COURSE STRUCTURE

for

B.TECH. DEGREE

in

COMPUTER SCIENCE & DESIGN

(Applicable from the academic session 2024-2025)

DR.B.C.ROY SOCIETY
ENGINEERING
AN AUTONOMOUS INSTITUTE
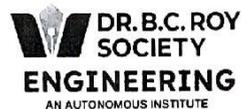
Dr. B. C. Roy Engineering College

An Autonomous Institution

Approved by: All India Council for Technical Education (AICTE)

Affiliated to: Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly Known as -WBUT)

Jemua Road, Durgapur, West Bengal, India,713206

The first year course structure (Page 3 and Page 4) is unanimously accepted and approved in the first BoS meeting held in the Department of a) Physics, b) Chemistry, c) Mathematics, d) English, e) Electrical Engineering, f) Electronics and Communication Engineering, g) Computer Science and Engineering, h) Mechanical Engineering.

The BoS of CSD (Computer Science & Design) in its first meeting (held in the Department of CSD (Computer Science & Design) on 6th November 2024 has unanimously accepted and approved the four year course structure of CSD (Computer Science & Design).

HOD
Computer Sc. & Design
Dr. B. C. Roy Engineering College

Dr. B. C. Roy Engineering College, Durgapur
(An Autonomous Institution)
Syllabus for B. Tech in Computer Science & Design

Semester: IV					
Sl. No.	Course Type	Course Code	Course Title	Engagement Type	Credit
1	PC	CSD-401	Computer Graphics and Animation	T	3
2	PC	CSD-402	Design & Analysis of Algorithms	T	3
3	PC	CSD-403	Object Oriented Programming and Design	T	3
4	PC	CSD-404	Computer Networks	T	3
5	HM	CSD-405	Economics for Engineers (Humanities-II)	T	3
6	BS	CSD-406	Biology	T	3
7	PC	CSD-491	Computer Graphics and Animation Lab	P	2
8	PC	CSD-492	Design & Analysis of Algorithms Lab	P	2
9	PC	CSD-493	Object Oriented Programming and Design Lab	P	2
TOTAL CREDIT					24

Semester-IV			
Subject/Course Name	Computer Graphics & Animation	**Subject/Course Code**	CSD-401
Contact Lecture/Week	3	**Tutorial**	1
Credit	3	**Maximum Marks**	100
Examination Scheme			
Internal Exam (CIA)	40	**Final Exam (ESE)**	60

Objective

1	To understand computer graphics, devices
2	To understand algorithms for drawing line, circle, polygon, filling
3	To understand algorithms for scaling, rotation, projection, viewing, clipping, transformations
4	To understand and apply computer animations
5	

Prerequisite

1	Mathematical concept on Geometry, Matrix.
2	
3	
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Unit	Content	Hours/Unit
1	Overview of computer graphics, representing, preparing, presenting & interacting with pictures for presentations; RGB color model, storage tube graphics display, Raster/Random scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software. Scan conversion: Points & Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.	9
2	2D transformation & viewing: Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline, Window to view port co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse. Cohen and Sutherland line clipping, Sutherland-Hodgeman Polygon clipping & viewing.	9

3	Curves: Curve representation, surfaces, designs, Bezier, Hermit curves, B-spline curves, Hidden surfaces: Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Painter's algorithm, scan-line algorithm; Hidden line elimination. Fractal - geometry. Color & shading models: Light & color model; interpolative shading model; Texture. Introduction to Ray-tracing: Human vision and color, Lighting, Reflection and transmission models.	8
4	Animation: Definition of Animation, Types of Animation, Cell Animation, Path Animation, 2D & 3D Animation Computer assisted Animation Techniques of Animation, Onion skinning, Motion cycling, Masking, Color cycling, Morphing Camera effects, Camera Location, Camera movement, Zones of vision Special effects, Methods of controlling the Animation, Procedural Animation, Tracking live action, Kinematics of controlling Animation, Tweening, Warping, Color dissolve Animation Software.	10

