

**JHARKHAND UNIVERSITY OF TECHNOLOGY**  
**Jharkhand, Ranchi**



**Syllabus for**

**BACHELOR OF COMPUTER APPLICATION**  
**(B.C.A) Programme**

# Fourth Semester

Subject Code	Course Type	Subject Name	Load Allocation			Marks distribution		Total Marks	Credit
			L	T	P	Internal Marks	External Marks		
4CR01	Core	Programming in Python	4	0	0	30	70	100	4
4CR02	Core	Software Engineering	4	0	0	30	70	100	4
4CR03	Core	Computer System Architecture	4	0	0	30	70	100	4
4OE01	Elective-II	Open Elective – II	4	0	0	30	70	100	4
4OE01	Elective- III	Open Elective – III	3	0	0	30	70	100	3
4CR01-L	Computer Lab-1	Python Lab	0	0	2	25	25	50	2
4OE02-L	Open Elective Lab- 2	Open Elective Lab-II/III	0	0	2	25	25	50	2
Semester Total			18	0	4	200	400	600	22

Open Elective – II

1. Computer Networks
2. Discrete Mathematics

Open Elective – III

1. Web technology
2. Computer Graphics

# Course Code: 4CR01

## Course Name: Programming in Python

Detailed Contents	Contact hours
<p><b>Unit-I</b></p> <p><b>Introduction to Python Programming Language:</b> Programming Language, History and Origin of Python Language, Features of Python, Limitations, Major Applications of Python, Getting, Installing Python, Setting up Path and Environment Variables, Running Python, First Python Program, Python Interactive Help Feature, Python differences from other languages.</p> <p><b>Python Data Types &amp; Input/Output:</b> Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command.</p> <p><b>Operators and Expressions:</b> Operators in Python, Expressions, Precedence, Associativity of Operators, Non Associative Operators.</p>	12 Hours
<p><b>Unit-II</b></p> <p><b>Control Structures:</b> Decision making statements, Python loops, Python control statements.</p> <p><b>Python Native Data Types:</b> Numbers, Lists, Tuples, Sets, Dictionary, Functions &amp; Methods of Dictionary, Strings (in detail with their methods and operations).</p>	10 Hours
<p><b>Unit-III</b></p> <p><b>Python Functions:</b> Functions, Advantages of Functions, Built-in Functions, User defined functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables.</p> <p><b>Python Modules:</b> Module definition, Need of modules, Creating a module, Importing module, Path Searching of a Module, Module Reloading, StandardModules, Python Packages.</p>	12 Hours
<p><b>Unit-IV</b></p> <p><b>Exception Handling:</b> Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python.</p> <p><b>File Management in Python:</b> Operations on files (opening, modes, attributes, encoding, closing), read() &amp; write() methods, tell() &amp; seek() methods, renaming &amp; deleting files in Python, directories in Python.</p> <p><b>Classes and Objects:</b> The concept of OOPS in Python, Designing classes, Creating objects, Accessing attributes, Editing class attributes, Built-in class attributes, Garbage collection, Destroying objects.</p>	10 Hours

### Text Books:

1. Programming in Python, Pooja Sharma, BPB Publications, 2017.

2. Core Python Programming, R. Nageswara Rao, 2<sup>nd</sup> Edition, Dreamtech.

**Reference Books:**

1. Python, The complete Reference, Martin C. Brown, Mc Graw Hill Education.
  2. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.
-

**Course Code: 4CR02**  
**Course Name: Software Engineering**

Detailed Contents	Contact hours
<b>Unit 1</b>  The Nature of Software, Need of Software Engineering, Prescriptive Process Models, Specialized Process Models, The Unified Process.	10 Hours
<b>Unit 2</b>  Role of a system analyst, SRS, Properties of a good SRS document, functional and non-functional requirements, Decision tree and Decision table, Formal Requirements Specification, Software Cost Estimation.	10 Hours
<b>Unit 3</b>  Software design and its activities, Preliminary and detailed design activities, Characteristics of a good software design, Features of a design document, Cohesion and Coupling, Structured Analysis, Function Oriented Design, Object-Oriented Design.	12 Hours
<b>Unit 4</b>  Testing Fundamentals, Unit Testing, Integration Testing, Validation Testing, System Testing, Maintenance and Reengineering, Measures, Metrics, and Indicators, Software Measurement, Metrics for Requirements Model, Metrics for Design Model, Metrics for Testing, Metrics for Maintenance.	12 Hours

