

# Department of Computer Science, Tarakeswar Degree College

Program outcomes, program specific outcomes and course outcomes

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Program outcomes/program specific outcomes/course outcomes

Department of Computer Science, Tarakeswar Degree College, offers undergraduate (honours/General) courses in Computer Science in accordance to the prescribed CBCS curriculum of Burdwan University. Generic course in Computer Science is offered for students of other departments and B.Sc. Program in Computer Science is also offered at the undergraduate level.

This department provides 14 Core Courses (CC papers), 4 Discipline Specific Elective (DSE papers) and 2 Skill Enhancement Course (SEC) for Semester-I to VI undergraduate B.Sc. Honours students. Beside that 4 General Electives (GE papers) also offers to other disciplines.

This department offers 4 Core Courses (CC papers), 2 Discipline Specific Elective (DSE papers) and 4 Skill Enhancement Course (SEC papers) for Semester-I to VI undergraduate B.Sc. General students.

The undergraduate honours/general course in Computer Science is intended to introduce the fundamental aspects of all branches of Computer Science to the students. Students learn about different area of computer science in this three year degree course, which enables them to identify their area of keen interest and hence provides the basic foundation of their higher studies and IT industry. They develop computer laboratory skills, critical thinking and reasoning to address different aspects of computer science.

### PROGRAM OUTCOMES POs:

B.Sc (Hons/Gen) Graduates will be able to:

1. **Computer Science knowledge:** Apply the knowledge of mathematics, computer science fundamentals to the solution of complex real life problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and computer sciences.
3. **Design/development of solutions:** Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern IT tools including prediction and modelling to complex activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional practice.
7. **Environment and sustainability:** Understand the impact of the professional solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex activities with the community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### PROGRAM SPECIFIC OBJECTIVES (PSOs) :

1. To analyze, design and develop computing solutions by applying foundational concepts of Computer Science.
2. To apply software engineering principles and practices for developing quality software for scientific and business applications.
3. To adapt to emerging Information and Communication Technologies (ICT) to innovate ideas and solutions to existing/novel problems.

### Course Outcomes of UG Honours Course:

#### Semester-I

Course code	Course Title	Credits	Course Outcomes
CC-1	Programming Fundamentals using C / C++	4-0-2=6	Upon successful completion of the course requirements, a student should be able to use: <ol style="list-style-type: none"><li>1. C/C++ programming language to solve elementary real life problems.</li><li>2. Data types, variables, and arithmetic operators.</li><li>3. Conditional statements and loops structures.</li><li>4. Arrays and pointers.</li><li>5. The dynamic memory.</li><li>6. Mathematic library.</li><li>7. Develop function-oriented programs.</li><li>8. Improved understanding of the distinction for passing arguments to/from functions.</li><li>9. standard input/output and file</li></ol>

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			input/output operations. 10. Object oriented programming in C++ to solve basic engineering problems.
CC-2	Computer System Architecture	4-0-2=6	On completion of the course, student will be able to :  <ol style="list-style-type: none"> <li>1. Demonstrate computer architecture concepts related to design of modern processors, memories and I/Os.</li> <li>2. Analyze the performance of commercially available computers.</li> <li>3. To develop logic for assembly language programming</li> </ol>

### Semester-II

Course code	Course Title	Credit	Course Outcomes
CC-3	Programming in Java	4-0-2=6	<ol style="list-style-type: none"> <li>1. Identify classes, objects, members of a class and relationships among them needed for a specific problem.</li> <li>2. Write Java application programs using OOP principles and proper program structuring.</li> <li>3. Demonstrate the concepts of polymorphism and inheritance.</li> <li>4. Write Java programs to implement error handling techniques using exception handling.</li> </ol>
CC-4	Discrete Structure	5-1-0=6	Students will be able to: <ol style="list-style-type: none"> <li>1. Write an argument using logical notation and determine if the argument is or is not valid.</li> <li>2. Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.</li> <li>3. Understand the basic principles of sets and operations in sets.</li> <li>4. Prove basic set equalities.</li> <li>5. Apply counting principles to determine probabilities.</li> </ol>

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			<ol style="list-style-type: none"> <li>6. Demonstrate an understanding of relations and functions and be able to determine their properties.</li> <li>7. Determine when a function is 1-1 and "onto".</li> <li>8. Demonstrate different traversal methods for trees and graphs.</li> <li>9. Model problems in Computer Science using graphs and trees.</li> </ol>
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### Semester-III