Textbook and Reference Books

1	Hearn, Baker – "Computer Graphics (C version 2nd Ed.)" – Pearson education
2	Z. Xiang, R. Plastock – "Schaum's outlines Computer Graphics (2nd Ed.)" – TMH
3	D. F. Rogers, J. A. Adams – "Mathematical Elements for Computer Graphics (2nd Ed.)" – TMH
4	M. K. Pakhira – "Computer graphics, multimedia and Animation", PHI.
5	The complete animation course by Chris Patmore Pub.-Baron's Educational Series. (New York)
6	Animation Unleashed by Ellen Bessen, Michael Weise Productions,2008 (U.S.A)
7	The Animator's Survival Kit by Richard Williams, Arrar Straus & Giroux Pub.(U.S.A)
8	

Course Outcome : On completion of the course students will be able to

CSD-401.1	Define / Explain the fundamental concepts / terms of Computer Graphics & Animation and its necessity / importance.
CSD-401.2	Apply the basic principles to solve simple model problems related to Computer Graphics & Animation in the real world.
CSD-401.3	Analyze a given Computer Graphics & Animation problem, design and implement a solution, and compute the output.
CSD-401.4	Identify sub-tasks / sub-systems , Perform Diagnostic assessment of a Computer Graphics & Animation problem, integrate / interconnect these sub-tasks to design an integrated working solution and Evaluate the solution.
CSD-401.5	Identify unsolved real world Computer Graphics & Animation problems, Synthesize pragmatic ideas and Create innovative solutions to such problems

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	2	1	1	2	1	3
CO2	3	3	3	3	3	2	2	1	1	2	1	3
CO3	3	3	3	3	3	2	2	1	1	2	1	3
CO4	3	3	3	3	3	2	2	1	1	2	1	3
CO5	3	3	3	3	3	2	2	1	1	2	1	3
Average	3	3	3	3	3	2	2	1	1	2	1	3

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Semester-IV			
Subject/Course Name	Design and Analysis of Algorithms	**Subject/Course Code**	CSD-402
Contact Lecture/Week	3	**Tutorial**	1
Credit	3	**Maximum Marks**	100
Examination Scheme			
Internal Exam (CIA)	40	**Final Exam (ESE)**	60

Objective

1	The aim of this module is to learn how to develop efficient algorithms for simple computational tasks and reasoning about the correctness of them
2	Through the complexity measures, different range of behaviours of algorithms and the notion of tractable and intractable problems will be understood.
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Prerequisite

1	To know data-structure and basic programming ability
2	
3	
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Unit	Content	Hours/Unit
1	Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behaviour; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem	8
2	Fundamental Algorithmic Strategies: Brute-Force, Greedy, Dynamic Programming, Branch and Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving, Bin Packing, Knap Sack TSP. Heuristics –characteristics and their application domains.	8
3	Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure,	7

	Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.	
4	Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.	11
5	Advanced Topics: Approximation algorithms, Randomized algorithms.	2

Textbook and Reference Books

1	Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.
2	Fundamentals of Algorithms – E. Horowitz et al.
3	Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
4	Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA
5	Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House (AICTE Recommended Textbook – 2018)
6	Algorithms Design and Analysis, Udit Agarwal, Dhanpat Rai
7	
8	

Course Outcome : On completion of the course students will be able to

CSD-402.1	Define / Explain the fundamental concepts / terms of Design and Analysis of Algorithms and its necessity / importance.
CSD-402.2	Apply the basic principles to solve simple model problems related to Design and Analysis of Algorithms in the real world.
CSD-402.3	Analyze a given Design and Analysis of Algorithms problem, design and implement a solution, and compute the output.
CSD-402.4	Identify sub-tasks / sub-systems , Perform Diagnostic assessment of a Design and Analysis of Algorithms problem, integrate / interconnect these sub-tasks to design an integrated working solution and Evaluate the solution.
CSD-402.5	Identify unsolved real world Design and Analysis of Algorithms problems, Synthesize pragmatic ideas and Create innovative solutions to such problems