**Text Books:**

1. Software Engineering—A Practitioner’s Approach, Roger S.Pressman, Seventh Edition, McGrawHill, 2010.

**Reference Books:**

1. An Integrated Approach to Software Engineering, Pankaj Jalota, Third Edition, Narosa Publishing House, 2005
  2. Software Engineering, Ian Sommerville, Ninth Edition, Addison-Wesley, 2011
-

**Course Code: 4CR03**  
**Course Name: Computer System Architecture**

Detailed Contents	Contact hours
<b>Unit 1</b> Basic computer organization and design, Instructions and instruction codes Timing and control Instruction cycle Register Types of register General purpose Special purpose registers Index registers Register transfer and micro operations Register transfer instructions Memory and memory function Bus Data transfer instructions Arithmetic logic micro- operations shift micro- operations Input/ Output and interrupts Memory reference instructions Memory interfacing Cache memory	10 Hours
<b>Unit 2</b> General Register Organization Stacks organizations Instruction formats Addressing modes Data transfer and manipulation Program control Reduced computer Pipeline RISC CISC pipeline vector processing Array processing Arithmetic Algorithms Integer multiplication using shift and add Booth's algorithm Integer division Floating-point representations	10 Hours
<b>Unit 3</b> Addition algorithms Subtraction algorithms Multiplication algorithms Divisor algorithms Floating point Arithmetic operations Decimal arithmetic operations	12 Hours
<b>Unit 4</b> Peripheral devices Input/output interface ALU Asynchronous Data transfer Mode of transfer Priority interrupts Direct memory Address (DMA) Input/ Output processor (IOP)Serialcommunication Overview of Intel 8085 to Intel Pentium processors Basic microprocessors Architecture and interface Internal architecture External architecture memory and input/output interface	12 Hours
<b>Unit 5</b> Assembly language Assembler Assembly level instructions Macro Use of macros in I/C instructions Program loops Programming arithmetic and logic subroutines Input-Outputprogramming	12 Hours

**Text Books:**

1. Computer Organization and Design: The Hardware/Software Interface” by David A Patterson and John L Hennessy
2. Computer Organization and Architecture: Designing for Performance” by William Stallings

**Reference Books:**

1. Computer Architecture & Organization” by Raj Kamal and Nicholas Carter

**Course Code: 4OE01 (Open Elective – II)**  
**Course Name: Computer Networks**

Detailed Contents	Contact hours
<p><b>Unit-I</b>  <b>Data communications concepts:</b> Digital and analog transmissions-Modem, parallel and serial transmission, synchronous and asynchronous communication. Modes of communication: Simplex, half duplex, full duplex.  <b>Types of Networks:</b> LAN, MAN, WAN</p> <p><b>Network Topologies:</b> Bus, Star, Ring, Mesh, Tree, Hybrid</p> <p><b>Communication Channels: Wired transmissions:</b> Telephone lines, leased lines, switch line, coaxial cables-base band, broadband, optical fiber transmission.</p> <p><b>Communication Switching Techniques:</b> Circuit Switching, Message Switching, Packet Switching.</p>	12 Hours
<p><b>Unit-II</b>  <b>Network Reference Models:</b> OSI Reference Model, TCP/IP Reference Model, Comparison of OSI and TCP/IP Reference Models.  Transmission impairments – Attenuation, Distortion, Noise. Multiplexing – Frequency division, Time division, Wavelength division.</p> <p><b>Data Link Layer Design Issues:</b> Services provided to the Network Layer, Framing, Error Control (error detection and correction code), Flow Control, Data Link Layer in the Internet (SLIP, PPP)</p>	10 Hours
<p><b>Unit-III</b>  <b>MAC sub layer:</b> CSMA/CD/CA, IEEE standards (IEEE802.3 Ethernet, Gigabit Ethernet, IEEE 802.4 Token Bus, IEEE 802.5 Token Ring)</p> <p><b>Network Layer:</b> Design Issues, Routing Algorithms: Optimality Principle, Shortest Path Routing, Congestion Control Policies, Leaky bucket and token bucket algorithm, Concept of Internetworking.</p>	12 Hours
<p><b>Unit-IV</b>  <b>Transport Layer:</b> Design issues, Elements of transport protocols – Addressing, Connection establishment and release, Flow control and buffering, Introduction to TCP/UDP protocols.</p> <p><b>Session, Presentation and Application Layers:</b> Session Layer – Design issues, remote procedure call. Presentation Layer – Design issues, Data compression techniques, Cryptography. Application Layer – Distributed application (client/server, peer to peer, cloud etc.), World Wide Web (WWW), Domain Name System (DNS), E-mail, File Transfer Protocol (FTP), HTTP as an application layer protocol.</p>	10 Hours

**Text Books:**

1. Computer Networks, Tanenbaum, Andrew, Fifth Edition, PHI.
2. Data Communication and Networking, Behrouz A. Forouzan, Fourth Edition.
3. Computer Today, S.K. Basandra, First Edition, Galgotia.

