Curriculum for

Bachelor of Computer Application (BCA)

Learning Outcomes based Curriculum Framework (LOCF)
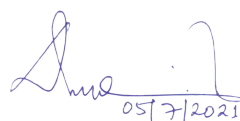## 2021

Rajiv Gandhi University

(A Central University)
RONO HILLS, DOIMUKH,
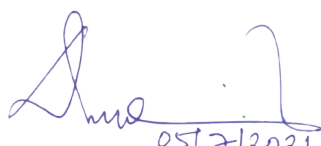ARUNACHAL PRADESH

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संयुक्त कुलसचिव (शैक्षणिक एवं सम्मेलन)
राजीव गांधी विश्वविद्यालय
Jt. Registrar (Acad. & Conf.)
Rajiv Gandhi University
Rono Hills, Doimukh (A.P.)

Preamble

In today's world, impact of higher education is crucial for getting desired guidance to secure right kind of employment. It is also necessary to pursue higher studies in the best institutes. One of the major reforms in recent years is to introduce the Learning Outcomes-based Curriculum Framework (LOCF) in the undergraduate education, which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. LOCF also targets at ensuring uniform education standard and content delivery throughout the country.

Considering the need to impart learner-centric education; a syllabus based on LOCF is adopted to provide a more focused, outcome-oriented learning at the undergraduate level with an aim to make the teaching-learning process student-centric. The LOCF approach has been adopted to strengthen students' experiences as they engage themselves in the programme of their choice. The undergraduate programme will prepare the students for both, academia and employability. The current technical trends, industry standards, market needs, and interests of students, teachers as well as areas with future expectations has been taken into consideration while developing this syllabus.

The main objective of adopting Learning Outcomes-based Curriculum Framework (LOCF) is to prepare a comprehensive course structure with detailed syllabus along with quality reading material. It is a student centric framework where they are expected to learn fundamentals of computer science along with the latest trends and techniques like Artificial Intelligence, Internet of Things, Machine Intelligence along with advanced skillsets that include Mobile Application Development, Object Oriented Programming among many other courses. . Each course aims to present learning targets and objectives, and thus provide learning and teaching strategies, assessment and resources. The students shall be equipped with fundamental as well as advanced and latest technologies in computer science after completion of the programme.

Programme Objectives and Programme Learning Outcomes

Programme Objectives:
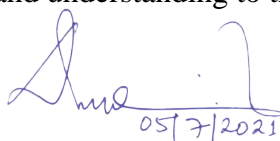
The main objectives of the Bachelor of Computer Application Programme are to:

1) To develop an understanding and knowledge of the basic theory of Computer Science and Information Technology with good foundation on theory, systems and applications such as algorithms, data structures, data handling, data communication and computation.

2) To develop the ability to utilise knowledge of Computer Science to solve real world problems.

3) To have expertise in current trending courses as well as technologies to meet industry needs.

4) The ability to synthesize the acquired knowledge, understanding and experience for a better and improved comprehension of the real world problems.

5) To learn state of the art skills as well as tools to find the solution, interpret the results and make predictions for the future developments.

Programme Learning Outcomes:

After completing the programme the students will be able to:
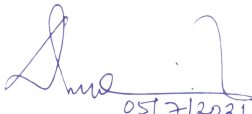
- Demonstrate the knowledge of Computer Science and Computer programming based problem solving skills.
- Showcase the aptitude of appropriate theory courses, practices and specialized tools for the specification, design, developement.
- Ability to acquire knowledge through online courses available at different MOOC Providers.
- Ability to link knowledge of Computer Science with other two chosen auxiliary disciplines of study.
- Ability to appreciate emerging technologies and tools.
- Display ethical code of conduct in usage of Internet and Cyber systems.
- Ability to pursue specialized higher studies and to take up employment in the IT industry.
- Ability to formulate, to model, to design solutions, procedure and to use different software tools to solve real world problems and evaluate as well.
- Ability to operate, manage, deploy, configure computer network, hardware, software operation of an organization.
- Design and develop computer programs/computer -based systems in the areas related to algorithms, networking, web design, cloud computing, IoT and data analytics.
- The ability to apply the knowledge and understanding to the analysis of a given information handling problem.

