कंप्यूटर साइंस

Department of Computer-Science

Institute for Excellence in Higher Education (IEHE), Bhopal (MP)

NAAC Re-accredited (Fourth Cycle) Autonomous College
Under the UGC Scheme with 'A+' Grade (CGPA-3.45)

Program Outcomes (POs),
Program Specific Outcome (PSOs)
&
Course Outcomes (COs)
of
Department of Computer Science

B.Sc./B.Sc. (Honours) Computer Science
(Session: 2023-2024)

(Dr. Sabha Kant Dwivedi)
HOD, Computer Science
IEHE, Bhopal (M.P.)

Programmes offered in the Institute

Under Graduate Programmes

- B.Com. *(4-Year UG programme under NEP-2020)*
- B.Com. Honours (Management/Account) *(3-Year UG programme under old pattern)*

- B.A. (Major: Economics/History/Psychology/Sociology/Political-Science/English-Literature/ Hindi-Literature/Geography/Fashion Designing) *(4-Year UG programme under NEP-2020)*
- B.A. Honours (Economics/History/Psychology/Sociology/Political Science/English-Literature/ Hindi-Literature/Geography/Fashion-Designing) *(3-Year UG programme under old pattern)*

- **B.Sc. (Major:** Physics/Chemistry/**Computer-Science**/Mathematics/Electronics/Biotechnology/ Geography/Forensic-Science/Clinical Nutrition and Dietetics) *(4-Year UG programme under NEP-2020)*
- **B.Sc. Honours** (Physics/Chemistry/**Computer-Science**/ Mathematics/Electronics/Biotechnology/ Geography/Forensic-Science) *(3-Year UG programme under old pattern)*

- B.B.A. *(4-Year UG programme under NEP-2020) (New)*

- B.P.E.S. *(3-Year UG programme) (New)*

Post Graduate Programmes

- MA (Economics)
- MA (English)
- MA (Hindi) *(New)*
- MA (History)
- MA (Political Science)
- MA (Psychology) *(New)*
- MA (Public Administration)
- MA (Sociology) *(New)*
- MA (Social Work)
- M.Sc. (Biotechnology)
- M.Sc. (Chemistry)
- M.Sc. (Mathematics)
- M.Sc. (Physics)
- M.Com. (Marketing Management)

Courses offered by Vocational Cell (IEHE)

Diploma Courses (16)

1. Diploma in Financial Services (**DFS**)
2. Diploma in Human Resources Development (**DHRD**)
3. Diploma in Communicative English (**DCE**)
4. Diploma in Guidance and Counselling Psychology (**DGC**)
5. Diploma in Industrial Work & Management System (**DIWMS**)
6. Diploma in Statistical Analysis (**DSA**)
7. Diploma in Taxation (**DIT**)
8. Diploma in Creative Arts (**DCrA**)
9. Diploma in Computer Application (**DCA**)
10. Diploma in Tourism & Hospitality Management (**DTHM**)
11. Diploma in Forensic Science (**DFSc.**)
12. Diploma in Remote Sensing & GIS (**DRSG**)
13. Diploma in Hostel Management (**DHM**) *
14. Diploma in Retail Marketing Management (**DRMM**)
15. Diploma in Banking Financial Services and Insurance (**DBFSAI**)
16. Diploma in Data Science and Analysis (**DDA**) – NEW

Certificate Courses (16)

1. Certificate Courses in English Creative Writing (**CECW**)
2. Certificate Courses in Research Methodology (**CRM**)
3. Certificate Courses in Instrumentation & Electronic Maintenance (**CIEM**)
4. Certificate Courses in Cyber Security (**CCS**)
5. Certificate Courses in Spoken English (**CSE**)
6. Certificate Course in Intellectual Property Right (**CIPR**)
7. Certificate Courses in French Language (**CFL**)
8. Certificate Courses in Hostel Management (**CHM**)
9. Certificate Courses in Retail Marketing Management (**CRMM**)
10. Certificate Courses in Banking Financial Services and Insurance (**CBFSAI**)
11. Certificate Course in Advance Excel (**CCAE**) – NEW
12. Certificate Course in Psychological Assessment and Tool Development (**CPATD**) – NEW
13. Certificate Course in Basics in Geogebra (**CCBG**) – NEW
14. Certificate Course in Cooking and Baking (**CCCB**) – NEW
15. Certificate Course in Emotional Intelligence (**CCEI**) – NEW
16. Certificate Course in Packaging and Designing (**CCPD**) - NEW

Training Courses (06)

1. 45 Hours Training Programme in Food Processing & Preservation (**FPP**)
2. 30 Hours Training Programme in (**MATLAB**)
3. 30 Hours Training Programme in (**SPSS**)
4. 30 Hours Training Programme in Tally
5. 30 Hours Training Programme in Traditional Art (**TPTA**)
6. CII-IWN-IEHE Finishing School

Special Courses

1. Foundation Course in Civil Services Examinations (**FCCSE**)
2. Joint Admission Test for M.Sc. (**JAM**)

Program Outcomes (PO) of the Under-Graduate Courses Offered in the Institute

PO1: **Domain Knowledge:** Capable of demonstrating comprehensive knowledge & understanding of one or more other disciplines that form a part of an undergraduate programme of study.

