

**R.T. M. Nagpur University, Nagpur**  
**FOUR YEAR B.E. COURSE**  
**(Curriculum as per AICTE Model Curriculum)**

**SCHEME OF EXAMINATION FOR**  
**B.E. COMPUTER SCIENCE & ENGINEERING**  
**(SEMESTER-III)**

Sr. No	Subject	Teaching Scheme				Credit				Marks				Total Marks
		L	P	T/ A	Total	L	P	T/A	Total	Theory		Practical		
										Internal	University	Internal	University	
1	BSC:Applied Mathematics – III	3	-	1	4	3		1	4	30	70	-	-	100
2	PCC: Object Oriented Programming with Java	3	-	1	4	3	-	1	4	30	70	-	-	100
3	PCC: Operating System	3	-	-	3	3	-	-	3	30	70	-	-	100
4	PCC: Computer Architecture & Digital System	3	-	1	4	3	-	1	4	30	70	-	-	100
5	PCC: Ethics in IT	3	-	-	3	3	-	-	3	30	70	-	-	100
6	PCC: Object Oriented Programming with Java Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
7	PCC: Operating System Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
8	PCC: Computer Workshop-I Lab	-	2	-	2	-	1	-	1	-	-	25	25	50
9	HSMC: Universal Human Values	2	-	-	2	2	-	-	2	15	35	-	-	50
10	HSMC: Environment Sciences	2	-	-	2	-	-	-	-	-	-	-	-	Audit
	<b>Total</b>	<b>19</b>	<b>6</b>	<b>3</b>	<b>28</b>	<b>17</b>	<b>3</b>	<b>3</b>	<b>23</b>	<b>165</b>	<b>385</b>	<b>75</b>	<b>75</b>	<b>700</b>

**L – Lecture ; P – Practical ; T/A – Tutorial/Activity**

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**

**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 3<sup>rd</sup> (C.B.C.S.)**

**BRANCH: COMPUTER SCIENCE & ENGINEERING**

Subject : *Applied Mathematics - III*

Subject Code : **BECSE301T**

Load	Credits	College Assessment Marks	University Evaluation	Total Marks
03 Hrs. (Theory) 01 Hr. (Tutorial)	04	30	70	100

**Aim:** To knowledge of Mathematics I and Mathematics II

**Prerequisite(s):** None

**Course Objectives:**

1	A primary objective is to provide a bridge for the student from lower-division mathematics courses to upper-division mathematics
2	Explain the importance of mathematics and its techniques to solve real life problems and provide the limitations of such techniques and the validity of the results.
3	Propose new mathematical and statistical questions and suggest possible software packages and/or computer programming to find solutions to these questions.

**Course Outcomes:**

After completing the course, students will be able:

<b>CO1</b>	To understand numerical methods, matrices for the solution of linear and nonlinear equations, and the solution of differential equations, among other mathematical processes and activities.
<b>CO2</b>	To analyze real world scenarios to recognize when matrices and probability are appropriate, formulate problems about the scenarios, creatively model these scenarios (using technology, if appropriate) in order to solve the problems using multiple approaches.
<b>CO3</b>	To organize, manage and present data in a clear and concise manner.
<b>CO4</b>	To develop an ability to identify, formulate, and/or solve real world problems.
<b>CO5</b>	To understand the impact of scientific and engineering solutions in a global and societal context.
<b>CO6</b>	To create the groundwork for post-graduate courses, specialized study, and research in computational mathematics.

**Unit I: Numerical Methods**

**[10**

**Hours]**Solution of algebraic and transcendental Equations: Newton–Raphson method, Method of false position and their convergence, Solution of simultaneous linear equations using Gauss-Seidal method and Crout’s method (LU decomposition).

**Numerical solution of ordinary differential equations:** Taylor's series method, Euler's modified method, Runge-Kutta fourth order method, Milne's predictor- corrector method.

**Unit II: Matrices**

**[08 Hours]**

Linear dependence of vectors, Eigen values and Eigen vectors, Reduction to diagonal form, Singular value decomposition, Sylvester's theorem (Statement only), Largest Eigen value and its corresponding Eigen vector by iteration method.