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	2	1	1	2	1	3
CO2	3	3	3	3	3	2	2	1	1	2	1	3
CO3	3	3	3	3	3	2	2	1	1	2	1	3
CO4	3	3	3	3	3	2	2	1	1	2	1	3
CO5	3	3	3	3	3	2	2	1	1	2	1	3
Average	3	3	3	3	3	2	2	1	1	2	1	3

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Semester-IV			
Subject/Course Name	Object Oriented Programming and Design	**Subject/Course Code**	CSD-403
Contact Lecture/Week	3	**Tutorial**	Nil
Credit	3	**Maximum Marks**	100
Examination Scheme			
Internal Exam (CIA)	40	**Final Exam (ESE)**	60

Objective

1	Write programs using objects & classes.
2	Develop programs to create and destroy the objects using constructors and Destructors.
3	Use existing operators for different meanings in Operator Overloading concept.
4	Using reusability concept through Inheritance concept.
5	Implement pointers for arrays, strings & object.

6	Describe polymorphism, concepts, its types, virtual function & write program for the same.

Prerequisite

1	Interaction with DOS / Windows Operating System.
2	Ability to develop logic / flow of simple problems.
3	Basic Concepts of 'C'.
4	

Unit	Content	Hours/Unit
1	**Introduction to OOP:** Overview of OOP –Object oriented programming paradigms – Features of Object-Oriented Programming, Difference between OOP and other conventional programming – advantages and disadvantages, Class, object, relationships among objects, aggregation, links, relationships among classes association, aggregation, using, instantiation, meta-class, grouping constructs, abstraction, inheritance, Encapsulation, polymorphism.	5

2	**Overview of Java:** Java Buzzwords, advantages of java, Java language specification API, JDK and IDE, byte-code & JVM, data types, access specifiers, Operators – Control Statements – Programming Structures in Java – classes in Java – Constructors Methods -Access specifiers – Static members-Java Doc comments, garbage collection, basics of I/O operations – keyboard input using BufferedReader; Scanner classes. **Control statements:** If-else statements, Switch statements, Conditional Expressions, Common mathematical functions, While, do-while and for loop, nested loops, Keyword break and continue. Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods), **Objects & Classes:** **2.1** Specifying a class, Defining member functions, Arrays within a class, Creating objects, memory allocation for objects, static data & member function, Arrays of objects, objects as function argument. **2.2** Class specifiers and their uses, distinction between structure (struct) of C and Class.	5
3	**Constructors.** 1.1. Concept of Constructor (Default, Parameterized), Zero argument and explicit Overloaded Constructors. **Function and Operator Overloading** 3.2 Function overloading, Inline member functions, constant member functions. 3.3 Operator overloading (overloading unary & binary operators), rules for overloading operators. Type Conversion: Conversions from basic to class type, class to basic type, class to class type. Operators that cannot be overloaded.	6
4	**Inheritance** **4.1.** Concepts of inheritance, Derived classes, Member declaration (Protected), Types of inheritance (Single, multilevel, hierarchical, Hybrid inheritance). **4.2** Virtual base classes, Abstract classes, Constructors in derived classes. **4.3** Class within class, containership, IS A and HAS A relationship and their differences, Namespaces.	6
5	**Polymorphism** **5.1.** Concepts of polymorphism, types of polymorphism, Overloading & overriding, Overloading Virtual function, Static & dynamic binding. **5.2** Pure Virtual functions, Virtual Constructors and Destructors.	5
6	**Exception Handling** Concepts and uses of exception handler, the try /throw/ catch construct, uses and implementation of multiple exceptions, limitation of exception handling.	4