PO2: **Critical Thinking:** Critically evaluate practices, policies and theories by following scientific approach to knowledge development. Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO3: **Problem Solving and Analytical Skills:** Ability to think rationally, analyse situations and solve problems adequately.

PO4: **Information and Digital Literacy:** Capability to use ICT in a variety of learning situations. Demonstrate ability to access, evaluate and use a variety of relevant information sources; and use appropriate software for analysis of data.

PO5: **Communication Skills:** The capacity to communicate effectively using appropriate media, to present complex information in a clear & concise manner. Acquire the learning abilities by focusing on LSRW (Listening, Speaking, Reading & Writing skill, which provide a stage to the students to sharpen their capacity to learn more.

PO6: **Social Interaction and sensitivity towards the societal issue s:** Work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group and act together as a group or a team in the interests of a common cause. Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO7: **Self-directed & Life-long Learning:** Acquire the potential to engage in independent & life-long learning in the broadest context socio-technological changes. Critical sensibility to live experiences, with self-awareness and reflexivity of both and society.

PO8: **Environment and Sustainability:** Understand the issues of environmental contexts & sustainable development.

PO9: **Moral and Ethical Awareness:** Ability to embrace moral/ ethical values in conducting one's life, possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

PO10: **Effective Citizenship:** Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO11: **Research-related skills:** A sense of inquiry and capability for asking relevant/appropriate questions, problematizing, synthesizing and articulating; Ability to recognize cause and effective relationships, define problems, formulate hypotheses, interpret and draw conclusions from data, ability to plan, execute and report the results of an experiment or investigation. Efficiency to apply one's learning to real life situations or in interdisciplinary areas.

PO12: **Leadership and Management Skills:** Competence to use skills in organizing for people to reach a shared goal. During leading a project, ability to motivate others to complete a series of tasks, often according to a schedule.

PO13: **Employability and Entrepreneurial Skill:** Ability to develop employability skills such as, positive attitude, good business sense, willingness to learn, resilience, ability to work under pressure, optimism, adaptability, perseverance and motivation, and a host of similar skills.

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PROGRAMME OUTCOMES (PO): **B.Sc.**

Predefined Programme Outcomes	*Students taking admission to this program of B.Sc. get equipped with following outcomes:*
PO1	**Domain Knowledge:** Acquiring knowledge of fundamentals, basic Mathematics, domain knowledge of proper scientific models and Computing Specialization from defined problems and explaining the basic scientific principles and methods.
PO2	**Scientific thinking:** Inculcating scientific thinking and awareness, getting an ability to use necessary current techniques, skills, and modern tools.
PO3	**Problem Analysis:** Identifying, formulating, & analysing complex problems, reaching substantiated conclusions using first principles of Mathematics, natural sciences and electronic sciences.
PO4	**Communication:** Communicate concepts, designs, and solutions of scientific activities effectively and professionally with society at large.
PO5	**Information & Digital Literacy:** Capability to use ICT in a variety of learning situations. Demonstrate ability to access, evaluate and use a variety of relevant information sources; and use appropriate software for analysis of data.
PO6	**Ethical Awareness:** Ability to embrace moral/ ethical values in conducting one's life, possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to support the values required for collaborative work such as mutual trust & fairness.
PO7	**Environment & Sustainability:** Understanding the impact of scientific solutions on societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
PO8	**Self-directed and Life-long Learning:** Acquire the ability to engage in independent and life- long learning in the broadest context socio-technological changes. Critical sensibility to live experiences, with self-awareness and reflexivity of both and society.
PO9	**Research-related skills:** • Acquiring familiarity with emerging areas of different subjects in science and their applications in various spheres of sciences and getting appraise of its relevance in future studies. • Getting ability to apply various statistical tools to research problems and ability to build statistical knowledge and knowing the statistical organization in India and abroad. • Developing scientific intuition, ability and techniques to tackle problems either theoretical or experimental in nature.
PO10	**Employability Skill:** Ability to develop employability skills such as, positive attitude, good business sense, willingness to learn, resilience, ability to work under pressure, optimism, adaptability, perseverance and motivation, and a host of similar skills.