Course code	Course Title	Credit	Course Outcomes
CC-5	Data Structure	4-0-2=6	<p>After completing this course satisfactorily, a student will be able to:</p> <ol style="list-style-type: none"> <li>1. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms.</li> <li>2. Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs.</li> <li>3. Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs.</li> <li>4. Demonstrate different methods for traversing trees.</li> <li>5. Compare alternative implementations of data structures with respect to performance.</li> <li>6. Compare and contrast the benefits of dynamic and static data structures implementations.</li> <li>7. Describe the concept of recursion, give examples of its use, describe how it can be implemented using a stack.</li> <li>8. Design and implement an appropriate hashing function for an application.</li> <li>9. Discuss the computational efficiency of</li> </ol>

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			the principal algorithms for sorting, searching, and hashing.
CC-6	Operating Systems	4-0-2=6	<p>Upon successful completion of this course, students are expected to have the ability to:</p> <ol style="list-style-type: none"> <li>1. Describe and explain the fundamental components of a computer operating system.</li> <li>2. Define, restate, discuss, and explain the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems.</li> <li>3. Describe and extrapolate the interactions among the various components of computing systems.</li> <li>4. Design and construct the following OS components: System calls, Schedulers, Memory management systems, Virtual Memory and Paging systems.</li> </ol>
CC-7	Computer Networks	4-0-2=6	<ol style="list-style-type: none"> <li>1. Recognize the technological trends of Computer Networking.</li> <li>2. Discuss the key technological components of the Network.</li> <li>3. Evaluate the challenges in building networks and solutions to those.</li> </ol>
SEC-1	Programming in Python	1-0-1=2	<p>At the end of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Explain basic principles of Python programming language.</li> <li>2. Implement object oriented concepts.</li> <li>3. Implement database and GUI applications.</li> </ol>

### Semester-IV

Course code	Course Title	Credit	Course Outcomes
CC-8	Design and Analysis of Algorithms	4-0-2=6	<ol style="list-style-type: none"> <li>1. Able to Argue the correctness of algorithms using inductive proofs and Analyze worst-case running times of</li> </ol>

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			<p>algorithms using asymptotic analysis.</p> <ol style="list-style-type: none"> <li>2. Able to explain important algorithmic design paradigms (divide-and-conquer, greedy method, dynamic-programming and Backtracking) and apply when an algorithmic design situation calls for it.</li> <li>3. Able to Compare between different data structures and pick an appropriate data structure for a design situation.</li> <li>4. Able to Describe the classes P, NP, and NPComplete and be able to prove that a certain problem is NP-Complete.</li> <li>5. Able to analyze String matching algorithms.</li> </ol>
CC-9	Software Engineering	4-0-2=6	<ol style="list-style-type: none"> <li>1. Understand basic SW engineering methods and practices, and their appropriate application.</li> <li>2. Understand u of software process models such as the waterfall and evolutionary models.</li> <li>3. Role of project management including planning, scheduling and, risk management.</li> <li>4. Discuss data models, object models, context models and behavioural models.</li> <li>5. Understand of different software architectural styles and Process frame work.</li> <li>6. Understand of implementation issues such as modularity and coding standards.</li> <li>7. Understand to verification and validation including static analysis, and reviews.</li> <li>8. Describe software measurement and software risks.</li> <li>9. Discuss software evolution and related issues such as version management.</li> <li>10. Understand on quality control and how to ensure good quality software.</li> </ol>

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CC-10	Database Management System	4-0-2=6	<p>Upon successful completion of this course, students should be able to:</p> <ol style="list-style-type: none"> <li>1. Describe the fundamental elements of relational database management systems.</li> <li>2. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.</li> <li>3. Design ER-models to represent simple database application scenarios.</li> <li>4. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.</li> <li>5. Improve the database design by normalization.</li> <li>6. Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing.</li> </ol>
SEC-2	UNIX / Linux Programming	1-0-1=2	<ol style="list-style-type: none"> <li>1. Understanding the basic set of commands and utilities in Linux/UNIX systems.</li> <li>2. To learn to develop software for Linux/UNIX systems.</li> <li>3. To learn the important Linux/UNIX library functions and system calls.</li> <li>4. To understand the inner workings of UNIX-like operating systems.</li> <li>5. To obtain a foundation for an advanced course in operating systems.</li> </ol>

### Semester-V

Course code	Course Title	Credit	Course Outcomes
CC-11	Internet Technologies	4-0-2=6	<p>The student will be able to:</p> <ol style="list-style-type: none"> <li>1. Analyze a web page and identify its elements and attributes.</li> <li>2. Create web pages using XHTML and Cascading Style Sheets.</li> </ol>