7	**Package** Organizing Classes and Interfaces in Packages, Package as Access Protection, Defining Package, CLASSPATH Setting for Packages, Making JAR Files for Library Packages Import and Static Import Naming Convention For Packages.	4
8	**Array & String :** Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array, Operation on String, Mutable & Immutable String, Using Collection Bases Loop for String, Tokenizing a String, Creating Strings using StringBuffer.	4
9	**Thread :** Understanding Threads , Needs of Multi-Threaded Programming ,Thread Life-Cycle, Thread Priorities ,Synchronizing Threads, Inter Communication of Threads ,Critical Factor in Thread –DeadLock.	3

10	**GUI Programming** Designing Graphical User Interfaces in Java, Components and Containers, Basics of Components, Using Containers, Layout Managers, AWT Components, Adding a Menu to Window, Extending GUI Features Using Swing Components, Java Utilities (java.util Package) **JAVA FX controls and components:** Event Basics – Handling Key and Mouse Events. Controls: Labeled and Label, button, Checkbox, RadioButton, Textfield, TextArea, Combo Box, ListView, Scrollbar, Slider. **Applet Programming**– Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets. **The Collection Framework :** Collections of Objects, Collection Types, Sets , Sequence, Map, Understanding Hashing, Use of Array List & Vector.	6

Textbook and Reference Books

1	Patrick Naughton, Herbert Schildt – The complete reference - Java2 – TMH
2	R.K Das – Core Java for Beginners; – VIKAS PUBLISHING
3	Deitel and Deitel – Java How to Program; – 6th Ed. – Pearson
4	E. Balagurusamy – Programming with Java: A Primer; – 3rd Ed. – TMH
5	
6	

Course Outcome : On completion of the course students will be able to

CSD-403.1	Define / Explain the fundamental concepts / terms of Object Oriented Programming and Design and its necessity / importance.
CSD-403.2	Apply the basic principles to solve simple model problems related to Object Oriented Programming and Design in the real world.
CSD-403.3	Analyze a given Object Oriented Programming and Design problem, design and implement a solution, and compute the output.
CSD-403.4	Identify sub-tasks / sub-systems , Perform Diagnostic assessment of a Object Oriented Programming and Design problem, integrate / interconnect these sub-tasks to design an integrated working solution and Evaluate the solution.
CSD-403.5	Identify unsolved real world Object Oriented Programming and Design problems, Synthesize pragmatic ideas and Create innovative solutions to such problems

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	2	1	1	2	1	3
CO2	3	3	3	3	3	2	2	1	1	2	1	3
CO3	3	3	3	3	3	2	2	1	1	2	1	3
CO4	3	3	3	3	3	2	2	1	1	2	1	3
CO5	3	3	3	3	3	2	2	1	1	2	1	3
Average	3	3	3	3	3	2	2	1	1	2	1	3

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Dr. B. C. Roy Engineering College, Durgapur
(An Autonomous Institution)
Syllabus for B. Tech in Computer Science & Design

Semester-IV			
Subject/Course Name	Computer Networks	**Subject/Course Code**	CSD-404
Contact Lecture/Week	3	**Tutorial**	1
Credit	3	**Maximum Marks**	100
Examination Scheme			
Internal Exam (CIA)	40	**Final Exam (ESE)**	60
Objective			
1	To develop an understanding of modern network architectures from a design and performance perspective.		
2	To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).		
3	To provide an opportunity to do network programming		
4	To provide a WLAN measurement ideas.		
5			
Prerequisite			
1			
2			
3			
4			

Unit	Content	Hours/Unit
1	Data communication Components: Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.	8
2	Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA,CSMA/CD,CDMA/CA	8
3	Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.	10

4	Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.	6
	Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography.	4