**Unit III: Mathematical Expectation and Probability Distributions**

**[10 Hours]**

**Discrete Random Variable:** Review of discrete random variable, Probability function and Distribution function, Mathematical expectation, Variance and Standard deviation, Moments, Moment generating function.

**Probability Distributions:** Binomial distribution, Poisson distribution, Normal distribution, Exponential distribution.

**Unit IV: Statistical Techniques**

**[10 Hours]**

**Statistics:** Introduction to correlation and regression, Multiple correlation and its properties, Multiple regression analysis, Regression equation of three variables.

**Measures of central tendency and dispersion:** Mean, Median, Quartile, Decile, Percentile, Mode, Mean deviation, Standard deviation.

**Skewness:** Test and uses of skewness and types of distributions, Measure of skewness, Karl Pearson's coefficient of skewness, Measure of skewness based on moments.

**Unit V: Stochastic Process and Sampling Techniques**

**[10 Hours]**

**Stochastic Process:** Introduction of stochastic process, Classification of random process, Stationary and non-stationary random process, Stochastic matrix.

**Markov Chain:** Classification of states, Classification of chains, Random walk and Gambler ruin.

**Sampling:** Population (Universe), Sampling types and distribution, Sampling of mean and variance, Testing a hypothesis, Null and Alternative Hypothesis, One-tail and two-tails tests (Only introduction), t test and F test (Only introduction), Chi-square test.

**Text/ Reference Books:**

1. Advanced Engineering Mathematics (Wiley), Erwin Kreyzig.
2. Higher Engineering Mathematics (Khanna Publishers), B. S. Grewal.
3. Advanced Engineering Mathematics (S. Chand), H. K. Dass.
4. Probability and Statistics (Schaum's Outline Series), Murray Spiegel, John Schiller, R. A. Srinivasan.
5. Advanced Mathematics for Engineers, Chandrika Prasad.
6. Probability, Statistics and Random Processes (TMH), T. Veerarajan.

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**SEMESTER: 3<sup>rd</sup> (C.B.C.S.)**

**BRANCH: COMPUTER SCIENCE & ENGINEERING**

Subject : *Object Oriented Programming with Java*

Subject Code : **BECSE302T**

Load	Credits	College Assessment Marks	University Evaluation	Total Marks
03 Hrs. (Theory) 01 Hr. (Tutorial)	04	30	70	100

**Aim:** To learn how to implement object-oriented designs with Java

**Prerequisite(s):** None

**Course Objectives:**

1	Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
2	Be able to use the Java SDK environment to create, debug and run simple Java programs.
3	To analyze the object-oriented paradigm using java programming language
4	To implement small/medium scale java programs to resolve small business problems.

**Course Outcomes:**

At the end of this course student are able :

<b>CO1</b>	To identify classes, objects, members of a class and relationships among them for a specific problem
<b>CO2</b>	To understand and demonstrate the concepts of garbage collection, polymorphism, inheritance etc.
<b>CO3</b>	To do numeric(algebraic) and string-based computation.
<b>CO4</b>	To understand and implement modularity as well as basic error handling techniques
<b>CO5</b>	To develop, design and implement small multithreaded programs using Java language
<b>CO6</b>	To apply appropriate problem-solving strategies for the implementation of small /medium scale java applications

**UnitI:** [ 10 Hours]

Object Oriented Programming features: objects and classes, Abstraction, Encapsulation, Inheritance, Polymorphism, Characteristics of Java, Java Source File Structure – Compilation. Fundamental Programming Structures in Java, Introduction of JVM, Object class, Constructors, Access specifiers, static members, Data Types.