**Reference Books:**

1. Data Communication System, Black, Ulysse, Third Edition, PHI.
  2. Data and Computer Communications, Stalling, Ninth Edition, PHI.
  3. James F. Kurose and Keith W. Ross, "Computer Networking", PearsonEducation.
-



**Course Code: 4OE01 (Open Elective – II)**  
**Course Name: Discrete Mathematics**

Detailed Contents	Contact hours
<p><b>Unit-I</b>  <b>Fundamental</b>  Sets and subsets, operation on sets, Sequences, division in the integers, matrices, Mathematical structure. Logic-proposition and logical operations, Conditional Statement, Methods of proof, Mathematical induction.</p>	12 Hours
<p><b>Unit-II</b>  <b>Mathematical logic</b>  Statement and notation, connectivities, Normal Forms, The theory of Inference for the Statement calculus. The predicate calculus, Inference theory of the predicate calculus</p>	10 Hours
<p><b>Unit-III</b>  <b>Counting</b>  Permutation, combinations, the pigeon hole principle, recurrence relations and digraphs-product sets and partitions, relations and Digraphs, paths in relations and digraphs, properties of relations, equivalence relations, computer representation of relations and Digraphs, manipulation of relations, transitive closure and warshall's algorithm. Functions- definition and introduction , function for computer science, permutation functions,</p>	06 Hours
<p><b>Unit-IV</b>  <b>Graph Theory</b>  Basic concept of graph theory, Euler paths and circuits, Hamiltonian paths and circuits. Other relation and structure – partially Ordered sets, Lattices, Finite Boolean algebras, functions of Boolean algebras, Boolean function as Boolean polynomials. Tress - introduction, undirected trees, minimal spanning trees.</p>	06 Hours
<p><b>Unit-V</b>  <b>Semi groups and groups</b>  Binary Operations revisited Semi groups, products and quotient s of Semi groups, groups, product s and quotients of groups. Introduction to compatibility Theory-Languages, Finite state Machines, semigroups, Machines and languages.</p>	10 Hours

**Text Books:**

1. Discrete Mathematics by Kevin Ferland

**Reference Books:**

1. Discrete Mathematics, authored by Dr. Anjana Gupta
  2. Discrete Mathematics and Its Applications by Kenneth Rosen
-

**Course Code: 4OE01 (Open Elective – III)**  
**Course Name: Web technology**

Detailed Contents	Contact hours
<p><b>Unit-I</b></p> <p><b>Internet Basics</b>  Basic concepts, communicating on the internet, internet domains, internet server identities, establishing connectivity on the internet client IP address.</p> <p><b>Introduction To HTML</b>  Information Files Creation, Web Server, Web Client/Browser, Hyper Text Markup Language (HTML Tags, Paired Tags, Singular Tags), Commonly Used Html Commands (Document Head, Document Body), Title and Footer, Text Formatting (Paragraph Breaks, Line Breaks), Emphasizing Material in a Web Page (Heading Styles, Drawing Lines).  Basic Formatting Tags  HTML Basic Tags, Text Formatting (Paragraph Breaks, Line Breaks), Emphasizing Material in a Web Page (Heading Styles, Drawing Lines), Text Styles (Bold, Italics, Underline), Other Text Effects (Centering (Text, Images etc.), Spacing (Indenting Text), HTML Color Coding.</p>	8 Hours
<p><b>Unit-II</b></p> <p><b>Lists</b>  Type of Lists (Unordered List (Bullets), Ordered Lists (Numbering), Definition Lists.</p> <p><b>Adding Graphics To Html Documents</b>  Using The Border Attribute, Using The Width And Height Attribute, Using The Align Attribute, Using The Alt Attribute.</p> <p><b>Tables</b>  Introduction (Header, Data rows, The Caption Tag), Using the Width and Border Attribute, Using the Cell padding Attribute, Using the Cell spacing Attribute, Using the BGCOLOR Attribute, Using the COLSPAN and ROWSPAN Attributes</p> <p><b>Linking Documents</b>  Links (External Document References, Internal Document References), Image As Hyperlinks.</p> <p><b>Frames</b>  Introduction to Frames: The &lt;FRAMESET&gt; tag, The &lt;FRAME&gt; tag, Targeting Named Frames. DHTML: Cascading Style Sheets, Style Tag.</p>	9 Hours
<p><b>Unit-III</b></p> <p><b>Forms Used by a Web Site</b>  The Form Object, The Form Object's Methods (The Text Element, The Password Element, The Button Element, The Submit (Button) Element, The</p>	8 Hours

