailwind CSS development environments.

CO2: Design responsive web pages using Bootstrap components and grid systems.

CO3: Develop modern user interfaces using Tailwind CSS utility classes and responsive design techniques.

CO4: Create complete responsive websites using Bootstrap and Tailwind CSS while following usability and design best practices.

CO-PO Mapping:

Course Outcomes (Cos)	PO1 (Voc/Tech)	PO2 (Prob. Solving)	PO3 (Tool Usage)	PO4 (Quality / Security)	PO5 (Comm/Team)	PO6 (Ethics)	PO7 (Entre/Mgmt)	PO8 (Lifelong)
CO1	3	1	3	1	1	–	–	2
CO2	3	2	3	2	1	–	1	2
CO3	3	2	3	2	1	–	1	2
CO4	3	2	3	3	1	1	1	3

Correlation: 1 = Low, 2 = Medium, 3 = High; “–” = No correlation.

CO–PSO Mapping:

Course Outcomes	PSO1 (Web Application Development)	PSO2 (Full Stack Web Solutions)
CO1	2	1
CO2	3	1
CO3	3	2
CO4	3	2

List of Practical:

1. Install and configure Bootstrap and Tailwind CSS development environments.
2. Create a basic responsive webpage using Bootstrap.
3. Design layouts using Bootstrap containers, rows and columns.
4. Develop responsive navigation bars using Bootstrap components.
5. Create forms using Bootstrap form controls and validation features.
6. Design responsive cards, alerts, buttons and badges using Bootstrap.
7. Develop a responsive landing page using Bootstrap components.
8. Create a dashboard-style interface using Bootstrap utilities.
9. Install and configure Tailwind CSS in a web project.
10. Design responsive page layouts using Tailwind utility classes.
11. Create navigation menus using Tailwind CSS.
12. Design forms and input controls using Tailwind CSS.
13. Develop responsive cards, galleries and content sections using Tailwind CSS.
14. Create a modern portfolio webpage using Tailwind CSS.
15. Implement responsive typography and spacing utilities.
16. Compare Bootstrap and Tailwind CSS by designing similar layouts in both frameworks.
17. Design an e-commerce homepage using Bootstrap.
18. Design an e-commerce homepage using Tailwind CSS.
19. Optimize responsive websites for mobile, tablet and desktop devices.
20. Mini Project: Design and develop a complete responsive website using Bootstrap, Tailwind CSS or a

combination of both frameworks.

Suggested Mini Project Themes

- Personal Portfolio Website
- College Information Website
- Small Business Website
- Restaurant Website
- Tourism Information Website
- NGO Website
- Healthcare Information Portal
- Event Management Website

Textbooks & References:

1. Mark Otto & Jacob Thornton, "Bootstrap Documentation and Guides".
2. Tailwind Labs, "Tailwind CSS Official Documentation".
3. Jon Duckett, "HTML and CSS: Design and Build Websites", Wiley Publications.
4. Jennifer Robbins, "Learning Web Design", O'Reilly Media.
5. Ben Frain, "Responsive Web Design with HTML5 and CSS", Packt Publishing.
6. David Karlins, Doug Sahlin & Ed Tittel, "Bootstrap Essentials", Wiley Publications.
7. Mozilla Developer Network (MDN) Web Docs – CSS and Responsive Design Reference.

UI/UX DESIGN USING FIGMA AND ADOBE XD LAB

WDD-108-V1

No of Credits: 2
L T P Total
0 0 4 4

Sessional: 25 Marks
Practical: 25 Marks
Total: 50 Marks

Course Objective:

To provide practical exposure to User Interface (UI) and User Experience (UX) design using industry-standard design tools such as Figma and Adobe XD. The laboratory enables students to create wireframes, prototypes, user interfaces and interactive designs for websites and web applications while following user-centered design principles and usability standards.

Course Outcomes (COs):

At the end of the course, the student shall be able to:

CO1: Demonstrate the use of Figma and Adobe XD for UI/UX design and prototyping.

CO2: Create wireframes, mockups and user interface layouts for websites and web applications.

CO3: Develop interactive prototypes using UI/UX design principles and usability guidelines.

CO4: Design complete user-centered interfaces and evaluate them using usability and accessibility considerations.

CO-PO Mapping:

Course Outcomes (Cos)	PO1 (Voc/Tech)	PO2 (Prob. Solving)	PO3 (Tool Usage)	PO4 (Quality / Security)	PO5 (Comm/Team)	PO6 (Ethics)	PO7 (Entre/Mgmt)	PO8 (Lifelong)
CO1	3	1	3	1	1	–	–	2
CO2	3	2	3	2	1	–	1	2
CO3	3	2	3	3	1	–	1	2
CO4	3	2	3	3	2	1	1	3

Correlation: 1 = Low, 2 = Medium, 3 = High; “–” = No correlation.