Curriculum Structure in BCA

Semester	Core Courses (CC)	Elective Courses				Semester wise credits
		DSE	GE	AEC	SEC	
I	CC 1, CC 2	-	GE 1	AEC 1	SEC 1	24
II	CC 3, CC 4	-	GE 2	AEC 2	SEC 2	24
III	CC 5, CC 6, CC 7	-	GE 3	-	SEC 3	26
IV	CC 8, CC 9, CC 10	-	GE 4	-	SEC 4	26
V	CC 11, CC 12	DSE 1 DSE 2	-	-	-	24
VI	CC 13, CC 14	DSE 3 DSE 4	-	-	-	24
Total Minimum Credits	**84**	**24**	**24**	**8**	**8**	**148**

Details of Courses to be taken by Students

Core Course (CC): Students have to take compulsory 16(Sixteen) Core Courses of 6 Credits each from of his/her own opted discipline.

Ability Enhancement Compulsory Course (AECC): Students have to take compulsory 2(Two) Ability Enhancement Compulsory Courses (AECC)of 4 Credits each.

Skill Enhancement Course (SEC): A student shall select at least 2 SEC of total 4 credits from his/her concerned discipline. For remaining 4 credits, he/she may select course(s) either from his/her own discipline or other under-graduate disciplines of Science and Technology in the College/University. The courses are divided into two groups: (i) Group-A: Contains courses to be offered in Semester-I and III. (ii) Group-B: Contains courses to be offered in Semester-II and IV. However, **options will be offered subject to availability of resource persons and infrastructure.**

Generic Electives (GE) (to be offered to students from other disciplines): Students are required to take 4(Four) Generic Elective (GE) courses/papers, either exclusively from one Discipline or Two papers each from two different Disciplines but both cases excluding his/her own discipline. Considering the special nature of the BCA programme options are offered only in the 4th semester.
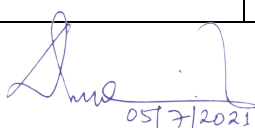
Discipline Specific Elective (DSE): Students are required to take4(Four) Discipline Specific Courses (DSE) of 6 Credits each; 2(Two) Courses in Semester-V and 2(Two) Courses in Semester-VI from his/her own discipline. Students shall opt for Dissertation/Project work in place of DSE-2 and DSE-4 Papers (6 credits) in Semester-V & Semester-VI respectively**. Options will be offered subject to availability of resource persons and infrastructure.**

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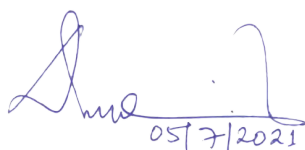Rajiv Gandhi University
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Semester and Course Wise Credit Distribution

Semester	Core Course (CC) (14 Papers) Credit: 6	Ability Enhancement Course (AEC) (2 Papers) Credit: 4 each	Skill Enhancement Course (SEC) (4 Papers) Credit: 2 each	Discipline Specific Elective (DSE) (4 Papers) Credit: 6 each	Elective Generic (GE) (4 Papers) Credit: 6 each	Semester Wise Total Credit
I	BCA-CC-111: Fundamental of Computers and Digital Logics BCA-CC-112: Introduction to Programming	**AEC-1** ENG-AE-111: Communicative English **(OR)** HIN-AE-111 : हिंदी शिक्षण (Hindi Sikshan)	**SEC-1**		**GE-1**	**6+6+4+2+6 = 24**
II	BCA-CC-121: Computer Organization and Architecture BCA-CC-122: Data Structures	**AEC-2** EVS-AE-121: Environmental Studies	**SEC-2**		**GE-2**	**6+6+4+2+6 = 24**
III	BCA-CC-231: Theoretical Computer Science BCA-CC-232: Object Oriented Programming BCA-CC-233: Operating System		**SEC-3**		**GE-3**	**6+6+6+2+6 = 26**
IV	BCA-CC-241: Data Communication and Computer Network BCA-CC-242: Database Management System BCA-CC-243: System Software and Compilers		**SEC-4**		**GE-4**	**6+6+6+2+6 = 26**
V	BCA-CC-351: Web Technology			**DSE-1**		

	BCA-CC-352: Algorithm Design			DSE-2 (Project/Dissertation)		6+6+6+6= 24
VI	BCA-CC-361: Systems and Network Administration			DSE-3		6+6+6+6= 24
	BCA-CC-362: Software Engineering			DSE-4 (Project/Dissertation)		
Total Credits	**6x14=84**	**4x2=8**	**2x4=8**	**6x4=24**	**6x4=24**	**148**

