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

**NAAC Re-accredited (Third Cycle) Autonomous College
Under the UGC Scheme with 'A' Grade (CGPA-3.10)**

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

B.Sc. (Honours) Computer Science
(Session: 2021-2022)

COURSES OFFERED BY THE INSTITUTE

Under Graduate Courses

- B.Com. Honours (Management/Account)

- B.A. Honours (Economics/History/Psychology/Sociology/Political Science/English Literature/Hindi Literature/Geography/Fashion Designing)

- **B.Sc. Honours** (Physics/Chemistry/**Computer-Science**/Mathematics/Electronics/ Biotechnology/Geography/Forensic-Science)

Post Graduate Courses

- MA (English)
- MA (Economics)
- MA (Social Work)
- MA (History)
- MA (Public Administration)
- MA (Political Science)
- M.Com. (Management)
- M.Sc. (Physics)
- M.Sc. (Chemistry)
- M.Sc. (Biotechnology)
- M.Sc. (Mathematics)

Diploma Programme

- 14 Vocational Programmes

Certificate Programme

- 31 Vocational Programmes

Training Programmes

- 09 Vocational Programmes

Special Programmes

- 03 Vocational Programmes

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.

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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

Computer System 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 modem 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 flow chart to solve a problem.
CO-2	Learn text and string processing efficient algorithms.
CO-3	Learn text and string searching techniques & use of pointers.
CO-4	Understand recursive techniques in programming.
CO-5	Learn problem solving skills coupled with top-down design.

Semester: I

Programming Methodology *(Paper Code: GES-173)*

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 simple algorithms and flows chart to solve a problem.
CO-2	Learn text and string processing efficient algorithms.
CO-3	Learn text and string searching techniques and use of pointers
CO-4	Understand recursive techniques in programming.
CO-5	Learn problem solving skills coupled with top-down design

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

Course Outcomes	The students taking up this course of BSc with Computer Science (Major) as a special subject of study receive the following outcomes:
CO-1	Understand recursive techniques in programming.
CO-2	Learn searching techniques & use of pointers.
CO-3	Develop the skills for formulating iterative solutions to a problem.
CO-4	Learn array processing algorithms coupled with iterative.
CO-5	Learn to develop simple algorithms & how charts to solve a problem.

Semester: II
Operating system *(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	Understand the basic of O.S like kernel, shell types & views of O.S.
CO-2	Describe the various CPU scheduling algorithms & remove deadlocks.
CO-3	Explain various memory module management techniques & concept of thrashing.
CO-4	Use disk management & disk scheduling algorithms for better utilization of external memory module.
CO-5	Explain the various features of distributed O.S. like Unix, Linux, Windows etc.

Semester: II
Data Structure *(Paper Code: GES-273)*

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	Student become accustomed to the description of algorithms in both functional & procedural style.
CO-2	Have knowledge of complexity of basic operations like insert, delete and search on various data structure.
CO-3	Design programmes using various data structure including hash tables, binary and general search trees, heaps, graphs etc.
CO-4	Ability to assess efficiency trade-offs among different data structure implementations.
CO-5	Implement and know the application of algorithms for storing, pattern matching etc.

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Semester: III

Data Structure Through C ++ *(Paper Code: S-373)*

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	Student become accustomed to the description of algorithms in both functional & procedural style.
CO-2	Have knowledge of complexity of basic operations like insert, delete and search on various data structure.
CO-3	Design programmes using various data structure including hash tables, binary and general search trees, heaps, graphs etc.
CO-4	Ability to assess efficiency trade-offs among different data structure implementations.
CO-5	Implement and know the application of algorithms for storing, pattern matching etc.

Semester: III

Data Base Management System & Design (DMBS) *(Paper Code: S-374)*

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	Gain knowledge of database system, database management systems software.
CO-2	Ability to model real world problems using conceptual modelling tool such as E-R diagrams, design database schemas.
CO-3	Formulate using SQL solutions to a board range of query and data update problems.
CO-4	Be acquainted with the basics of transaction processing and concurrency control.
CO-5	Familiarity with database storage structure and access techniques.

