

BCA

Sixth

Semester

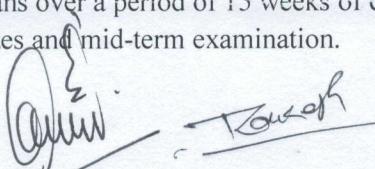

**Purbanchal University**  
**Bachelor of Computer Application (BCA)**

**Year: III**

**Semester: II**

Course Code	Course Title	Credit Hour	Lecture (Hrs.)	Tutorial (Hrs.)	Laboratory (Hrs.)	Total (Hrs.)
BCA351HS	Research Methodology	3	3	1	-	4
BCA352CO	Software Engineering	3	3	1		4
BCA353CO	Cyber Security	3	3	1	2	6
BCA354CO	Advance Object Oriented Programming	3	3	1	2	6
BCA355CO	Artificial Intelligence	3	3	1	2	6
BCA356CO	Computer Project-VI	2	-	-	3	3
	<b>Total</b>	<b>17</b>	<b>15</b>	<b>5</b>	<b>9</b>	<b>29</b>

Note: Each semester of BCA program spans over a period of 15 weeks of class work and one week of internal examinations, such as internal tests, quizzes and mid-term examination.

**Research Methodology**  
**BCA351HS**

Year III			Semester II				
Teaching Schedule Hours/week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	-	Theory	Practical	Theory	Practical	100
			20		80		

**Course objectives:**

This course will help you accomplish the following things:

- ability for individual research work on the field of information and communication technologies,
- ability to research, select and organize information, as well as synthesize solution and anticipate their consequences,
- mastering of research methods, procedures and processes, development of critical and self-critical assessment,
- ability to use knowledge in practice,

**Course Contents:**

**Unit 1: Introduction to Research**

[6 Hrs]

Meaning of Research, Applied and Fundamental Research, Scientific Research Process, Management Research Methods: Action Research, Evaluation Research, Managerial Research. Meaning of Project Work, Objectives of Project Work, Methods of Field and Project Work: Exploratory/Descriptive, Case Study, Feasible Study.

**Unit 2: Research Design –**

[7 Hrs]

Concept of Research Design, Elements of Research Design, Types of Research Design: Historical, Descriptive, Developmental, Case Study, Co-relational, Causal- Comparative and Action Research Design.

**Unit 3: Sampling Process and Data Collection**

[8 Hrs]

Sampling and its significance in Research, Types of Sampling, Probability and Non- Probability Sampling: Stratified, Systematic, Multistage, Judgment, Quota, and Convenience sampling, Sampling Error and Non- Sampling Error, Primary and Secondary Data, Use of Secondary Data, Methods of Collecting Primary Data: Interviewing, Questionnaire and Observation.

**Unit 4: Testing of Statistical Hypothesis****[9 Hrs]**

Statistical Hypothesis, Level of Significance, Difference between Parametric and Non- Parametric tests. Use of z-Distribution in Hypothesis Testing of Population Mean and Population Proportion in one-Sample Case.

**Unit 5: Research Ethics, IPR and Scholarly Publishing****[7 Hrs]**

Ethics, Intellectual Property Rights(IPR) and Patent Law, Copy Right, Royalty, Trade related aspects of Intellectual Property Rights(TRIPS), Scholarly Publishing, Plagiarism

**Unit 6: Writing the Research Report****[8 Hrs]**

Purpose of Writing a Report, Contents and Style of Report, Types of Report: Descriptive and Analytical Report, Presenting Data, Table and Figures in Report, Use of Quotations, Abbreviations, Bibliography

**Reference Books:**

1. Kerlinger, Fred N, Foundations of Behavioral Research
2. Kothari, C. R., Research Methodology: Methods and Techniques. New Age International



Handwritten signatures and initials are present on the page. On the left, there is a signature that appears to be "R. S. Bhatia". In the center, there is a signature that appears to be "S. J. Bawali" followed by a checkmark. On the right, there is a signature that appears to be "J. M. P." followed by a checkmark.