Ability Enhancement Course (AEC)

First Semester: (Choose any ONE)

ENG-AE-111: Communicative English

HIN-AE-111 : हिंदी शिक्षण (Hindi Sikshan)

Second Semester:

EVS-AE-121: Environmental Studies

Discipline Specific Electives (DSE):
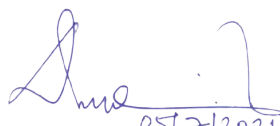
Fifth Semester:
Choices for DSE-1 (Choose any ONE)

1. BCA-DE-351: Python Programming
2. BCA-DE-352: Data Analytics
3. BCA-DE-353: Computer Ethics
4. BCA-DE-354: Cyber Crime and Legal Framework

DSE-2 (Compulsory)

1. BCA-DE-002: Project-I

Sixth Semester:
Choices for DSE-3(Choose any ONE)

1. BCA-DE-361: Computer Graphics and Multimedia
2. BCA-DE-362: Data Mining
3. BCA-DE-363: Cloud Computing
4. BCA-DE-364: Internet of Things

DSE-4 (Compulsory)

1. BCA-DE-004: Project-II

Skill Enhancement Course (SEC):

(Students have to choose different papers in different Semesters from the respective groups.)

Group-A: Choices for Semester-I and Semester-III

1. BCA-SE-001: Office Automation Tools
2. BCA-SE-003: ICT Hardware

Group-B: Choices for Semester-II and Semester-IV

1. BCA-SE-002: Mobile Application Development
2. BCA-SE-004: Java Programming

Generic Electives (GE) (to be offered to students of other disciplines)

(Students have to choose one paper each from Semester I to IV)

Group A:
First Semester:
    BCA-GE-001 Mathematics – I

Group B:
Second Semester:
    BCA-GE-002 Mathematics – II

Group C:
Third Semester

    BCA-GE-003 Financial Management Techniques

Group D:
Fourth Semester (Any One)
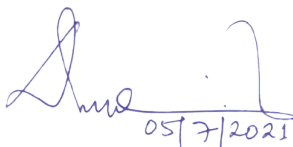
1. BCA-GE-004Discrete Mathematics
2. BCA-GE-005Principles of Management
3. BCA-GE-006 Digital Marketing

Assessment Methods, Conduct of Examinations, Eligibility Conditions and Declaration of results

Academic performance in various courses i.e. core, discipline electives, generic electives and skill enhancement courses are to be considered as parameters for assessing the achievement of students. All students shall be subjected to the process of continuous evaluation and assessment. A number of appropriate assessment methods will be used to determine the extent to which students demonstrate desired learning outcomes.

Marks allocation for Internal Assessment and End Semester Examinations, Question paper pattern, Duration of examination for various courses, Attendance and other eligibility conditions for appearing in the examination, and Declaration of results shall be done in accordance with the relevant provisions as stipulated in the above cited regulation and also the Ordinance(s) of the University.

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CORE COURSE (CC) & ABILITY ENHANCEMENT COURSES (AEC)

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SEMESTER I

BCA-CC-111 : FUNDAMENTAL OF COMPUTERS AND DIGITAL LOGICS

Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

Course Objectives

CO-1. Bridge the fundamental concepts of computers with the present level of knowledge of the students.

CO-2. Familiarise operating systems, programming languages, peripheral devices, networking, multimedia and internet

CO-3 Understand binary, hexadecimal and octal number systems and their arithmetic.
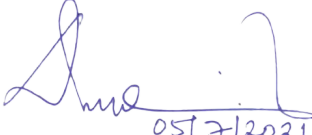
CO-4. Understand how logic circuits and Boolean algebra form as the basics of digital computer.

CO-5. Demonstrate the building up of Sequential and combinational logic from basic Gates.

LearningOutcomes
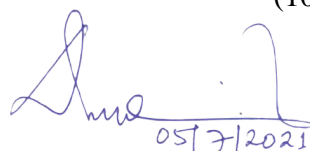
On completion of this course the students will be able to:

1. Know the characteristics of various digital circuit components.
2. Understand the utilization of components.
3. Design and analyze small signal amplifier circuits.
4. Learn Postulates of Boolean algebra and to minimize combinational functions
5. Design and analyze combinational and sequential circuits
6. Know about the logic families and realization of logic gates.