Programme Specific Outcomes (PSO): B.Sc. (Computer-Science) as *(Honours/Major Subject)*

Programme Specific Outcomes	The students taking up this program of BSc with Computer-Science (Honours/Major) as a special subject of study, receive the following outcomes:
PSO-1	Domain knowledge must be learned from software. Users in the domain as domain specialist.
PSO-2	Computation thinking is the process involved in formulating problems so that their solution is represented as computation steps.
PSO-3	Problems analysis in computer programming involve breakdown problems into their components, so that problem can be easily identified.
PSO-4	Programmers can create program specific to client needs. Social interaction is an initial study that people use complex technological inventions. This shows the impact of the technology on the way people communicate & change in work & social habits.
PSO-5	Digital literacy refers to individual ability to finds evaluate and clearly communicate information through typing and others media on various digital platform.
PSO-6	Ethics is a branch that pertain to the relationship between the creation, organization, dissemination & use of information with standards like plagiarism.
PSO-7	-
PSO-8	It is process in which individual take primary charge of planning.
PSO-9	Research skills refers to an individual ability to find & evaluate useful information.
PSO-10	Employability skills are the core skills & traits needed in nearly every job.

Mapping of PSOs of BSc (Computer Science) *(Honours/Major)* **with POs (Under-Graduate)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
PSO-1	*	*	*	*	*	*	*		*	*	*	*	*
PSO-2	*	*	*	*	*		*		*	*	*	*	*
PSO-3	*	*	*	*		*	*		*	*	*	*	*
PSO-4	*	*	*	*		*	*		*	*	*	*	*
PSO-5	*	*	*	*		*	*		*	*	*	*	*
PSO-6	*	*	*	*		*	*		*	*	*	*	*
PSO-7													
PSO-8	*	*	*	*		*	*	*	*	*	*	*	*
PSO-9	*	*	*	*		*	*	*	*	*	*	*	*
PSO-10	*	*	*	*		*	*	*	*	*	*	*	*

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Course Outcomes (CO)s

Semester: I

Digital Computer System and Architecture *(Paper Code: MJS-173)*

Course Outcomes	The students taking up this course of B.Sc. with Computer Science (Major) as a special subject of study receive the following outcomes:
CO-1	To **demonstrate** computer architecture concepts related to design of modern processors & memories.
CO-2	**Analyse** the performance of commercially available computers.
CO-3	To **develop** logic for assembly language programming.
CO-4	To **familiarize** the students with hierarchical m/m system including Cache memories & virtual m/m.
CO-5	To **make** students know the different ways of communicating with I/O devices & standards interfaces.

Semester: I

Programming Methodology *(Paper Code: MNS-174)*

Course Outcomes	The students taking up this course of B.Sc. with Computer Science (Minor) as a special subject of study receive the following outcomes:
CO-1	Learn to **develop** simple algorithms and flowchart to **solve** a problem.
CO-2	**Develop** problem solving skills coupled with top down designprinciples
CO-3	Learn text and string searching techniques & **use** of pointers.
CO-4	**Develop** the skills for formulating iterative solutions to aproblem.
CO-5	Learn problem **solving** skills coupled with top-down design.

Semester: I

Programming Fundamentals using C (Theory) *(Paper Code: GES-173(A))*

Course Outcomes	The students taking up this course of B.Sc. with Computer Science (Generic Elective) as a special subject of study receive the following outcomes:
CO-1	Learn to **develop** a C program, simple algorithms and flowchart to **solve** a problem.
CO-2	**Understand** Control the sequence of the program and give logical outputs.
CO-3	Learn to implement the **use** of strings in C program.
CO-4	**Understand** and manage various I/O operations in your C program.
CO-5	Learn skill development and problem **solving** skills coupled with top-down design.

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Semester: I
Computer Fundamental (Theory) *(Paper Code: GES-173(B))*

Course Outcomes	*The students taking up this course of B.Sc. with Computer Science (Generic Elective) as a special subject of study receive the following outcomes:*
CO-1	To **understand** the fundamentals of computers.
CO-2	To **use** computer in his daily life as well as can do assigned official work.
CO-3	**Interpret** the issues related to computers and internet.
CO-4	**Understand** to communicate through internet.
CO-5	**Evaluate s**kill development through IT in a day to day **use.**

Semester: II
Programming Methodology (Theory) *(Paper Code: MJS-273 (B))*

Course Outcomes	*The students taking up this course of B.Sc. with Computer Science (Major) as a special subject of study receive the following outcomes:*
CO-1	**Understand** to develop simple algorithms and flow charts to solve aproblem
CO-2	**Develop** problem solving skills coupled with top down design principles
CO-3	**Understand** about the strategies of writing efficient and well-structured computer algorithms/programs.
CO-4	**Develop** the skills for formulating iterative solutions to aproblem.
CO-5	**Understand** array processing algorithms coupled with iterativemethods