**Software Engineering**  
**BCA 352CO**

**Year III**

**Semester II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	-	Theory	Practical	Theory	Practical	<b>100</b>
			<b>20</b>	-	<b>80</b>	-	

**Course Objectives:**

This course is intended to provide an introduction to SE concepts and practices focusing on industrial software development characteristics and processes, development models, and the software life cycle for mid-scale system.

- Provide students a comprehensive introduction to software engineering.
- provide the students the kinds of activities that are necessary for developing a software system
- Study the important phases of software development

**Course Contents:**

**Unit1:Introduction to Software Engineering:**

[4Hrs]

- 1.1 Definition of software engineering
- 1.2 The evolving role of software
- 1.3 Changing nature of software
- 1.4 Characteristics of software
- 1.5 A generic view of software engineering
- 1.6 Software engineering-layered technology

**Unit 2:Process Models**

[5 Hrs]

- 2.1 The Waterfall model
- 2.2 Prototyping model
- 2.3 RAD model
- 2.4 Spiral model
- 2.5 Agile Software Model.

**Unit 3: Software Project Management**

[8 Hrs]

- 3.1 Meaning of 4Ps in software project management
- 3.2 Activities of project planning
- 3.3 Project estimation techniques
- 3.4 COCOMO model

*Rathna Agarwal Jyoti*

- 3.5 Risk Management
- 3.6 Project Scheduling
- 3.7 Staffing
- 3.8 Software Configuration Management (SCM)

<b>Unit 4: Software Requirements and Specification</b>	<b>[7Hrs]</b>
4.1 Functional and non-functional requirements, requirements engineering process(feasibility studies, requirements elicitation and analysis, requirements validation, requirements management)	
4.2 Data Modeling and flow diagram	
4.3 Software prototyping techniques	
4.4 Requirement definition and specifications	

<b>Unit 5: Software Design</b>	<b>[7Hrs]</b>
5.1 Introduction to software design	
5.2 Characteristics of a good software design	
5.3 Design principle	
5.4 Design concepts	
5.5 Design strategy	
5.6 Design process and design quality	
5.7 Software architecture and its types	

<b>Unit 6: Software Testing</b>	<b>[7Hrs]</b>
6.1 Software testing process	
6.2 Principal of testing	
6.3 Test case design	
6.4 Black-box testing(Boundary-value analysis,Equivalence class partitioning)	
6.5 White-box testing (Statement coverage,Path coverage,Cyclomatic complexity)	
6.6 Software verification and validation	

<b>Unit 7: Metrics for Process and Products</b>	<b>[4Hrs]</b>
7.1 Software measurement	
7.2 Metrics for software quality	
7.3 Software quality assurance	
7.4 Software reliability	
7.5 The ISO 9000 quality standards	

<b>Unit 8: Software Engineering Trends and Technology</b>	<b>[3Hrs]</b>
8.1 Agile development	
8.2 Extreme programming	
8.3 Cloud computing and grid computing	
8.4 Enterprise mobility	
8.5 Business intelligent and approaches	
8.5.1 ERP, Supply chain management, Service-oriented architecture and web services	

*Rethinam* *Amma* *Tareekh* *Dwight*

### 8.5.2 Enterprise portals and Content management

### 8.6 Introduction to OOSE

**Case Study:** Students are encouraged to perform the case study to implement concepts of above-mentioned topics.

#### Reference Books:

1. Sommerville, "Software Engineering", Pearson Education
2. RajibMalla, "Fundamentals of Software Engineering"
3. Pankaj Jalote, "Software Engineering - A Precise Approach"
4. Udit Agrawal, "Software Engineering"
5. Roger S. Pressman, "Software Engineering - A Practitioner's Approach", 6th Ed., McGrawHillInternational Edition

*Bettermark* *✓* *Pearson* *buy*

**Cyber Security**  
**BCA353CO**

**Year III**

**Semester II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal		Final		Total
			Theory	Practical	Theory	Practical	
3	1	2	20	20	60	-	100

**Course Objective:**

The learner will gain knowledge about securing both clean and corrupted systems, protect personal data, and secure **computer** networks. The learner will develop an understanding of **security** policies (such as confidentiality, integrity, and availability), as well as protocols to implement such policies.