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			<ol style="list-style-type: none"> <li>3. Build dynamic web pages using JavaScript (Client side programming).</li> <li>4. Create XML documents and Schemas.</li> </ol>
CC-12	Theory of Computation	5-1-0=6	<p>Upon the successful completion of the course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Explain the basic concepts of finite automata and regular expressions.</li> <li>2. Describe the types of grammar and derivation tree.</li> <li>3. Test the equivalence of pushdown automata and CFL.</li> <li>4. Develop a computational model using Turing machine for the given problem.</li> <li>5. Examine the complexity for P and NP completeness for the given problem.</li> </ol>
DSE-1	Microprocessors	4-0-2=6	<p>Students are able to:</p> <ol style="list-style-type: none"> <li>1. recall and apply a basic concept of digital fundamentals to Microprocessor based personal computer system.</li> <li>2. identify a detailed s/w &amp; h/w structure of the Microprocessor.</li> <li>3. illustrate how the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.</li> <li>4. distinguish and analyze the properties of Microprocessors &amp; Microcontrollers.</li> <li>5. analyze the data transfer information through serial &amp; parallel ports.</li> <li>6. train their practical knowledge through laboratory experiments.</li> </ol>
DSE-2	System Programming	4-0-2=6	<p>Upon completion of this course, students are be able to:</p> <ol style="list-style-type: none"> <li>1. Explain basic concepts in systems programming.</li> <li>2. Describe UNIX file systems and process control.</li> <li>3. Utilize UNIX system services in application development.</li> <li>4. Design and implement system utility programs.</li> </ol>



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### Semester-VI

Course code	Course Title	Credit	Course Outcomes
CC-13	Artificial Intelligence	4-0-2=6	<p>On completion of the course students will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.</li> <li>2. Apply these techniques in applications which involve perception, reasoning and learning.</li> <li>3. Explain the role of agents and how it is related to environment and the way of evaluating it and how agents can act by establishing goals.</li> <li>4. Acquire the knowledge of real world Knowledge representation.</li> <li>5. Analyze and design a real world problem for implementation and understand the dynamic behavior of a system.</li> <li>6. Use different machine learning techniques to design AI machine and enveloping applications for real world problems.</li> </ol>
CC-14	Computer Graphics	4-0-2=6	<p>After learning the course the students should be able to:</p> <ol style="list-style-type: none"> <li>1. Explain fundamental concepts within computer graphics such as geometrical transformations, illumination models, removal of hidden surfaces and rendering</li> <li>2. Explain the ideas in some fundamental algorithms for computer graphics and to some extent be able to compare and evaluate them</li> <li>3. Explain and apply fundamental principles within interaction programming</li> <li>4. Explain and understand fundamental concepts within information visualization</li> </ol>

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			and scientific visualization.
DSE-3	Soft Computing	4-0-2=6	<p>Upon completion of the course, the student are expected to :</p> <ol style="list-style-type: none"> <li>1. Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.</li> <li>2. Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic</li> <li>3. To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations</li> <li>4. Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications</li> <li>5. Reveal different applications of these models to solve engineering and other problems.</li> </ol>
DSE-4	Project Work / Dissertation	4-0-2=6	<ol style="list-style-type: none"> <li>1. Understand programming language concepts, particularly Java and object-oriented concepts or go through research activities.</li> <li>2. Plan, analyze, design and implement a software project or gather knowledge over the field of research and design or plan about the proposed work.</li> <li>3. Demonstrate the ability to locate and use technical information from multiple sources.</li> <li>4. Demonstrate the ability to communicate effectively in speech and writing.</li> <li>5. Learn to work as a team and to focus on getting a working project done on time with each student being held accountable for their part of the project.</li> <li>6. Learn about and go through the software development cycle with</li> </ol>

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			emphasis on different processes - requirements, design, and implementation phases.
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### Course Outcomes of UG General Courses:

#### Semester-I

Course code	Course Title	Credit	Course Outcomes
CC-1A	Problem solving Using Computer	4-0-2=6	<p><b>Upon completion of the course, the students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Bridge the fundamental concepts of computers with the present level of knowledge of the students.</li> <li>2. Explain basic principles of Python programming language.</li> <li>3. Implement object oriented concepts.</li> <li>4. Implement GUI applications.</li> </ol>