**UnitII:** [ 10 Hours]

Operators, Control Flow, Wrapper classes, Command line arguments, static modifier, this keyword, Garbage collection, Java Arrays, Declaration and initialization of an array, One Dimensional Array, Two-Dimensional Array, Vector. String Handling: String, StringBuffer and StringBuilder class, String constructors, Data conversion using valueOf(), toString() methods, Methods for String Comparison, Searching string and modifying string

**UnitIII:** [ 10 Hours]

Inheritance: Types of inheritance, Abstract class, Method Overriding, super keyword, final modifier Packages: Package Fundamental, importing packages, Concept of interface, Exception Handling: Fundamental Exception type: Checked, Unchecked Exceptions, throw and throws keywords, creating user defined exceptions, Built-in Exceptions.

**UnitIV:** [ 10 Hours]

Threads and Multithreading: Fundamentals, Thread Life Cycle, Ways of creating threads, Creating multiple threads, isAlive (), join (), sleep(), Thread Synchronization, Thread priorities, Interthread communication, Methods for suspending, resuming and stopping threads

**UnitV:** [08Hours]

Collection Framework: Introduction, Difference between Array and Collection, List interface and its classes, Set interface and its classes, Map interface and its classes.

**TextBooks:**

- The Complete Reference (8th Edition) by Herbert Schildt, Tata McGraw-Hill publications
- Head First Java, 2nd Edition by Kathy Sierra, Bert Bates, O'Reilly Media
- Programming in Java (Fifth edition) by E. Balguruswami, McGraw Hill Education

**ReferenceBooks:**

- Sun Certified Java Programmer for Java 6 by Kathy Sierra.
- The Java™ Programming Language (3rd Edition) by Arnold, Holmes, Gosling, Goteti
- Core Java for Beginners by Rashmi Kanta Das (III Edition) Vikas Publication
- Java A Beginner's Guide, Fifth Edition, Tata McGraw

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**  
**SEMESTER: THIRD (C.B.C.S.)**  
**BRANCH: COMPUTER SCIENCE & ENGINEERING**

**Subject : *Operating System***

**Subject Code : BECSE303T**

<b>Load</b>	<b>Credits</b>	<b>College Assessment Marks</b>	<b>University Evaluation</b>	<b>Total Marks</b>
<b>3 Hrs (Theory)</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>100</b>

**Aim:** To understand operating system concepts used in designing operating system

**Prerequisite(s):** Basics of computing system

**Course Objectives:**

<b>1</b>	To make the computer system convenient to use in an efficient manner.
<b>2</b>	To provide users a convenient interface to use the computer system.
<b>3</b>	Course Description Covers the classical internal algorithms and structures of operating systems, including CPU scheduling, memory management, device management and deadlock
<b>4</b>	To keep track of who is using which resource, to provide efficient and fair sharing of resources among users and programs.

**Course Outcomes:**

At the end of this course Student are able to:

<b>CO1</b>	To describe the important computer system resources and the role of operating system in their management policies and algorithms.
<b>CO2</b>	To understand the process management policies and scheduling of processes by CPU.
<b>CO3</b>	To evaluate the requirement for process synchronization and coordination handled by operating system.
<b>CO4</b>	To describe and analyze the memory management and its allocation policies.
<b>CO5</b>	To identify use and evaluate the storage management policies with respect to different storage management technologies.
<b>CO6</b>	To identify the need to create the special purpose operating system.

**Unit I:** [09Hrs]

**Introduction:** Evolution of OS, Types of OS, Basic h/w support necessary for modern operating systems, services provided by OS, system programs and system calls, OS structure: Layered, Monolithic, Microkernel, Disk space management and space allocation strategies, disk arm scheduling algorithms.

**Unit II:** [06 Hrs]

**Process Scheduling:** Process concept, Process control Block, Types of scheduler, context switch, threads, multithreading model, goals of scheduling and different scheduling algorithms, examples from WINDOWS 2000 & LINUX.

**Unit III:** [06 Hrs]

**Memory Management:** Contiguous allocation, Relocation, Paging, Segmentation, Segmentation with paging, demand paging, page faults and instruction restart, page replacement algorithms, working sets, Locality, Thrashing, Garbage Collection.

**Unit IV:** [06 Hrs]

**Process Cooperation and Synchronization:** Concurrency conditions, Critical section problem, software and hardware solution, semaphores, conditional critical regions and monitors, classical inter process communication problems.