Semester: IV

Computer Graphics & Multimedia (Elective) *(Paper Code: S-473(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	Students are able to understand core concepts of computer graphics, viewing, projection, modelling.
CO-2	Ability to implement various algorithm to scan, convert the basic geometrical primitives, transformation, clipping.
CO-3	Familiarize with fundamental of animation & virtual reality technologies.
CO-4	Be able to design application that display graphics image in given specification.
CO-5	To understand a typical graphics pipeline.

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Cloud Computing (Elective) *(Paper Code: S-473(B)) (Not taken by students)*

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	Analyse the trade-off between deploying applications in cloud and over local infrastructure.
CO-2	Compare the advantages and disadvantages of various cloud computing platforms.
CO-3	Analyse the performance, scalability and availability of the underlying cloud technology.
CO-4	Identify security and privacy issues in cloud computing.
CO-5	Solve a real-world problem using cloud computing through group collaboration.

Semester: IV
Oracle *(Paper Code: S-474)*

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	Understand the underlying concepts of database technologies.
CO-2	Populate and query a database using DDL, DML, DCL commands.
CO-3	Implement security by applying user management.
CO-4	Declare & enforce integrity constraints on a database.
CO-5	Enable to perform PL/SQL programs using procedures, triggers etc.

Semester: V
Object Oriented Programming with JAVA (Elective) *(Paper Code: S-573(A))*

Course Outcomes	The students taking up this course of BSc with Honours-I as a special subject of study receive the following outcomes:
CO-1	Use an integrated development environment to write compile run & test JAVA programmes.
CO-2	Validate input in a JAVA Program.
CO-3	Identify and fix defects & common security issues in code.
CO-4	Read & make elementary modification to Java programs.
CO-5	Document a JAVA program using Javadoc.

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Semester: V
Programming in Python (Elective) *(Paper Code: S-573(B))* *(Not taken by students)*

Course Outcomes	*The students taking up this course of BSc with Honours-I as a special subject of study receive the following outcomes:*
CO-1	Acquire programming skills in core python.
CO-2	Acquire object-oriented skills in python.
CO-3	Develop the designing skills of graphical user interface.
CO-4	Develop the ability to right database application in Python.
CO-5	

Semester: V
Internet Technology *(Paper Code: S-574(A))*

Course Outcomes	*The students taking up this course of BSc with Honours-II/Subsidiary as a special subject of study receive the following outcomes:*
CO-1	Students are able to develop a dynamic webpage.
CO-2	Will able to connect a JAVA program to a DBMS.
CO-3	Students will able to write a well-formed/valid XML document.
CO-4	Will able to write a server-side JAVA application called servlet to catch update & delete operations on DBMS table.
CO-5	

Semester: VI
Artificial Intelligence with Python (Elective) *(Paper Code: S-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	When student's complete introduction to artificial intelligence with python they will be able to understand its concept.
CO-2	Python is a more well-known language than any other language, this is due to its easy and simple to work with python.
CO-3	Python can be used for the analyzation of lats in expert system of AI.
CO-4	Python because of libraries and performance wise also has the advantage and better suited for AI.
CO-5	It also provide easy syntax and readability and facilitate speedy testing of advanced machine learning algorithm.

Semester: VI

Advanced JAVA Programming (Elective) *(Paper Code: S-673(B))*

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 acquire programming skills in advanced JAVA.

Semester: VI
Software Engineering *(Paper Code: S-674)*

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	Software engineering provide students on ability to work in one or more significant application domain.
CO-2	Students work as individual and as a part of a multidisciplinary team to develop a deliver quality software.
CO-3	Subject also demonstrate an Indus trading of and apply current theories, models and techniques that provide basic for software lifecycle.