Semester: II
Data Structure *(Paper Code: MNS-274)*

Course Outcomes	*The students taking up this course of BSc with Computer Science (Minor) as a special subject of study receive the following outcomes:*
CO-1	Become familiar with fundamental data structures and with the manner in which these data structures can best be implemented; become accustomed to the **demonstrate** of algorithms in both functional and procedural styles
CO-2	To **analyse** the knowledge of complexity of basic operations like insert, delete, and search on these data structures
CO-3	Ability to choose a data structure to suitably model any data **used** in computer applications.
CO-4	**Design** programs using various data structures including hash tables, Binary and general search trees, heaps, graphs etc.
CO-5	**Implemen**t and know the applications of algorithms for sorting, pattern matching etc.

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Semester: II

Data Analysis & Visualization through Spreadsheet *(Paper Code:* GES-273(A)

Course Outcomes	*The students taking up this course of BSc with Computer Science (Generic) as a special subject of study receive the following outcomes:*
CO-1	**Create** a spreadsheet file and enter data into the sheet.
CO-2	**Illustrate** formatting and editing capabilities on the data.
CO-3	**Demonstrate** basic calculations and save data.
CO-4	**Import** and export data into the spreadsheet.
CO-5	**Demonstrate** basic visualizing, analysing, organizing and sharing techniques.

Semester: II

Introduction to Programming in C++ *(Paper Code:* GES-273(B))

Course Outcomes	*The students taking up this course of BSc with Computer Science (Generic Elective) as a special subject of study receive the following outcomes:*
CO-1	**Learn** the concepts of data, abstraction and encapsulation
CO-2	To **Learn** write programs using classes and objects,packages.
CO-3	**Understand** conceptually principles of Inheritance and polymiand their use and program level implementation.
CO-4	**Learn** exception and basic event handling mechanisms ina program
CO-5	To **learn** typical object-oriented constructs of specificobject oriented programming language

Semester: III

Computer Networks *(Paper Code:* MJS-373) *(Major)*

Course Outcomes	*The students taking up this course of BSc with Computer Networks (Major) as a special subject of study receive the following outcomes:*
CO-1	Students will **Understand and compare** layered Architecture of TCP/IP and OSI Model.
CO-2	It helps to **Understand and analyse** reliable data transfer and how TCP **implement**s these concepts.
CO-3	It **Describes** the principle of routing, principles of congestion control, IP addressing, and Datagrams.
CO-4	**Implement** the basic error detection including checksum and CRC.
CO-5	Make students **Understand and evaluate** the current topics of computer networks.

Semester: III
Object Oriented Programming with Java *(Paper Code: MNS-374) (Minor)*

Course Outcomes	*The students taking up this course of BSc with Object Oriented Programming with Java (Minor) as a special subject of study receive the following outcomes:*
CO-1	**Implement or construct** Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
CO-2	**Identify** classes, objects, members of a class and the
CO-3	Relationship among them needed for a **conclude t**he solution on a specific problem.
CO-4	**Build** Demonstrates how to achieve reusability using inheritance,
CO-5	Interfaces and packages and **describes** faster application

Semester: III
Operating System *(Paper Code: GES-373(A)) (Generic Elective)*

Course Outcomes	*The students taking up this course of BSc with Operating System (Generic Elective) as a special subject of study receive the following outcomes:*
CO-1	**Describe** the important computer system resources and the role of operating system in their management policies and algorithms.
CO-2	To **understand** various functions, structures and history of operating systems and should be able to specify objective so of modern operating systems and describe how operating system shave evolved overtime.
CO-3	**Understanding** of design issues associated with operating systems.
CO-4	**Have** a basic knowledge about multi-threading.

Semester: III

Computer Ethics *(Paper Code: GES-373(B)) (Generic Elective)*

Course Outcomes	*The students taking up this course of BSc with Computer Ethics (Generic Elective) as a special subject of study receive the following outcomes:*
CO-1	To describe and **distinguish** between the various ethical theories which can be used to form the basis of solutions to moral dilemmas in computing.
CO-2	**Identify** traditional and current Issues related to Computers, Information Systems, Ethics, Society and Human Values;
CO-3	To **identify** and **define** the components of a structured plan for solving ethical problems and, in the process, will be able to **understand** the basis for her/his own ethical system.
CO-4	**Develop** skills of critical analysis and **applying** ethical principles to situations and dialectical thinking.