**Unit V:** [09Hrs]

**File Systems:** File concept, Access methods, directory structures, Recovery, Log-structured File System. **Deadlocks & Protection:** Deadlock characteristics, Prevention, Avoidance, Detection and recovery, Goals of Protection, access matrix, implementation, Security problem.

**Text books:**

1. Operating System Concepts (8th Edition) by Silberschatz, Peter B. Galvin and Greg Gagne, Wiley Indian Edition (2010).
2. Modern Operating Systems (Third Edition) by Andrew S Tanenbaum, Prentice Hall India (2008).
3. Operating Systems – A. Godbole: TMH Publications
4. Operating Systems by D.M. Dhamdhare, Tata McGraw Hill 2nd edition.

**Reference books:**

1. Operating Systems (5th Ed) – Internals and Design Principles by William Stallings, Prentice Hall India, 2000
2. Operating System: Concepts and Design by Milan Milenkovic, McGraw Hill Higher Education
3. Operating Systems, 3rd Edition by Gary Nutt, Pearson Education
4. Operating System, 3rd Edition by P. Balakrishna Prasad, SciTech Publications



**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**

**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: III (C.B.C.S.)**

**BRANCH: COMPUTER SCIENCE & ENGINEERING**

Subject : *Computer Architecture & Digital System*

Subject Code : **BECSE304T**

Load	Credits	College Assessment Marks	University Evaluation	Total Marks
3 Hrs. (Theory) 1 Hr. (Tutorial)	4	30	70	100

**Aim:** To study the notion of Computer Architecture and Digital System.

**Prerequisite(s):** Semiconductor, Transistor, Some Concept of Physics related to digital system.

**CourseObjectives:**

<b>1</b>	Discuss the basic concepts of digital system that are applicable in the designing of computer architecture
<b>2</b>	Explain concepts of basic processing unit of computer such as ALU, CU, MU, I/O Units and Arithmetic Operation used in computer.
<b>3</b>	Explain various technologies used in memory system and motivate students to design memory modules.
<b>4</b>	Discuss the different types of interrupts and interrupt handling mechanism.

**CourseOutcomes:**

**At the end of this course student are able:**

<b>CO1</b>	To memorize and understand the basic concept of digital system which will be used to design the computer system.
<b>CO2</b>	To study and understand various instruction format used in computer design.
<b>CO3</b>	To study and understand the details working principle of basic processing unit.
<b>CO4</b>	To perform the arithmetic operation which is being used in the operation of computer system.
<b>CO5</b>	To understand wide variety of memory technologies used in computer and design the memory system.
<b>CO6</b>	To understand different ways of communicating with I/O devices and standard I/O interfaces.

**Unit I: Motivation for Digital Systems:** [10 Hours]

Logic and Boolean algebra, Logic Gates & Truth Tables, Demorgan's law, Minimization of combinational circuits using Karnaugh maps. Multiplexers, Demultiplexer, Encoders, Decoders.

**Unit II: Basic Structure of Computers:** [09 Hours]

Functional units, Von Neumann Architecture, Basic operational concepts, Bus structures Addressing modes, Subroutines: parameter passing, Instruction formats: Three-address Instructions, Two-address instructions, One-address instructions, Zero-address instructions.

**Unit III: Basic Processing Unit:** [09 Hours]

Bus architecture, Execution of a complete instruction, sequencing of control signals, Hardwired control, Micro-programmed Control, microinstruction format.

**Unit IV: Arithmetic:** [10 Hours]

Number representations and their operations, Addition and Subtraction with signed-magnitude, Design of Fast Adders, Array multiplier, Signed multiplication: Booth's Algorithm, Bit-pair recoding, Integer Division, Floating-point Arithmetic operations, guard bits and rounding.

**Unit V: The Memory System:** [10 Hours]

Various technologies used in memory design, higher order memory design, Memory hierarchy, Main memory, Auxiliary memory, Cache memory, cache optimization techniques, Memory interleaving, Virtual memory, Address Space and Memory Space, Associative memory, Page table, Page Replacement.