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	CO1	*	*	*	*			*	*		*
	CO2	*	*	*		*				*	*
Paper Code: MJS-173	CO3	*	*	*				*			
	CO4	*	*	*					*		*
	CO5	*	*	*		*		*	*		*

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

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

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

Paper Title		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Programming Methodology	CO1	*	*	*	*	*			*		*
	CO2	*	*	*	*		*		*	*	*
	CO3	*	*								*
Paper Code: GES-173	CO4	*	*	*		*					*
	CO5	*	*		*	*					*

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

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

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

Paper Title		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Operating System	CO1	*		*	*		*	*	*	*	*
	CO2	*	*	*	*						*
Paper Code: MNS-274	CO3	*	*	*		*	*	*		*	*
	CO4	*	*						*		*
	CO5	*	*		*		*	*			*

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

Paper Title: **Data Structure** / Paper Code: GES-273	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	*				*			*	*	*
CO2	*	*		*		*	*		*	*
CO3	*	*	*		*			*	*	*
CO4	*	*			*	*	*	*		*
CO5	*	*	*		*	*	*	*	*	*

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

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: **Data Structure Through C++** / Paper Code: S-373	CO1	*	*	*	*	*	*			*	*
	CO2	*	*	*			*				
	CO3	*	*	*	*		*			*	
	CO4	*	*	*		*	*				*
	CO5	*	*	*	*		*	*		*	

Mapping of COs and PSOs for Semester-III *(Honours-II/Subsidiary)*

Paper Title: **Database Management System & Design** / Paper Code: S-374	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	*	*	*	*	*	*			*	*
CO2	*	*				*				*
CO3	*	*		*	*			*	*	*
CO4	*		*	*	*					*
CO5	*		*	*	*	*		*		*

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

Paper Title: **Computer Graphics & Multimedia** / Paper Code: S-473(A)	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	*	*	*	*	*	*		*	*	*
CO2	*	*	*					*		*
CO3	*	*	*		*	*			*	*
CO4	*	*	*	*				*	*	*
CO5	*	*	*			*		*	*	*

Mapping of COs and PSOs for Semester-IV *(Honours-II/Subsidiary)*

Paper Title: **Oracle** / Paper Code: S-474	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	*	*		*		*	*			
CO2	*	*	*	*	*				*	
CO3	*	*				*				*
CO4	*	*	*					*		*
CO5	*	*		*			*	*		*

Mapping of COs and PSOs for Semester-V *(Elective) (Honours-II/Subsidiary)*

Paper Title: **Internet Technology** / Paper Code: S-574(A)	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	*	*	*	*				*		*
CO2	*	*	*	*						*
CO3	*	*	*		*	*		*	*	
CO4	*			*	*	*		*	*	*
CO5									*	

Department of Computer-Science

Mapping of COs and PSOs for Semester-V (Elective) (Honours-I)

Paper Title: Object Oriented Programming with Java / Paper Code: S-573(A)		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
	CO1	*	*	*	*	*	*		*	*	*
	CO2	*	*		*	*	*		*		*
	CO3	*		*	*		*		*	*	
	CO4	*	*	*		*	*			*	*
	CO5	*	*		*	*			*	*	

Mapping of COs and PSOs for Semester-VI (Elective) (Honours-I)

Paper Title: Artificial Intelligence with Python / Paper Code: S-673(A)		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
	CO1	*	*								
	CO2	*	*								*
	CO3			*	*						
	CO4			*		*					
	CO5						*			*	*

Mapping of COs and PSOs for Semester-VI (Elective) (Honours-I)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
Paper Title: Advance Java Programming / Paper Code: S-673(B)	CO1	*	*	*		*			*	*	*
	CO2	*	*	*	*				*	*	*
	CO3	*			*		*		*		*
	CO4	*	*	*			*		*	*	
	CO5										

Mapping of COs and PSOs for Semester-VI (Honours-II/Subsidiary)

Paper Title: Software Engineering / Paper Code: S-674		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
	CO1	*	*	*	*	*	*		*		*
	CO2	*		*	*		*			*	*
	CO3	*			*	*	*			*	*
	CO4		*	*		*	*			*	
	CO5										

(IQAC Coordinator) 26/09/2021   (Convenor, Academic Committee)   (HOD, Computer-Science)

संयोजक
अकादमिक समिति
उच्चशिक्षा उत्कृष्टता संस्थान
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(Dr Pragyesh Kumar Agarwal)
Director
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