Semester: III
Web Designing (HE) *(Paper Code: Voc/SEC-XXX) (Voc/SEC) Optional*

Course Outcomes	*The students taking up this course of BSc with Web Designing (HE) (Voc/SEC) as a special subject of study receive the following outcomes:*
CO-1	**Describe** and insert a graphic within a web page.
CO-2	**Create** a link within a web page.
CO-3	**Arrange** a table within a web page.
CO-4	Insert heading levels within a web page and **Evalute** the design
CO-5	**Analyse** and Insert ordered and unordered lists within a web page.

Semester: III
Programming in Python *(Paper Code: Voc/SEC-XXX) (Voc/SEC) Optional*

Course Outcomes	*The students taking up this course of BSc with Programming in Python (Voc/SEC) as a special subject of study receive the following outcomes:*
CO-1	**Understanding** basics of python programming
CO-2	Familiarize the students with the basic concept of Python.
CO-3	Introduced the student in the field of advanced programming in Python.
CO-4	Student will able to data **analysis** and **visualize** with the help of python

Semester: IV
Computer Network Security *(Paper Code: MJS-473) (Major)*

Course Outcomes	*The students taking up this course of BSc with Computer Network Security (Major) as a special subject of study receive the following outcomes:*
CO-1	**Understand** and learn the basics of ethical hacking
CO-2	**Build** the concepts related to web server hacking and attacks. Detect and prevent security attacks in different places.
CO-3	**Describe** advanced cyber security **concept.**
CO-4	Students are able to **create** webpages.
CO-5	**Demonstrate** the student with current topics such as security, network management, sensor networks, and/or other topics.

Semester: IV
Advance Java Programming (*Paper Code:* **MNS-474) (***Minor***)**

Course Outcomes	*The students taking up this course of BSc with Advance Java Programming (Minor) as a special subject of study receive the following outcomes:*
CO-1	**Understand** the Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
CO-2	**Build** classes, objects, members of a class and the relationship among them needed for finding the solution to a specific problem.
CO-3	**Create** how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
CO-4	**Demonstrate** understanding and use of different exception handling mechanisms and concepts of multi-threading for robust faster and efficient application development.
CO-5	**Develop** common abstract user interface components to design GUI in Java using Applet & AWT along with response to events.

Semester: IV
Database Management System *(Paper Code:* **GES-473 (A))** *(Generic Elective) Optional*

Course Outcomes	*The students taking up this course of BSc with Database Management System (Generic Elective) as a special subject of study receive the following outcomes:*
CO-1	Ability to model data In applications using conceptual modelling tools such as ER **Diagrams** and design database schemas based on the model.
CO-2	**Formulate**, using SQL, solutions to a broad range of query and data update problems.
CO-3	**Demonstrate** an **understanding** of normalization theory and **apply** such knowledge to the normalization of a database.
CO-4	**Represents** with the basics of transaction processing and concurrency control.

Semester: IV
Web & E-Commerce Technology *(Paper Code:* **GES-473(B))** *(Generic Elective) Optional*

Course Outcomes	*The students taking up this course of BSc with Web & E-Commerce Technology (Generic Elective) as a special subject of study receive the following outcomes:*
CO-1	**Analyze** the impact of E-commerce on business models and strategy.
CO-2	**Describe** the major types of E-commerce.
CO-3	**Explain** the process that should be followed in building an E-commerce presence.
CO-4	**Identify** the key security threats in the E- commerce environment.

Semester: IV
Data Analysis through Python *(Paper Code:* **Voc/SEC-XXX***) (Voc/SEC)*

Course Outcomes	*The students taking up this course of BSc with Data Analysis through Python (Voc/SEC) as a special subject of study receive the following outcomes:*
CO-1	**Understanding** basics of python for performing data analysis
CO-2	**Understanding** the data, performing pre-processing, processing and data **visualization** to get insights from data.
CO-3	**Use** different python packages for mathematical, scientific applications and for web data analysis.
CO-4	**Develop** the model for data **analysis** and **evaluate** the model performance.
CO-5	**Develop**, document, and debug modular python programs to solve computational problems.

Semester: IV
Cloud Computing *(Paper Code:* **Voc/SEC-XXX***) (Voc/SEC)*

Course Outcomes	*The students taking up this course of BSc with Cloud Computing (Voc/SEC) as a special subject of study receive the following outcomes:*
CO-1	**Analyze** the trade-offs between deploying applications in the cloud and over the local infrastructure.
CO-2	**Compare** the advantages and disadvantages of various cloud computing platforms.
CO-3	**Understand** applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and Google AppEngine.
CO-4	**Understand** the program data intensive parallel applications in the cloud.
CO-5	**Analyze** the performance, scalability, and availability of the underlying cloud technologies and software.