Textbook and Reference Books

1	An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2	Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.
3	
4	

Course Outcome : On completion of the course students will be able to

CSD-404.1	Define / Explain the fundamental concepts / terms of Computer Networks and its necessity / importance.
CSD-404.2	Apply the basic principles to solve simple model problems related to Computer Networks in the real world.
CSD-404.3	Analyze a given Computer Networks problem, design and implement a solution, and compute the output.
CSD-404.4	Identify sub-tasks / sub-systems , Perform Diagnostic assessment of a Computer Networks problem, integrate / interconnect these sub-tasks to design an integrated working solution and Evaluate the solution.
CSD-404.5	Identify unsolved real world Computer Networks problems, Synthesize pragmatic ideas and Create innovative solutions to such problems

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	2	1	1	2	1	3
CO2	3	3	3	3	3	2	2	1	1	2	1	3
CO3	3	3	3	3	3	2	2	1	1	2	1	3
CO4	3	3	3	3	3	2	2	1	1	2	1	3
CO5	3	3	3	3	3	2	2	1	1	2	1	3
Average	3	3	3	3	3	2	2	1	1	2	1	3

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Semester-IV			
Subject/Course Name	Economics for Engineers (Humanities-II)	**Subject/Course Code**	CSD-405
Contact Lecture/Week	3	**Tutorial**	Nil
Credit	3	**Maximum Marks**	100
Examination Scheme			
Internal Exam (CIA)	40	**Final Exam (ESE)**	60

Objective

1	Understand the role and scope of Engineering Economics and the process of economic decision making
2	Understand the different concepts of cost and different cost estimation techniques
3	Familiarization with the concepts of cash flow, time value of money and different interest formulas
4	Appreciation of the role of uncertainty in future events and using different concepts from probability to deal with uncertainty
5	Understand the concepts of Depreciation and Replacement analysis along with their methods of calculation
6	Familiarization with the phenomenon of inflation and the use of price indices in engineering Economics
7	Introduction to basic concepts of Accounting and Financial Management

Prerequisite

1	Mathematics
2	
3	
4	

Unit	Content	Hours/Unit
1	Economic Decisions Making– Overview, Problems, Role, Decision making process. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life - Cycle Costs; Types Of Estimate, Estimating Models – Per Unit Model, Segmenting Model, Cost Indexes, Power Sizing Model, Improvement & Learning Curve, Benefits.	9

2	Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal& Effective Interest. Cash Flow & Rate of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing an Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity and Breakeven Analysis. Economic Analysis In The Public Sector -Quantifying And Valuing Benefits & drawbacks.		9
3.	Inflation and Price Change – Definition, Effects, Causes, Price change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates. Present Worth Analysis:		

	End-Of- Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, and Risk vs Return, Simulation, Real Options.		9
4	Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types of Property, Calculation, Depreciation Fundamentals, Depreciation And Capita lAllowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements of Tax Regulations for Depreciation and Capital Allowances. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios, Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.		9

Textbook and Reference Books

1	James L.Riggs, David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw Hill
2	Donald Newnan, Ted Eschembach, Jerome Lavelle: Engineering Economics Analysis, OUP
3	John A. White, Kenneth E. Case, David B. Pratt : Principle of Engineering Economic Analysis, John Wiley
4	Sullivan and Wicks: Engineering Economy, Pearson
5	R.Paneer Seelvan: Engineering Economics, PHI
6	Michael R Lindeburg : Engineering Economics Analysis, Professional Pub
7	
8	

Course Outcome : On completion of the course students will be able to

CSD-405.1	Define / Explain the fundamental concepts / terms of Economics for Engineers (Humanities-II) and its necessity / importance.
CSD-405.2	Apply the basic principles to solve simple model problems related to Economics for Engineers (Humanities-II) in the real world.
CSD-405.3	Analyze a given Economics for Engineers (Humanities-II) problem, design and implement a solution, and compute the output.
CSD-405.4	Identify sub-tasks / sub-systems , Perform Diagnostic assessment of a Economics for Engineers (Humanities-II) problem, integrate / interconnect these sub-tasks to design an integrated working solution and Evaluate the solution.
CSD-405.5	Identify unsolved real world Economics for Engineers (Humanities-II) problems, Synthesize pragmatic ideas and Create innovative solutions to such problems