**Input/output Organization:** I/O mapped I/O and memory mapped I/O, Interrupts and Interrupts handling mechanisms, vectored interrupts, Synchronous vs. Asynchronous data transfer, Direct Memory Access.

**Textbooks:**

1. V.C.Hamacher, Z.G.Vranesic and S.G.Zaky, Computer Organisation, McGrawHill, 5th ed, 2002.
2. Computer Organization, Design and Architecture (IV Ed), Sajjan G. Shiva, CRC Press
3. Computer Architecture & Organization III Ed - J.P. Hayes.
4. Fundamentals of Digital Electronics: A. Anand Kumar

**Reference books:**

1. M.Mano, "Computer System and Architecture", PHI, 1993
2. W.Stallings, "Computer Organization & Architecture", PHI, 2001.
3. Digital circuit & design: A.P.Godse

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: III (C.B.C.S.)**

**BRANCH: COMPUTER SCIENCE & ENGINEERING**

Subject : *Ethics in IT*

Subject Code : **BECSE305T**

Load	Credits	College Assessment Marks	University Evaluation	Total Marks
3 Hrs. (Theory)	3	30	70	100

**Aim:** To understand the ethical behavior of individuals, organizations towards IT Profession

**Prerequisite(s):** None

**Course Objectives:**

1	Ability to understand and meet ethical standards and legal responsibilities.
2	Create an awareness on professionals Ethics and Human Values.
3	Discuss the Privacy and Anonymity issues, Defamation and Hate Speech
4	Gain the knowledge of Copyrights, Patents and Trade Secret Laws.
5	Create and understand the awareness on Whistle-blowing

**Course Outcomes:**

At the end of this course Student are able:

<b>CO1</b>	To acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.
<b>CO2</b>	To articulate what makes a particular course of action ethically defensible
<b>CO3</b>	To identify the multiple ethical interests at stake in a real-world situation or practice
<b>CO4</b>	To understand and apply Intellectual Property and related law in reality.
<b>CO5</b>	To understand the core values that shape the ethical behavior of an engineer / IT Professional.
<b>CO6</b>	To develop cognitive skills in solving social problems.

**Unit I:**

**[09 Hours]**

**An overview of Ethics:** Ethics in IT, Ethics for IT professionals and IT users, IT professionals, Ethical behavior, IT professional malpractices, IT users. Educating Employees, contractors and

part-time Workers **Computer and Internet Crime:**Types of Exploits, Reducing Vulnerabilities, Establishing a Security Policy, Prevention, Detection, Response.

**Unit II:**

[ 07 Hours]

**Privacy:** The right of Privacy, Recent History of Privacy Protection, Key Privacy and Anonymity issues, Governmental Electronic Surveillance, Data Encryption, Identity Theft, Consumer Profiling, Workplace Monitoring, Advanced surveillance Technology, Freedom of Expression: Key issues, Controlling Access to Information on the Internet, Defamation and Hate Speech.

**Unit III:**

[ 07 Hours]

**Intellectual Property:** Copyrights, Patents, Trade Secret Laws, Key Intellectual Property Issues, Plagiarism, Reverse Engineering, Open Source Code, Software Development, Strategies to Engineer Quality Software, Capability Maturity Model Integration for Software, Development of Safety-Critical Systems.

**Unit IV:**

[ 06 Hours]

**Ethics of IT Organization:** Need for Nontraditional Workers, Contingent Workers H-IB Workers, Whistle-blowing, Protection for Whistle-Blowers, Dealing with Whistle-Blowing Situation.

**Unit V:**

[ 07 Hours]

**The Impact of Information Technology on the Quality of Life:** The impact of IT on the standard of Living and productivity, The impact of IT on Health care costs, Electronic Health Records, Use of Mobile and Wireless Technology, Telemedicine.