**Course Contents:**

**Unit 1: Introduction to Cyber Security**

**[4 Hrs]**

Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats: - Cyber Warfare, Cyber Crime, Cyber Terrorism, Cyber Espionage, need for a Comprehensive Cyber Security Policy, need for a Nodal Authority, Need for an International convention on Cyberspace.

**Unit 2: Cyber Security Vulnerabilities and Cyber Security Safeguards [8 Hrs]**

Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

**Unit 3: Securing Web Application, Services and Servers**

**[4 Hrs]**

Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.

**Unit 4: Intrusion Detection and Prevention**

**[5 Hrs]**

Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.

*Rathnam* / *John* / *Poulen* / *Jay*

**Unit 5: Cryptography and Network Security****[14 Hrs]**

Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.

**Unit 6: Cyberspace and the Law****[5 Hrs]**

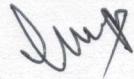
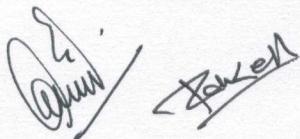
Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.

**Unit 7: Cyber Forensics****[5 Hrs]**

Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.

**Reference Books:**

1. Mark Stamp, "Information security Principles and Practice" Wiley
2. Charles P. Pfleeger, "Security in Computing", Pearson Education
3. Michael E. Whitman and Herbert J. Mattord, Principles of Information Security, Thomson/Course Technology, ISBN 0-619-21625-5, Fourth Edition, 2012
4. Computer Security: Art and Science, Matt Bishop, Addison- Wesley



**Advanced Object Oriented Programming**  
**BCA354CO**

**Year III**

**Semester II**

Teaching Schedule Hours/Week			Examination Scheme				
<b>Theory</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Internal</b>		<b>Final</b>		<b>Total</b>
			<b>Theory</b>	<b>Practical</b>	<b>Theory</b>	<b>Practical</b>	
<b>3</b>	<b>1</b>	<b>2</b>	<b>20</b>	<b>20</b>	<b>60</b>	<b>-</b>	<b>100</b>

**Objective:**

The main objective of this course is to provide advanced concepts and techniques which form the object oriented programming paradigm using Java.

**Course Contents:**

**Unit 1: Introduction to Java**

**[12 Hrs]**

- 1.1 Overview of Object oriented Programming in Java
- 1.2 JVM,Java environment , Java tools
- 1.3 Features of Java
- 1.4 Control Statements
- 1.5 Looping
- 1.6 Array
- 1.7 String and StringBuffer
- 1.8 Vector
- 1.9 Class and Objects
- 1.10 Inheritance
- 1.11 Polymorphism
- 1.12 Working with Collections
- 1.13 Interface and Packages
- 1.14 Exception Handling(try,catch,throw,User defined exception)
- 1.15 Multi threaded Programming(life cycle, thread creation, thread synchronization)

**Unit 2: Applet Programming**

**[2 Hrs]**

- 2.1 Introduction to Applet
- 2.2 Standard Applet Methods
- 2.3 Putting an Applet on a Web Page
- 2.4 Passing parameter to Applets
- 2.5 Comparison between Applet and Application

**Unit 3: GUI Programming**

**[7 Hrs]**

- 3.1 AWT Vs. Swing
- 3.2 Using Swing Components
- 3.3 Using Automic Components (JLabel, JButtonetc)

*Rishabh* *Arjun* *Sakshi* *Dinesh*

- 3.4 Using JFrame, JPanel, JTree and JTable
- 3.5 Event handling(Mouse driven, Keyboard driven and other)
- 3.6

**Unit 4: Java IO** [5 Hrs]

- 4.1 Working with Input/output APIs
- 4.2 Working with scanner class
- 4.3 Working with Files
- 4.4 Working with Object Serialization