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	2	1	1	2	1	3
CO2	3	3	3	3	3	2	2	1	1	2	1	3
CO3	3	3	3	3	3	2	2	1	1	2	1	3
CO4	3	3	3	3	3	2	2	1	1	2	1	3
CO5	3	3	3	3	3	2	2	1	1	2	1	3
Average	3	3	3	3	3	2	2	1	1	2	1	3

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Semester-IV			
Subject/Course Name	Biology	**Subject/Course Code**	CSD-406
Contact Lecture/Week	3	**Tutorial**	Nil
Credit	3	**Maximum Marks**	100
Examination Scheme			

Internal Exam (CIA)	40	Final Exam (ESE)	60
Objective			
1	Bring out the fundamental differences between science and engineering		
2	Discuss how biological observations of 18th Century that lead to major discoveries		
3			
4			
5			
Prerequisite			
1	Basic knowledge of Physics ,Chemistry and mathematics		
2			
3			
4			

Unit	Content	Hours/Unit
1	To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry, bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why do we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.	2

2	The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) Energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion– amino telic, ureotelic, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus.	3
3	To convey that "Genetics is to biology what Newton's laws are to Physical Sciences" Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.	4
4	Biomolecules: To convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.	4
5	Enzymes: To convey that without catalysis life would not have existed on earth Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss	4

	at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.	
6	Information Transfer: The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.	4
7	Macromolecular analysis: How to analyse biological processes at the reductionist level Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.	5
8	Metabolism: The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergonic reactions. Concept of Keqand its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO_2 + H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge	4

9	Microbiology Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.	3

Textbook and Reference Books

1	Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2	Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H. John Wiley and Sons
3	Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4	Molecular Genetics (Second edition), Stent, G. S.; and Calender, R. W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5	

Course Outcome: On completion of the course students will be able to

CSD-406.1	Define / Explain the fundamental concepts / terms of Biology and its necessity / importance.
CSD-406.2	Apply the basic principles to solve simple model problems related to Biology in the real world.
CSD-406.3	Analyze a given Biology problem, design and implement a solution, and compute the output.
CSD-406.4	Identify sub-tasks / sub-systems , Perform Diagnostic assessment of a Biology problem, integrate / interconnect these sub-tasks to design an integrated working solution and Evaluate the solution.
CSD-406.5	Identify unsolved real world Biology problems, Synthesize pragmatic ideas and Create innovative solutions to such problems

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	2	1	1	2	1	3
CO2	3	3	3	3	3	2	2	1	1	2	1	3
CO3	3	3	3	3	3	2	2	1	1	2	1	3
CO4	3	3	3	3	3	2	2	1	1	2	1	3
CO5	3	3	3	3	3	2	2	1	1	2	1	3
Average	3	3	3	3	3	2	2	1	1	2	1	3

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Semester-IV (PRACTICAL)			
Subject/Course Name	Computer Graphics & Animation Lab	**Subject/Course Code**	CSD-491
Contact Practical/Week	4	**Tutorial**	Nil
Credit	2	**Maximum Marks**	100
Examination Scheme			
Internal Exam (CIA)	40	**Final Exam (ESE)**	60
Objective			
1	Concepts of 2D & 3D object representation		
2	Implementation of various scan & clipping algorithms		
3	Implementation of illumination model for rendering 3D objects		
4	Implementation of a project based on learned concepts.		
5			
6			
Prerequisite			
1	Programming, basic understanding of Geometry, Matrix		
2			

Sl No	Content
1	Implementation DDA algorithm, Bresenham's line algorithm
2	Implementation Circle generation algorithm; polygon drawing; fill algorithm
3	Implementation Scaling, Rotation, Clipping & Viewing
4	Introduction to Animation in Maya, Animation related interface of Maya and animation preferences
5	Tools used for Animation in Maya, Key framing, playback and playblast
6	Introduction to Tangents, Graph editor, Dope sheet.
7	Applying animation principles to object like bouncing ball
8	Character Jump Animation,
9	Character walk cycle animation
10	Some programming beyond syllabus