**Text books:**

1. George Reynolds, "Ethics in information Technology" Cengage Learning

**Reference books:**

1. Deborah G.Johnson,"Computer Ethics",3/e Pearson Education.
2. Sara Baase, "A Gift of Fire: Social, Legal and Ethical Issues, for Computing and the Internet," PHI Publications.
3. Richard A.Spinello, "Case study in Information Technology Ethics", second Edition PHI Publications.
4. Duncan Lanford "Internet Ethics".
5. D. Micah Hester and Paul J. Ford "Computer and Ethics in the Cyber age".
6. Prof.A.R.Aryasri, DharanikotaSuyodhana "Professional Ethics and Morals" Maruthi Publications.
7. A.Alavudeen, R.KalilRahman and M.Jayakumaran "Professional Ethics and Human Values" - LaxmiPublications.

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**  
**SEMESTER: 3<sup>rd</sup> (C.B.C.S.)**  
**BRANCH: COMPUTER SCIENCE & ENGINEERING**

Subject : *Universal Human Values*

Subject Code : **BECSE306T**

Load	Credits	College Assessment Marks	University Evaluation	Total Marks
02 Hrs (Theory)	02	15	35	50

**Aim:** To inculcate sensitivity among students towards themselves and their surrounding including family, society and nature.

**Prerequisite(s):** None

**Course Objectives:**

<b>1</b>	Development of a holistic perspective based on self-exploration, about themselves (human being), family, society and nature/existence.
<b>2</b>	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
<b>3</b>	Strengthening of self-reflection.
<b>4</b>	Development of commitment and courage to act.

**Course Outcomes:**

At the end of this course Student are able to:

<b>CO1</b>	To become more aware of themselves, and their surroundings (family, society, nature)
<b>CO2</b>	To become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
<b>CO3</b>	They would have better critical ability.
<b>CO4</b>	To become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

**Unit 1**

**[06 Hours]**

Value education, definition, need for value education. The content and the process of value education, basic guidelines for value education, self-exploration as a means of value education, happiness and prosperity as part of value education.

**Unit 2**

**[06 Hours]**

Harmony of self with body, coexistence of self and body, understanding the needs of self and the needs of body, understanding the activities in the self and the activities in the body.

**Unit 3**

**[06 Hours]**

Values in relationship, the five dimensions of human endeavour, the holistic perception of harmony in existence.

**Unit 4**

**[06 Hours]**

Basics for ethical human conduct, defects in ethical human conduct, human rights violations and social disparities, value based life.

**Text Books:**

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, ExcelBooks, New Delhi, 2010

**Reference Books**

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Indian Ethos and Modern Management: Amalgam of the best of the ideas from the East and the West, B.L. Bajpai, New Royal Book Bo., Lucknow, 2004
4. Human society in ethics and politics, Bertrand Russel, Routledge Publications, 2009

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**  
**SEMESTER: 3<sup>rd</sup> (C.B.C.S.)**  
**BRANCH: COMPUTER SCIENCE & ENGINEERING**

Subject : *Environmental Science*

Subject Code : **BECSE307T**

Load	Credits	College Assessment Marks	University Evaluation	Total Marks
02Hrs (Theory)	NIL	NIL	NIL	NIL

**Aim:** To learn how to implement object-oriented designs with Java

**Prerequisite(s):** None

**Course Objectives:**

1	Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
2	Be able to use the Java SDK environment to create, debug and run simple Java programs.
3	To analyze the object-oriented paradigm using java programming language
4	To implement small/medium scale java programs to resolve small business problems.

**Course Outcomes:**

At the end of this course student are able to:

<b>CO1</b>	Identify different types of air pollutions as well as explain their causes, detrimental effects on environment and effective control measures.
<b>CO2</b>	Recognize various sources of water pollutants and interpret their causes and design its effective control measure
<b>CO3</b>	Illustrate various types of pollutants and waste management
<b>CO4</b>	Analyze various social issues related to environment and challenges in implementation of environmental laws.

**Unit I:****[06 Hours]**

Contaminant behaviour in the environment, Air pollution due to SO<sub>x</sub>, NO<sub>x</sub>, photochemical smog, Indoor air pollution

Natural pathways for degradation: Carbon cycle, Sulphur cycle, Nitrogen cycle, Oxygen cycle.

Factors responsible for altering the composition of atmosphere (deforestation, burning of fossil fuels, industrial and vehicular emissions, CFCs).