#### Semester-II

Course code	Course Title	Credit	Course Outcomes
CC-1B	Database Management Systems	4-0-2=6	<p>On successful completion of the course the students will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand database concepts and structures and query language.</li> <li>2. Understand the E R model and relational model.</li> <li>3. To design and build a simple database system and demonstrate competence with the</li> <li>4. fundamental tasks involved with modeling, designing, and implementing a DBMS.</li> </ol>

#### Semester-III

Course code	Course Title	Credit	Course Outcomes
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<b>CC-1C</b>	<b>Operating Systems</b>	<b>4-0-2=6</b>	<ol style="list-style-type: none"> <li>1. Understands the different services provided by Operating System at different level.</li> <li>2. They learn real life applications of Operating System in every field.</li> <li>3. Understands the use of different process scheduling algorithm and synchronization techniques to avoid deadlock.</li> <li>4. They will learn different memory management techniques like paging, segmentation and demand paging etc.</li> <li>5. Demonstrate UNIX commands for file handling and process control.</li> <li>6. Write Regular expressions for pattern matching and apply them to various filters for a specific task.</li> </ol>
<b>SEC-1</b>	<b>Office Automation Tools</b>	<b>1-0-1=2</b>	<p>By learning the course, the students will be able:</p> <ol style="list-style-type: none"> <li>1. to perform documentation.</li> <li>2. to perform accounting operations.</li> <li>3. to perform presentation skills.</li> </ol>

### Semester-IV

Course code	Course Title	Credit	Course Outcomes
<b>CC-1D</b>	<b>Computer System Architecture</b>	<b>4-0-2=6</b>	<p>Upon completion of this course, the students will be able to:</p> <ol style="list-style-type: none"> <li>1. Describe the fundamental organisation of a computer system.</li> <li>2. Explain the functional units of a processor.</li> <li>3. Explain addressing modes, instruction formats and program control statements.</li> <li>4. Distinguish the organization of various parts of a system memory hierarchy.</li> <li>5. Exemplify in a better way the I/O and memory organization.</li> </ol>

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<b>SEC-2</b>	<b>HTML Programming</b>	<b>1-0-1=2</b>	<p>Upon completion of the course students will be able to:</p> <ol style="list-style-type: none"> <li>1. Use knowledge of HTML and CSS code and an HTML editor to create personal and/or business websites following current professional and/or industry standards.</li> <li>2. Use critical thinking skills to design and create websites.</li> </ol>
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### Semester-V

Course code	Course Title	Credit	Course Outcomes
<b>DSE-1A</b>	<b>Software Engineering</b>	<b>4-0-2=6</b>	<ol style="list-style-type: none"> <li>1. Students will be able to decompose the given project in various phases of a lifecycle.</li> <li>2. Students will be able to choose appropriate process model depending on the user requirements.</li> <li>3. Students will be able perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.</li> <li>4. Students will be able to know various processes used in all the phases of the product.</li> <li>5. Students can apply the knowledge, techniques, and skills in the development of a software product.</li> </ol>
<b>SEC-3</b>	<b>MySQL/PL-SQL</b>	<b>1-0-1=2</b>	<p>At the end of the course the students are able to:</p> <ol style="list-style-type: none"> <li>1. Apply the basic concepts of Database Systems and Applications.</li> <li>2. Use the basics of SQL and construct queries using SQL in database creation and interaction.</li> <li>3. Design a commercial relational database system (MySQL) by writing SQL using the system.</li> <li>4. Analyze and Select storage and recovery techniques of database system.</li> </ol>

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**Semester-VI**

<b>Course code</b>	<b>Course Title</b>	<b>Credit</b>	<b>Course Outcomes</b>
<b>DSE-1B</b>	<b>Computer Networks</b>	<b>4-0-2=6</b>	<ol style="list-style-type: none"><li>1. Recognize the technological trends of Computer Networking.</li><li>2. Discuss the key technological components of the Network.</li><li>3. Evaluate the challenges in building networks and solutions to those.</li></ol>
<b>SEC-4</b>	<b>Programming in Visual Basic</b>	<b>1-0-1=2</b>	<ol style="list-style-type: none"><li>1. Demonstrate fundamental skills in utilizing the tools of a visual environment such as command, menus and toolbars.</li><li>2. Implement SDI and MDI applications using forms, dialogs, and other types of GUI components.</li><li>3. Implement the methods and techniques to develop projects.</li><li>4. Learn the advantages of Controls in VB.</li><li>5. Design and develop the event- driven applications using Visual Basic framework.</li></ol>