Semester: V
Operating System (Theory) **Major** *(Paper Code: MJS-573)*

Course Outcomes	*The students taking up this course of BSc as a dse subject of study receive the following outcomes:*
CO-1	**Describe, Analyze, Evaluate and develop** the important computer system resources and the role of operating system in the management policies and algorithms
CO-2	To **understand** various functions, structures and history of operating systems and should be able to specify objectives of modern operating systems and describe how operating systems have evolved overtime. Have a basic knowledge about multithreading.
CO-3	**Understand and evaluate** various process management Concepts including scheduling, synchronization, and Deadlocks.
CO-4	**Understand** and **develop** concepts of memory management including virtual memory.

Semester: V
PHP Programming (Theory) **VOC/SEC** *(Paper Code: SEC:573)*

Course Outcomes	*The students taking up this course of BSc (Major) as a vocational subject of study receive the following outcomes:*
CO-1	To **develop** a graphic within a web page
CO-2	To **create** a link within a web page
CO-3	To **creat**e a table within a web page
CO-4	To **arrange** a table within a web page
CO-5	To **develop** ordered and unordered lists within a web page.

Semester: V
Data Structure (Theory) **DSE** *(Paper Code:)*

Course Outcomes	*The students taking up this course of BSc as a dse subject of study receive the following outcomes:*
CO-1	Become familiar with fundamental data structures and with the manner in which these data structures can best be **implemented**; become accustomed to the description of algorithms in both functional and procedural styles
CO-2	To **develop** a program of basic operations like insert, delete, and search on these data structures.
CO-3	**Ability** to choose a data structure to suitably model any data used in computer applications.
CO-4	**Design** programs using various data structures including hash tables, Binary and general search trees, heaps, graphs etc.

Semester: V

CLOUD COMPUTING (Theory) **SEC (V)** *(Paper Code:)*

Course Outcomes	*The students taking up this course of BSc as a dse subject of study receive the following outcomes:*
CO-1	**Ability** with areas of cloud technologies.
CO-2	**Design** programs using Acquaintance with the concept of cloud computing in relation to business activities
CO-3	**Evaluate** the efficiency of, long-term perspective, the study of economics of cloud computing;
CO-4	**Evaluate** Feasibility study to migrate existing applications to a cloud environment from both a technical and an economic point of view

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Semester: VI
Artificial Intelligence (Major) *(Paper Code: MJS-673(A))*

Course Outcomes	*The students taking up this course of BSc with Computer Science (Honours-I) as a special subject of study receive the following outcomes:*
CO-1	**Explain** what constitutes "Artificial" Intelligence and how to identify systems with Artificial Intelligence.
CO-2	**Identify** the problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
CO-3	**Formalize** and **analyze** given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, etc.).
CO-4	**Implement** basic AI algorithms (e.g., standard search or constraint propagation algorithms.

Semester: VI
Data Base Management System (DSE 1) *(Paper Code: DSE-673(A))*

Course Outcomes	*The students taking up this course of BSc (BA/BSc/BCom) with Honours-I as a special subject of study receive the following outcomes:*
CO-1	Outcome of this course is to provide the ability to **design** console based, GUI based and web based applications.
CO-2	Student will also be able to **understand** integrated development environment to create debug and run multi-tier and enterprise level application.
CO-3	Student also **analyze** programming skills in advanced JAVA.

Semester: VI
Software Engineering (DSE II) (Paper Code: DSE-673(B))

Course Outcomes	*The students taking up this course of BSc with Computer Science (Honours-II/ Subsidiary) as a special subject of study receive the following outcomes:*
CO-1	Basic knowledge and understanding of the **analysis** and **design** of complex systems.
CO-2	Ability **to apply** software engineering principles and techniques
CO-3	**To produce** efficient, reliable, robust and cost-effective software solutions
CO-4	**Understand** to work as an effective member or leader of software engineering teams.
CO-5	To manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals **Identify** and **analyses** the common threats in each domain.

A brief note on Bloom's Taxonomy:

According to the revised version of Bloom's Taxonomy there are six levels of cognitive learning. Each level is conceptually different. The six levels are (1) remembering, (2) understanding, (3) applying, (4) analyzing, (5) evaluating, and (6) creating. We follow the Bloom's Taxonomy in deciding the course outcome & the levels (1/2/3/4/5/6) are displayed in the mapping table of COs with the PSOs of each program of NEP-2020. Details of the terms used in the levels are as follows:

Level-1: **REMEMBER** - this level include:

cite, define, describe, identify, label, list, match, name, outline, quote, recall, report, reproduce, retrieve, show, state, tabulate, and tell.