Techniques to control Air pollution, ambient air quality and continuous air quality monitoring, Control measures at source, Kyoto Protocol, Carbon Credits.

**Unit II:****[06 Hours]**

Major sources of water pollution: Eutrophication, acid mine drains, pesticides and fertilizers, dyeing and tanning, marine pollution, microplastics

Techniques to control water pollution: Conventional waste water treatment-types of sewage, sewerage system, alternative systems, primary, secondary and tertiary processes including aerobic and anaerobic techniques, safe disposal and its utility.

Treatment schemes for waste water from dairy, textile, power plants, pharmaceutical industries, and agro based industries such as rice mills

**Unit III:****[06 Hours]**

Soil pollution: Soil around us, Soil water characteristics, soil pollution.

Causes, effects & control : noise pollution, nuclear & radiation hazards, marine pollution (Oil spills & Ocean Acidification)

Solid waste management: Composting, vermiculture, landfills, hazardous waste treatment, bioremediation technologies, conventional techniques (land farming, constructed wetlands), and phytoremediation.

Degradation of xenobiotics in environment: Petroleum hydrocarbons, pesticides, heavy metals

Introduction, types of e-wastes, environmental impact, e-waste recycling, e-waste management rules.

**Unit IV:****[06 Hours]**

Concept of Sustainable development

Water conservation, rain water harvesting, watershed management

Resettlement and rehabilitation of people; its problems and concerns.

Environmental Laws (brief idea only)

Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act

Issues involved in enforcement of environmental legislation.

Different government initiatives (brief idea only)- National ambient air quality standard 2009, Swachh Bharat Abhiyan, National afforestation program and Act- 2016, National River conservation plan and National Ganga River basin authority, Formation of National Green Tribunal



**Activity**

1. Field Trip & Report Writing
2. Case-study & Report Writing

**Books suggested:**

1. Benny Joseph, Environmental Studies, McGraw Hill Education (India) Private Limited
2. B. K. Sharma, Environmental Chemistry, Goel Publishing House, Meerut
3. P. Aarne Vesilind, J. Jeffrey Peirce and Ruth F. Weiner, Environmental Pollution and Control, Butterworth-Heinemann
4. D. D. Mishra, S. S. Dara, A Textbook of Environmental Chemistry and Pollution Control, S. Chand & Company Ltd.
5. Shree Nath Singh, Microbial Degradation of Xenobiotics, Springer-Verlag Berlin Heidelberg
6. Indian Environmental Law: Key Concepts and Principles edited by Shibani Ghosh, Publisher, Orient BlackSwan, 2019. ISBN, 9352875796.
7. P. Thangavel & Sridevi, Environmental Sustainability: Role of Green technologies, Springer publications

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**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 3<sup>rd</sup> (C.B.C.S.)**

**BRANCH: COMPUTER SCIENCE & ENGINEERING**

Subject : *Object Oriented Programming with Java*

Subject Code : **BECSE308P**

Load	Credits	College Assessment Marks	University Evaluation	Total Marks
02 Hrs (Practical)	01	25	25	50

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**Note:**

1. Practical's are based on Object Oriented Programming with java syllabus  
(subject code: **BECSE302T**)
2. There should be at the most two practical's per unit
3. Minimum ten practical's have to be performed
4. IDE (e.g. eclipse, netbeans)
5. Include at least one content beyond syllabus practical
6. Do not include study experiments

**Text Books:**

1. The Complete Reference (8<sup>th</sup> Edition) by Herbert Schildt, Tata McGrawHill Publications
2. Head First Java, 2<sup>nd</sup> Edition by Kathy Sierra, Bert Bates, O'Reilly Media
3. Programming in Java (Fifth edition) by E Balguruswami, McGraw Hill Education

**Reference Books:**

1. Sun Certified Java Programmer for Java 6 by Kathy Sierra.
2. The Java™ Programming Language (3rd Edition) by Arnold, Holmes, Gosling, Goteti
3. Core Java for Beginners by Rashmi Kanta Das (III Edition) Vikas Publication
4. Java A Beginner's Guide, Fifth Edition, Tata McGRAW-HILL.