CO–PSO Mapping:

Course Outcomes	PSO1 (Web Application Development)	PSO2 (Full Stack Web Solutions)
CO1	2	1
CO2	3	1
CO3	3	2
CO4	3	2

List of Practical:

1. Install, configure and explore the Figma and Adobe XD design environment.
2. Study the interface, tools and collaborative features of Figma and Adobe XD.
3. Create basic design components such as shapes, icons, text and color palettes.
4. Design typography styles and reusable design elements.
5. Create low-fidelity wireframes for a website homepage.
6. Develop wireframes for a multi-page website.
7. Design user personas and user journey maps for a web application.
8. Create high-fidelity website mockups using Figma.
9. Design responsive web page layouts for desktop and mobile devices.
10. Create reusable components and design systems.
11. Design navigation menus, headers and footers for websites.
12. Develop forms, login pages and registration interfaces.
13. Create interactive prototypes with page transitions and navigation flows.
14. Design a landing page for a business or e-commerce website.
15. Create a portfolio website interface using Figma or Adobe XD.
16. Conduct usability evaluation of a selected website and document findings.
17. Apply accessibility guidelines in UI/UX design projects.
18. Design a dashboard interface for a web application.
19. Explore AI-assisted design features available in modern UI/UX tools.
20. Mini Project: Design and prototype a complete website or web application interface using Figma or

Adobe XD.

Suggested Mini Project Themes

1. Personal Portfolio Website
2. College Information Website
3. Small Business Website
4. Restaurant Website
5. Tourism Information Website
6. NGO Website
7. Healthcare Information Portal
8. Event Management Website

Textbooks & References:

1. Jesse James Garrett, "The Elements of User Experience", New Riders.
2. Steve Krug, "Don't Make Me Think", New Riders.
3. Alan Cooper, Robert Reimann & David Cronin, "About Face: The Essentials of Interaction Design", Wiley.
4. Jennifer Tidwell, "Designing Interfaces", O'Reilly Media.
5. Ben Frain, "Responsive Web Design with HTML5 and CSS", Packt Publishing.
6. Figma Official Documentation and Design Resources.
7. Adobe XD Official Documentation and Tutorials.

DIGITAL MARKETING WDD-102-V1

No of Credits: 3**Sessional: 40****Marks****L T P Total****3 0 0 3****Theory: 60 Marks****Total: 100 Marks****Course Objective:**

To provide students with fundamental knowledge of digital marketing techniques and online business promotion strategies. The course introduces search engine optimization (SEO), social media marketing, content marketing, online advertising, web analytics and emerging digital marketing tools used to promote websites, products and services in the digital economy.

Course Outcomes (COs):

At the end of the course, the student shall be able to:

CO1: Explain the concepts, scope and importance of digital marketing in modern business environments.

CO2: Apply search engine optimization (SEO), content marketing and social media marketing techniques for online promotion.

CO3: Demonstrate understanding of online advertising, email marketing and web analytics tools.

CO4: Evaluate digital marketing campaigns and emerging trends including AI-enabled marketing technologies.

CO-PO Mapping:

Course Outcomes (Cos)	PO1 (Voc/Tech)	PO2 (Prob. Solving)	PO3 (Tool Usage)	PO4 (Quality / Security)	PO5 (Comm/Team)	PO6 (Ethics)	PO7 (Entre/Mgmt)	PO8 (Lifelong)
CO1	2	2	1	1	2	1	2	2
CO2	2	3	2	2	2	1	3	2
CO3	2	2	3	2	1	1	3	2
CO4	2	3	2	3	2	1	3	3

Correlation: 1 = Low, 2 = Medium, 3 = High; “–” = No correlation.

CO-PSO Mapping:

Course Outcomes	PSO1 (Web Application Development)	PSO2 (Full Stack Web Solutions)
CO1	1	1
CO2	2	1
CO3	2	2
CO4	2	2

Course Contents:**Unit 1: Introduction to Digital Marketing**

Digital marketing concepts and evolution; traditional marketing versus digital marketing; digital marketing ecosystem; online consumer behaviour; websites as marketing tools; digital marketing channels; role of digital marketing in business growth and entrepreneurship.

Unit 2: Search Engine Optimization and Content Marketing

Introduction to search engines; SEO fundamentals; on-page SEO and off-page SEO techniques; keyword research concepts; content marketing strategies; blogging and website content creation; link building concepts; search engine marketing overview.

Unit 3: Social Media Marketing and Online Advertising

Social media platforms and their business applications; social media marketing strategies; influencer marketing concepts; email marketing fundamentals; online advertising models; Google Ads and Pay-Per-Click (PPC) advertising overview; display advertising; campaign planning and budgeting basics.