**Unit 5: JDBC** [4 Hrs]

- 5.1 JDBC Basic
- 5.2 Different Types of Drivers
- 5.3 Setting up a database
- 5.4 Setting up a Connection
- 5.5 Retrieving Values from Result Sets
- 5.6 Deleting/Updating tables
- 5.7 Working with Statement and PreparedStatement

**Unit 6: Socket Programming** [6 Hrs]

- 6.1 Overview of Socket Programming
- 6.2 Introduction of APIs related to Socket Programming
- 6.3 Server Side Programming (TCP and UDP)
- 6.4 Client Side Programming (TCP and UDP)
- 6.5 A Sample Program

**Unit 7: Distributed Application** [5 Hrs]

- 7.1 Introduction to Distributed Objects
- 7.2 Overview of RMI
- 7.3 Rmi Architecture
- 7.4 Creating Distributed Application using RMI

**Unit 8: Overview of Servlet and JSP** [4 Hrs]

- 8.1 Introduction to Servlet and JSP and its Architecture
- 8.2 Configuring Apache Tomcat to host Servlet/JSP files
- 8.3 Sample program of Servlet and JSP.

**Laboratory work:**

There shall be lab exercises covering all features of above chapters.

**Reference Books:**

1. Cay S. Horstman, "Core Java Volume I & II", PHI
2. Bruce Eckel, "Thinking in Java", PHI

*R. Bhattacharya* *C. S. Kalra* *S. Barakat* *D. Murty*

3. Herbert Schildt, "Java: *The Complete Reference*", McGraw Hill
4. Java 2.0 by "Ivan Bayross"
5. Programming with java by: "E. BALAGURUSAMY" latest edition.

*Rathnam* *Arun* / *Sreeni* *LMS*

**Artificial Intelligence**  
**BCA355CO**

**Year III**

**Semester: II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical*	Theory**	Practical	100
			20	20	60	-	

**Course Objectives:**

- To provide basic knowledge of Artificial Intelligence
- To proved the knowledge of Machine Learning, Natural Language, Expert Systems and Neural Network
- To develop entrepreneurship skills and leadership in practical fields

**Course Contents:**

**Unit 1: Introduction**

**[2 Hrs]**

- 1.1 Definitions
- 1.2 Goals of AI
- 1.3 Challenges of AI
- 1.4 AI approaches
- 1.5 AI techniques
- 1.6 Applications of AI

**Unit 2: Agents**

**[5 Hrs]**

- 2.1 Introduction to agents
- 2.2 Agent's performance
- 2.3 Example of Agents
- 2.4 Rationality and omniscience
- 2.5 Types of agent environment
- 2.6 Agent architecture
- 2.7 PEAS (vacuum cleaner agent, human agent, robotic agent, taxi driving agent, 8-queen problem etc)
- 2.8 Types of agent (simple reflex, goal based, model based, utility agent, learning agent)

**Unit 3: Problem solving using searching**

**[8 Hrs]**

3.1 Uninformed Search

- 3.1.1 Problem solving agents
- 3.1.2 Problem types

*Gautam*

*Om Prakash*

*IAMP*

- 3.1.3 Problem formulation
- 3.1.4 Example problems
- 3.1.5 Basic search algorithms (BFS, DFS, Depth limited search, uniform cost search, iterative deepening, bidirectional search)
- 3.1.6 Comparative study of all uninformed search strategies (completeness, optimality, time complexity and space complexity)

### 3.2 Informed Search

- 3.2.1 Best first (greedy) search
- 3.2.2 A\* Search
- 3.2.3 Heuristic function
- 3.2.4 Hill Climbing and problems
- 3.2.5 Comparative Study of each type of searching
- 3.2.6 Simulated annealing
- 3.2.7 Genetic Algorithm

## Unit 4: Adversial Search and Constraint satisfaction problem

[5 Hrs]

- 4.1 Games
- 4.2 Perfect games
- 4.3 Game tree and formal definition
- 4.4 Min Max problem
- 4.5 Alpha beta pruning algorithm
- 4.6 CSP Problem and examples
- 4.7 Crypto arithmetic problems and solutions