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**

**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: 3<sup>rd</sup> (C.B.C.S.)**

**BRANCH: COMPUTER SCIENCE & ENGINEERING**

Subject : *Operating System*

Subject Code : **BECSE309P**

Load	Credits	College Assessment Marks	University Evaluation	Total Marks
02 Hrs (Practical)	01	25	25	50

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**Note:**

2. Practical's are based on Operating system syllabus
2. There should be at the most two practical's per unit
3. Minimum ten practical's have to be performed
4. Include at least one content beyond syllabus practical

**Text books:**

1. Operating System Concepts (8th Edition) by Silberschatz, Peter B. Galvin and Greg Gagne, WileyIndian Edition (2010).
2. Modern Operating Systems (Third Edition) by Andrew S Tanenbaum, Prentice Hall India (2008).
3. Operating Systems – A.Godbole: TMH Publications
4. Operating Systems by D.M. Dhamdhare, Tata McGraw Hill 2nd edition.

**Reference books:**

1. Operating Systems (5th Ed) – Internals and Design Principles by William Stallings, Prentice Hall India, 2000
2. Operating System: Concepts and Design by Milan Milenkovic, McGraw Hill Higher Education
3. Operating Systems, 3rd Edition by Gary Nutt, Pearson Education

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**SEMESTER: THIRD (C.B.S.C)**  
**BRANCH: COMPUTER SCIENCE & ENGINEERING**

Subject : *Computer Workshop-I*

Subject Code : **BECSE310P**

Load	Credit	College Assessment Marks	University Evaluation	Total Marks
2 Hrs. (Practical)	01	25	25	50

**Note - Practical list must have at least 10 practical's.**

**Unit I:**

**[Min 2 Practical]**

**Basic concepts of HTML:** HTML, Web Pages, World Wide Web, Tags in HTML, HTML As a Markup Language, HTML as a Page Formatting Tool, Structure of an HTML Page, Commands Written In Notepad, the <H>TAG, the basic tags, the <P>TAG, The Text attributes: The <marquee> tag, Example of Text Styles, the images, the list tag: Ordered List, Unordered List, Nested List The links: Links between Two Pages, Links in the Same Page, Images as Links, Attributes of Links, the basic web page, other formatting tags: sounds and videos, comments, the <XMP> tag, special characters.

**Unit II:**

**[Min 2 Practical]**

**The Tables:** The Table, The Rows, The Columns, Cellspacing, Cellpadding, Alignment of the Text Present inside the Cells, Alignment of Table, Border Attributes in the Table, Merging Of Rows and Columns, Colspan, Rowspan, Table within a Table, Empty Cells inside the Table, Links in the Table.

**Unit III:**

**[Min 2 Practical]**

**The Forms:** The<input> Tag, The <textarea></textarea> Tag, The Dropdown List, The Normal List, HTML 5: New Markup Elements of HTML5, Basic Tags, Images, List and Links, Tables and Forms. Cascading Style Sheet(CSS): Definition and Usage, Syntax, Selectors, Borders, Margin, padding, Box Model, outline, link, table, Rounded Corners, Border Images, Backgrounds.

**Unit IV:****[Min 2 Practical]**

**Java Script:** Variables, Array, Comments, Operators, Conditional Statements, Looping Statements.

**Unit V:****[Min 2 Practical]**

**The Frames:** Frames with Column Arrangement, Column Size for Frames, Row Size for Frames, Frame Spacing, Margin Width and Height in Frames.

**Applets:** Basics of applets – Types of Applet- Life cycle of an Applet – AWT: Event Handling Delegation event Model.

**Text Books:**

1. HTML Programming, Freeman and Robson, Oreilly publications.
2. E. Balaguruswamy, “Programming in java”, Fourth Edition, Tata McGraw Hill, 2010.

**Digital Resources:**

1. <http://www.w3schools.com/>
2. <https://www.javatpoint.com/>
3. <https://www.tutorialspoint.com/>