Unit 4: Web Analytics and Emerging Trends

Introduction to web analytics; website traffic analysis; key performance indicators (KPIs); Google Analytics overview; digital marketing metrics and reporting; mobile marketing concepts; AI-enabled marketing tools; Generative AI for content creation, campaign optimization and customer engagement; ethical issues in digital marketing; career opportunities in digital marketing.

Textbooks & References:

1. Seema Gupta, "Digital Marketing", McGraw Hill Education.
2. Puneet Singh Bhatia, "Fundamentals of Digital Marketing", Pearson Education.
3. Vandana Ahuja, "Digital Marketing", Oxford University Press.
4. Philip Kotler, Hermawan Kartajaya & Iwan Setiawan, "Marketing 5.0: Technology for Humanity", Wiley.
5. Damian Ryan, "Understanding Digital Marketing", Kogan Page.
6. Ian Dodson, "The Art of Digital Marketing", Wiley.

Suggested Tutorial / Sessional Assignments:

1. Prepare a report comparing traditional marketing and digital marketing.
2. Analyse the digital presence of a local business.
3. Conduct basic keyword research for a website.
4. Create a simple SEO checklist for a web page.
5. Prepare a content marketing plan for a small business.
6. Study social media campaigns of popular brands and identify best practices.
7. Design a sample email marketing campaign.
8. Compare different online advertising platforms and their features.
9. Prepare a report on Google Analytics and website traffic metrics.
10. Explore AI tools used in digital marketing and document their applications.
11. Develop a digital marketing strategy for promoting a newly launched website or web application.

ENVIRONMENTAL SCIENCE

ESU-205-V1

No of Credits: 3
L T P Total
3 0 0 3

Sessional: 40 Marks
Theory: 60 Marks
Total: 100 Marks

Course Objective:

The course aims to provide students with an understanding of the interactions between humans and the environment, natural resources, biodiversity, environmental pollution, climate change, and environmental management. It also seeks to develop awareness of sustainable development practices and familiarize students with national and international environmental laws and treaties for promoting responsible environmental stewardship.

Course Outcomes (COs):

At the end of the course, the student shall be able to:

- CO1:** Explain the historical evolution of human-environment interactions and the emergence of environmental thought and global environmentalism.
- CO2:** Analyze the classification, utilization, and sustainable management of natural resources, and relate them to the principles of sustainable development.
- CO3:** Evaluate the concepts of biodiversity and ecosystem services, conservation approaches.
- CO4:** Identify major types of environmental pollution and assess their sources, impacts on human health and ecosystems; assess the significance of climate change impacts, adaptation, and mitigation.
- CO5:** Interpret key national and international environmental laws, treaties, and institutional mechanisms aimed at environmental protection and sustainable governance.

CO-PO Mapping:

Course Outcomes (Cos)	PO1 (Voc/Tech)	PO2 (Prob. Solving)	PO3 (Tool Usage)	PO4 (Quality / Security)	PO5 (Comm/Team)	PO6 (Ethics)	PO7 (Entre/Mgmt)	PO8 (Lifelong)
CO1	1	2	–	2	1	2	–	3
CO2	2	3	1	3	1	2	1	3
CO3	1	2	1	3	1	2	–	3
CO4	2	3	1	3	1	2	1	3
CO5	1	2	–	2	1	3	1	3

Correlation: 1 = Low, 2 = Medium, 3 = High; “–” = No correlation.

CO–PSO Mapping:

Course Outcomes	PSO1 (Web Application Development)	PSO2 (Full Stack Web Solutions)
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	1
CO5	1	1

Course Contents:

Unit 1: Humans and the Environment

The man-environment interaction: Humans as hunter-gatherers, Mastery of fire, Origin of agriculture, Great ancient civilizations and the environment, Industrial revolution and its impact on the environment, Population growth and natural resource exploitation. The emergence of environmentalism: Anthropocentric and eco-centric perspectives, The Club of Rome- Limits to Growth, UN Conference on Human Environment 1972, World Commission on Environment and Development, Rio Summit.

Unit 2: Natural Resources and Sustainable Development

Definition of resource; Classification of natural resources- biotic and abiotic, renewable and nonrenewable. Biotic resources: Major type of biotic resources- forests, grasslands, wetlands, wildlife and aquatic (fresh water and marine), Microbes as a resource. Water resources: Types of water resources- fresh water and marine resources, Availability and use, Environmental impact of over-exploitation, issues and challenges, Water scarcity and stress, Conflicts over water. Soil and mineral resources: Important minerals, Mineral exploitation, Environmental problems due to extraction of minerals and use, Soil as a resource and its degradation. Energy resources: Sources of energy and their classification, renewable and non-renewable sources of energy, Conventional energy sources- coal, oil, natural gas, nuclear energy, non-conventional energy sources- solar, wind, tidal, hydro, wave, ocean thermal, geothermal, biomass, hydrogen and fuel cells, Implications of energy use on the environment. Introduction to sustainable development: Sustainable Development Goals (SDGs)

Unit 3: Environmental Issues: Local, Regional and Global

Temporal and spatial extents of local, regional, and global phenomena. Pollution: Types of Pollution- air, noise, water, soil, municipal solid waste, hazardous waste, Transboundary air pollution, Acid rain, Smog. Land use and Land cover change: land degradation, deforestation, desertification, urbanization. Global issues: Ozone layer depletion, Green-house effect, Global Warming, Climate change.