Reset (Button)Element, The Checkbox Element, The Radio Element, The Text Area Element, The Select and Option Element, The Multi Choice Select Lists Element).	
<b>Unit 4</b> <b>Introduction to JavaScript</b>  JS Introduction, Where To, Output, Statements, Syntax, Comments, Variables, Operators, Arithmetic, Assignment, Data Types, Functions, Objects, Events, Strings, String Methods, Numbers, Number Methods, Arrays, Array Methods, Array Sort, Array Iteration, Dates, Date Formats, Date Get Methods, Date Set Methods, Math, Random, Booleans, Comparisons, Conditions, Switch, Loop For, Loop While, Break, Type Conversion, Bitwise, RegExp, Errors, Scope, Hoisting, Strict Mode, JSON, Forms, Forms API JS Functions, Function Definitions, Function Parameters, Function Invocation, Function Call, Function Apply, Function Closures	8 Hours

**Text Books:**

1. Internet for Every One: Alexis Leon, 1st Edition, Leon Techworld, Publication, 2009.
2. Greenlaw R; Heppe, “Fundamentals of Internet and WWW”, 2nd Edition, Tata McGraw-Hill, 2007.

**Reference Books:**

1. Raj Kamal, “Internet & Web Technologies”, edition Tata McGraw-Hill Education.2009.

**Course Code: 4OE01 (Open Elective – III)**  
**Course Name: Computer Graphics**

Detailed contents	Contact hours
<p><b>Unit-I</b>  <b>Introduction to Computer Graphics</b>            Applications of Computer Graphics. Graphs and Types of Graphs</p> <p><b>Input Devices:</b> Light Pens, Graphic Tablets, Joysticks, Track Ball, Data Glove, Digitizers, Image Scanner.</p> <p><b>Video Display Devices:</b> Refresh Cathode Ray Tube, Raster Scan displays, Random Scan displays, Color CRT - monitors and Color generating techniques (Shadow Mask, Beam Penetration), Flat-Panel Displays; 3-D Viewing Devices, Graphics monitors and workstations, Color Models (RGB and CMY), Lookup Table.</p> <p><b>Introduction Virtual Reality &amp; Environments:</b> Applications in Engineering, Architecture, Education, Medicine, Entertainment, Science, Training.</p>	11 Hours
<p><b>Unit-II</b>  <b>Scan-conversions</b>            Process and need of Scan Conversion, Scan conversion algorithms for Line, Circle and Ellipse using direct method, Bresenham's algorithms for line &amp; circle and Midpoint Ellipse Algorithm along with their derivations, Area Filling Techniques, Flood Fill Techniques, Character Generation.</p>	11 Hours
<p><b>2 – Dimensional Graphics</b>            Cartesian and need of Homogeneous co-ordinate system, Geometric transformations (Translation, Scaling, Rotation, Reflection, Shearing), Viewing transformation and clipping (line, polygon and text) using Cohen-Sutherland, Sutherland Hodgeman and Liang Barsky algorithm for clipping.</p>	10 Hours
<p><b>Unit-IV</b>  <b>3 – Dimensional Graphics</b>            Introduction to 3-dimensional Graphics: Geometric Transformations (Translation, Scaling, Rotation), Mathematics of Projections (Parallel &amp; Perspective). Color Shading. Introduction to Morphing techniques.</p>	12 Hours

**Text Books:**

1. D. Hearn and M.P. Baker, *Computer Graphics*, PHI New Delhi.
2. J.D. Foley, A.V. Dam, S.K. Feiner, J.F. Hughes., R.L Phillips, *Computer Graphics Principles & Practices*, Second Edition, Pearson Education, 2007

**Reference Books:**

1. R.A. Plastock and G. Kalley, *Computer Graphic*, McGraw Hill, 1986.