## Unit 5: Knowledge Representations

[8 Hrs]

- 5.1 Knowledge and its types
- 5.2 Logic
- 5.3 Semantic Nets
- 5.4 Propositional logic vs FOPL
- 5.5 Resolution in FOPL
- 5.6 Frames

## Unit 6: Learning System

[4 Hrs]

- 6.1 Rote learning
- 6.2 Learning from example: inductive learning methods
- 6.3 Decision trees
- 6.4 Explanation based learning
- 6.5 Reinforcement learning

Ramanujan  
Rajesh  
Jyoti

**Unit 7: Reasoning** [4 Hrs]

- 7.1 Monotonic Reasoning
- 7.2 Statistical Reasoning (Bayesian Network)
- 7.3 Uncertainty in reasoning
- 7.4 Case based reasoning

**Unit 8: Expert System** [4 Hrs]

- 8.1 Human Expert vs expert system
- 8.2 Expert System Structure
- 8.3 Expert system example
- 8.4 Characteristics of expert system
- 8.5 Knowledge acquisition
- 8.6 Knowledge base
- 8.7 Inference engine
- 8.8 Forward chaining and backward chaining
- 8.9 Design of expert system

**Unit 9: Artificial Neural Networks** [3 hrs]

- 9.1 Research history
- 9.2 Model of artificial neuron
- 9.3 Neural networks architectures
- 9.4 Learning methods in neural networks
- 9.5 Perceptron Network, Multi-layered feed forward network, Hopfield networks
- 9.6 Application of neural networks

**Unit 10: Natural language processing** [2 Hrs]

- 10.1 Introduction
- 10.2 Components of natural language processing
- 10.3 Natural language understanding
- 10.4 Natural language generation
- 10.5 Steps in Natural language processing.

**Laboratory work:**

There shall be following labs using Prolog or LISP

- Solving family relation problem
- GCD
- Tower of Hanoi
- Using Prolog or LISP to understand (variable, rules, input output, arithmetic operations, recursion)

Students must do case study on expert system or natural language processing.

Ramya

Divya / Faizan

Jyoti

**Reference Books:**

1. E. Rich & K. Knight, "Artificial Intelligence", McGraw-Hill, 1991
2. Haykin "Neural Networks: A Comprehensive Fundamentals", Macmillan, 1994
3. E. Turban, "Decision Support and Expert Systems", Macmillan, 1993
4. R. Shingal, "Formal Concepts in Artificial Intelligence", Chapman & Hall, 1992
- 5.G. Gazadar& C. Mellish, "Natural Language Processing in Prolog: and introduction to computational linguistics", Addison-Wesley, 1989
6. D. Crookes, "Introduction to Programming in Prolog", Prentice Hall, 1988.
7. P. H. Winston, "Artificial Intelligence ", Addison-Wesley, 1984
9. Hecht-Neilson "Neurocomputing", Addison-Wesley, 1990
10. G. F. Luger & W. A Stubblefield, "Artificial Intelligence" , Benjamin Cummings,1993

Rithaen

✓  
Ajay  
Farrell

JMK

Project-VI  
 BCA56CO  
 BC A356CO  
 Rethraus

**Year: III**

**Semester: II**

Teaching Schedule			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
-	-	3	Theory	Practical	Theory	Practical	100
			-	60	-	40	

#### **Course Objective:**

After finishing this project, students will be able to develop Java programming language or AI based Application.

#### **Course Contents:**

A total of 45 lab hours covering all the features of application development projects using Java programming language or PROLOG or LISP will be assigned to every student. Every group of students (upto 3) will be assigned a project work. Students must develop the assigned application, submit written report, and give oral presentation.

#### **Project Evaluation Criteria for Internal assessment:**

The practical marks allotted for the project should be evaluated based on the following criteria:

- Title identification and Proposal Writing— 10 Marks
- Mid-term Presentation — 20 Marks
- Pre-final Submission and final Presentation — 30 Marks

Rethraus

Chinni / Faculty

Jayakumar