Level-2: **UNDERSTAND** - this level include:

abstract, arrange, articulate, associate, categorize, clarify, classify, compare, compute, conclude, contrast, defend, diagram, differentiate, discuss, distinguish, estimate, exemplify, explain, extend, extrapolate, generalize, give examples of, illustrate, infer, interpolate, interpret, match, outline, paraphrase, predict, rearrange, reorder, rephrase, represent, restate, summarize, transform, and translate.

Level-3: **APPLY** - this level include:

Apply, calculate, carry out, classify, complete, compute, demonstrate, dramatize, employ, examine, execute, experiment, generalize, illustrate, implement, infer, interpret, manipulate, modify, operate, organize, outline, predict, solve, transfer, and use.

Level-4: **ANALYZE** - this level include:

analyze, arrange, break down, categorize, classify, compare, contrast, deconstruct, detect, diagram, differentiate, discriminate, distinguish, divide, explain, identify, integrate, inventory, order, organize, relate, separate, and structure.

Level-5: **EVALUATE** - this level include:

appraise, apprise, argue, assess, compare, conclude, consider, contrast, convince, criticize, critique, decide, determine, discriminate, evaluate, grade, judge, justify, measure, rank, rate, recommend, review, score, select, standardize, support, test, and validate.

Level-6: (highest level): **CREATE** - this level include:

arrange, assemble, build, collect, combine, compile, compose, constitute, construct, create, design, develop, devise, formulate, generate, hypothesize, integrate, invent, make, manage, modify, organize, perform, plan, prepare, produce, propose, rearrange, reconstruct, reorganize, revise, rewrite, specify, synthesize, and write.

Programme: BSc Computer Science

Mapping of COs with PSOs for Semester-I *(Major)*

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: **Computer System Architecture** *Paper Code: MJS-173*	CO1	3									
	CO2		4								
	CO3			6							
	CO4				5						
	CO5					6					

Mapping of COs and PSOs for Semester-I *(Minor)*

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: **Programming Methodology** *Paper Code: MNS-174*	CO1			3			6				
	CO2						6				
	CO3			3							
	CO4				2		6				
	CO5			3							

Mapping of COs and PSOs for Semester-I *(Generic Elective)*

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: **Programming Fundamentals using C** *Paper Code: GES-173(A)*	CO1			3			6				
	CO2		2								
	CO3			3							
	CO4		2								
	CO5			3							

Mapping of COs and PSOs for Semester-I *(Generic Elective)*

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: **Computer Fundamentals** *Paper Code: GES-173(B)*	CO1		2								
	CO2			3							
	CO3			3							
	CO4		2								
	CO5			5							

Mapping of COs and PSOs for Semester-II *(Major)*

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: **Programming Methodology** *Paper Code: MJS-273*	CO1		2								
	CO2						6				
	CO3		2				6				
	CO4										
	CO5		2								

Mapping of COs and PSOs for Semester-II *(Minor)*

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: **Data Structure** *Paper Code: MNS-274*	CO1			3							
	CO2				4						
	CO3			3							
	CO4						6				
	CO5			3							

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Mapping of COs and PSOs for Semester-II *(Generic Elective)*

Paper Title	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Data Analysis & Visualization through Spreadsheet	CO1				1						
	CO2	2									
	CO3		3,5								
	CO4				4				8	9	4
Paper Code: GES-273 (A)	CO5									9	

Mapping of COs and PSOs for Semester-II *(Generic Elective)*

Paper Title	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Introduction to Programming in C++	CO1		2								
	CO2					6					
	CO3		2			6					
Paper Code: GES-273 (B)	CO4	1	2								
	CO5		2								

Mapping of COs with PSOs for Semester-III *(Major)*

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Computer Networks	CO1	2,5									
	CO2		2,4								
Paper Code: MJS-373	CO3			1							
	CO4				3						
	CO5					2,5					

Mapping of COs and PSOs for Semester-III *(Minor)*

Paper Title	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Object Oriented Programming with Java	CO1	2									
	CO2		1								
	CO3		5								
Paper Code: MNS-374	CO4			6							
	CO5			6							

Mapping of COs and PSOs for Semester-III *(Generic Elective) (Optional)*

Paper Title	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Operating System	CO1	2									
	CO2		1								
Paper Code: GES-373(A)	CO3			4							
	CO4				3						

Mapping of COs and PSOs for Semester-III *(Generic Elective) (Optional)*

Paper Title	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Computer Ethics	CO1	2									
	CO2		1								
Paper Code: GES-373(B)	CO3			1,2							
	CO4				6,3						