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	2	1	1	2	1	3
CO2	3	3	3	3	3	2	2	1	1	2	1	3
CO3	3	3	3	3	3	2	2	1	1	2	1	3
CO4	3	3	3	3	3	2	2	1	1	2	1	3
CO5	3	3	3	3	3	2	2	1	1	2	1	3
Average	3	3	3	3	3	2	2	1	1	2	1	3

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Semester-IV (PRACTICAL)			
Subject/Course Name	Design & Analysis of Algorithms Lab	**Subject/Course Code**	CSD-492
Contact Practical/Week	4	**Tutorial**	Nil
Credit	2	**Maximum Marks**	100
Examination Scheme			
Internal Exam (CIA)	40	**Final Exam (ESE)**	60
Objective			

1	Know the characteristics of various components.
Prerequisite	
1	Theoretical Knowledge about the subject ESC301
2	

Sl No	Content
1	Implement Binary Search using Divide and Conquer approach Implement Merge Sort using Divide and Conquer approach
2	Implement Quick Sort using Divide and Conquer approach Find Maximum and Minimum element from a array of integer using Divide and Conquer approach
3	Find the minimum number of scalar multiplication needed for chain of matrix
4	Implement all pair of Shortest path for a graph (Floyed- Warshall Algorithm) Implement Traveling Salesman Problem
5	Implement Single Source shortest Path for a graph (Dijkstra , Bellman Ford Algorithm
6	Implement 15 Puzzle Problem
7	Implement 8 Queen problem
8	Graph Coloring Problem Hamiltonian Problem
9	Knapsack Problem Job sequencing with deadlines
10	Minimum Cost Spanning Tree by Prim's Algorithm Minimum Cost Spanning Tree by Kruskal's Algorithm
11	Implement Breadth First Search (BFS)
12	Implement Depth First Search (DFS)

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	2	1	1	2	1	3
CO2	3	3	3	3	3	2	2	1	1	2	1	3
CO3	3	3	3	3	3	2	2	1	1	2	1	3
CO4	3	3	3	3	3	2	2	1	1	2	1	3
CO5	3	3	3	3	3	2	2	1	1	2	1	3
Average	3	3	3	3	3	2	2	1	1	2	1	3

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Dr. B. C. Roy Engineering College, Durgapur
(An Autonomous Institution)
Syllabus for B. Tech in Computer Science & Design

Semester-IV (PRACTICAL)			
Subject/Course Name	Object Oriented Programming & Design Lab	**Subject/Course Code**	CSD-493
Contact Practical/Week	4	**Tutorial**	Nil
Credit	2	**Maximum Marks**	100
Examination Scheme			
Internal Exam (CIA)	40	**Final Exam (ESE)**	60
Objective			
1			
2			
Prerequisite			
1			
2			

Sl No	Content
1	Assignments on class, constructor, overloading, inheritance, overriding
2	Assignments on wrapper class, arrays
3	Assignments on developing interfaces- multiple inheritance, extending interfaces
4	Assignments on creating and accessing packages
5	Assignments on multithreaded programming
6	Assignments on applet programming Note: Use Java for programming
7	Any experiment specially designed by the college (Detailed instructions for Laboratory Manual to be followed for further guidance)

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	2	1	1	2	1	3
CO2	3	3	3	3	3	2	2	1	1	2	1	3
CO3	3	3	3	3	3	2	2	1	1	2	1	3
CO4	3	3	3	3	3	2	2	1	1	2	1	3
CO5	3	3	3	3	3	2	2	1	1	2	1	3
Average	3	3	3	3	3	2	2	1	1	2	1	3

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3