Unit 4: Conservation of Biodiversity and Ecosystems

Ecosystems and ecosystem services: Concept; Structure and Functions of Ecosystem, Ecosystem types forests, wetlands, grasslands, agriculture, coastal and marine; Ecosystem services. Biodiversity and its distribution: Biodiversity as a natural resource, Levels and types of biodiversity, Biodiversity in India and the world, Biodiversity hotspots. Threats to biodiversity, in-situ and ex-situ conservation approach, role of traditional knowledge, community-based conservation.

Unit 5: Environmental Pollution and Health

Definition of pollution; Point sources and non-point sources of pollution. (5 hrs) Air pollution: Sources of air pollution, Primary and secondary pollutants, Criteria pollutants, Other important air pollutants- Volatile Organic compounds, Peroxyacetyl Nitrate, Polycyclic aromatic hydrocarbons and Persistent organic pollutants, Indoor air pollution, health impacts of air pollutants, National Ambient Air Quality Standards. Water pollution: Sources of water pollution, River, lake and marine pollution, groundwater pollution, Water quality parameters and standards, health impacts of water pollution on human and aquatic life. Soil pollution and solid waste: Soil pollutants and their sources, Solid and hazardous waste, Impact on human health. Noise pollution: Definition of noise, measurement and sources of noise pollution, Noise standards, impacts of noise on human health. Thermal and Radioactive pollution: Sources and impact on human health and ecosystems.

Unit 6: Climate Change: Impacts, Adaptation and Mitigation

Structure of atmosphere, Importance of 1.5 °C and 2.0 °C limits to global warming, Climate change projections for the Indian sub-continent. Impacts of climate change on ocean, land, forests and natural ecosystems, Impacts on animal species, agriculture, health, urban infrastructure; concept of vulnerability, Adaptation vs. resilience, Indigenous knowledge for adaptation to climate change. Mitigation measures: Green House Gas (GHG) reduction vs. sink enhancement, carbon neutrality, Net zero targets for the future, Energy efficiency measures, National climate action plan.

Unit 7: Environmental Management

Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g); Introduction to environmental legislations on the forest, wildlife and pollution control. Environmental management system: ISO 14001. Environmental audit and impact assessment, Pollution control and management, Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability, Ecolabeling /Ecomark scheme.

Unit 8: Environmental Treaties and Legislation

Vienna Convention; Montreal Protocol and the Kigali Amendment. Basel Convention, Stockholm Convention on Persistent Organic Pollutants, Minamata Convention. United Nations Framework Convention on Climate Change (UNFCCC), Kyoto Protocol, Paris Agreement, India's status as a party to major conventions. National Green Tribunal, Convention on Biological Diversity (CBD), Cartagena Protocol, Nagoya Protocol, Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), Ramsar Convention on Wetlands of International Importance, Ramsar sites, United Nations Convention to Combat Desertification (UNCCD).

Textbooks & References:

1. Barrow, C. J. (1999). Environmental management: Principles and practice. Routledge.
2. Berrang-Ford, L., J.D. Ford & J. Paterson (2011). Are we adapting to climate change? Global Environmental Change-Human and Policy Dimensions 21: 25-33.
3. Chiras, D. D and Reganold, J. P. (2010). Natural Resource Conservation: Management for a Sustainable Future. 10th edition, Upper Saddle River, N. J. Benjamin/Cummins/Pearson.
4. De Anil, K. (2003). Environmental chemistry. New Age International.
5. Gilbert M. Masters and W. P. (2008). An Introduction to Environmental Engineering and Science, Publisher (Pearson)
6. India Code - Digital repository of all Central and State Acts: <https://www.indiacode.nic.in/>
7. Kanchi Kohli and Manju Menon (2021) Development of Environment Laws in India, Cambridge University Press.
8. Kaushik, A., & Kaushik, C. P. (2006). Perspectives in environmental studies. New Age International.
9. Krishnamurthy, K.V. (2003) Textbook of Biodiversity, Science Publishers, Plymouth, UK
10. Rajagopalan, R. (2011). Environmental Studies: From Crisis to Cure. India: Oxford University Press.
11. Ela Richard A. Marcantonio, Marc Lane (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press.
12. Simmons, I. G. (2008). Global Environmental History: 10,000 BC to AD 2000. Edinburgh University Press