Mapping of COs and PSOs for Semester-III *(Voc/SEC) Optional*

Paper Title: **Web Designing (HE)** Paper Code: **Voc/SEC-XXX**											
	CO1	1									
	CO2		6								
	CO3			4							
	CO4				5						
	CO5					4					

Mapping of COs and PSOs for Semester-III *(Voc/SEC) Optional*

Paper Title: **Programming in Python** Paper Code: **Voc/SEC-XXX**											
	CO1	2									
	CO2		4								
	CO3			6							
	CO4				3,6						

Mapping of COs and PSOs for Semester-IV *(Major)*

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: **Computer Network Security** Paper Code: **MJS-473**	CO1	2									
	CO2		3								
	CO3			1							
	CO4				6						
	CO5					3					

Mapping of COs and PSOs for Semester-IV *(Minor)*

Paper Title: **Advance Java Programming** Paper Code: **MNS-474**											
	CO1	2									
	CO2		6								
	CO3			4							
	CO4				5						
	CO5				6						

Mapping of COs and PSOs for Semester-IV *(Generic Elective) Optional*

Paper Title: **Database Management System** Paper Code: **GES-473(A)**											
	CO1	2									
	CO2		6								
	CO3			2,3							
	CO4				2						

Mapping of COs and PSOs for Semester-IV *(Generic Elective) Optional*

Paper Title: **Web & E-Commerce Technology** Paper Code: **GES-473(B)**											
	CO1	4									
	CO2		1								
	CO3			4							
	CO4				1						

Department of Computer-Science

Mapping of COs and PSOs for Semester-IV *(Voc/SEC) Optional*

Paper Title: **Data Analysis through Python** / Paper Code: **Voc/SEC-XXX**											
Paper Title: **Data Analysis through Python**	CO1	2									
	CO2		2								
Paper Code: **Voc/SEC-XXX**	CO3			3							
	CO4				6,4,5						
	CO5					6					

Mapping of COs and PSOs for Semester-IV *(Voc/SEC) Optional*

Paper Title: **Cloud Computing** / Paper Code: **Voc/SEC-XXX**											
Paper Title: **Cloud Computing**	CO1	4									
	CO2		2								
Paper Code: **Voc/SEC-XXX**	CO3			2							
	CO4				2						
	CO5					4					

Mapping of COs and PSOs for Semester-V *(Major)*

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: **Operating System** Paper Code: MJ**S-573**	CO1	2		3,7							
	CO2		3,4								
	CO3			5							
	CO4				7						

Mapping of COs and PSOs for Semester-V *(DSE)*

Paper Title: **Data Structure** / Paper Code: **XXX**											
Paper Title: **Data Structure**	CO1	7									
	CO2		3								
Paper Code: **XXX**	CO3			5							
	CO4				7						

Mapping of COs and PSOs for Semester-V *(SEC)*

Paper Title: **PHP programming** / Paper Code: **SEC 573**											
Paper Title: **PHP programming**	CO1						6				
	CO2						6				
Paper Code: **SEC 573**	CO3						6				
	CO4		2								
	CO5						6				

Mapping of COs and PSOs for Semester-V *(SEC)*

Paper Title: **CLOUD COMPUTING** / Paper Code: **SEC 573**											
Paper Title: **CLOUD COMPUTING**	CO1	3									
	CO2		6								
Paper Code: **SEC 573**	CO3			5							
	CO4				5						

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Mapping of COs and PSOs for Semester-VI *(Major)*

| Paper Title **Artificial Intelligence** Paper Code: MJ*S-673 (A)*											
	CO1	2	6								
	CO2		3								
	CO3			4	6						
	CO4				5	6					

Mapping of COs and PSOs for Semester-VI *DSE)*

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title **Data base Management System** Paper Code: DSE-*673(A)*	CO1						6				
	CO2		2								
	CO3				4						

Mapping of COs and PSOs for Semester-VI *DSE)*

Paper Title: *Software Engineering* Paper Code: *DSE-673(B)*											
	CO1				4		6				
	CO2			3							
	CO3						6				
	CO4		2								
	CO5	1			4						

(IQAC Coordinator)
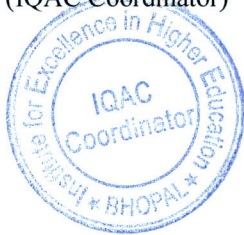
(Convenor, Academic Committee)
संयोजक
अकादमिक समिति
उच्चशिक्षा उत्कृष्टता संस्थान
भोपाल

(Dr. Sabha Kant Dwivedi)
HOD, Computer Science
IEHE, Bhopal (M.P.)

(Dr. Pragyesh Kumar Agrawal)
Director