UNIT – I
Current trends in Computer System, current hardware and software. Functional units comprising a typical computer configuration: input/output, fixed and removable data storage, internal storage, memory hierarchy, control and arithmetic/logic unit. Operating Systems, Windows, Linux etc. System software, Application software.

(10 Lectures)

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UNIT – II

Programming Concept: Flow charts and algorithms. Data communications concepts, transmission media; network concepts such as network types, network topologies and TCP/IP; Hardware essentials for a computer network; Internet, Multimedia, WWW, FTP, E-mail, Web pages. Concept of VPNs, Corporate Networks. Concept of Network security and management.

(10 Lectures)

UNIT – III

Data types and Number systems, Binary number system, Octal & Hexadecimal number system, 1's & 2's complement, Binary Fixed-Point Representation, Arithmetic operation on Binary numbers, Overflow & underflow, Floating Point Representation, Codes, ASCII, EBCDIC codes, Gray code, Exces-3 & BCD, Error detection & correcting codes.

(15 Lectures)

UNIT – IV

Logic Gates, AND, OR, NOT GATES and their Truth tables, NOR, NAND & XOR gates, Boolean Algebra, Basic Boolean Law's, Demorgan's theorem, MAP Simplification, Minimization techniques, K -Map, Sum of Product & Product of Sum.

(10 Lectures)

UNIT – V

Combinational & Sequential circuits, Half Adder & Full Adder, Full subtractor, Flip-flops - RS, D, JK & T Flip-flops, Shift Registers, RAM and ROM, Multiplexer, Demultiplexer, Encoder, Decoder, Idea about Arithmetic Circuits, Program Control, Instruction Sequencing.

(15 Lectures)

RecommendedBooks

1. ITL Education Solutions Limited,*Fundamentals of Computer*,First edition,Pearson Education (2010).
2. U K Singh, S Jain, AMaheshwari,*Fundamental of Computer Science and Information Technology*,1stEdition, SSDN Publication,2012.
3. Thomas Bartee,*Digital Computer Fundamentals*,*McGraw Hill Education*,2001.
4. Albert Malvino, Jerald Brown,*Digital Computer Electronics,* McGraw-Hill Education, 3rd edition,1992.

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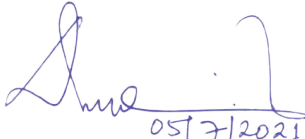Rajiv Gandhi University
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BCA-CC-112 : INTRODUCTION TO PROGRAMMING

Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO-1. Understanding foundation concepts of information and information processing in computer systems: a matter of information, data representation, coding systems.

CO-2. Understanding of an algorithm and its definition.

CO-3. Understanding of a programming language syntax and its definition by example of C language.

CO-4. Knowledge of basic principles of imperative and structural programming

CO-5. Ability to write simple programs in C language by using basic control structures (conditional statements, loops, switches, branching, etc.).

LearningOutcomes

On completion of this course the students will be able to:

1. Understanding foundation concepts of information and information processing in computer systems: a matter of information, data representation, coding systems.
2. Understanding of an algorithm and its definition.
3. Understanding of a programming language syntax and its definition by example of C language.
4. Knowledge of basic principles of imperative and structural programming.
5. Write simple programs in C language by using basic control structures (conditional statements, loops, switches, branching, etc.).
6. Ability to create a programmable model for a problem given.
7. Understanding a function concept and how to deal with function arguments and parameters.
8. Use pointers and pointer arithmetic in the simple cases. Basic knowledge of working witharrays in C language.

9. Understanding a defensive programming concept. Ability to handle possible errors during programexecution.
10. Elementary knowledge of programming code style

UNIT – I
The problem-solving process and strategies; programming paradigms – procedural, structured, object oriented and generic approaches; algorithms; programs (algorithm+data structure); data abstraction.

(10 Lectures)

UNIT – II
Basic data types and fundamental programming constructs (control structures); syntax and semantics of a higher-level language; variables, constants, operators, expressions, and assignment.

(10 Lectures)

UNIT – III
functions as building blocks of structured programming; recursions; searching and sorting algorithms. Array data type and use of arrays; character data type and text processing; functional and procedural abstraction; Pointer data type and simple applications of pointers.

(15 Lectures)

UNIT – IV
Principle of modeling (abstraction and decomposition); graphic models for structured programming; problems with structured programming; modular programming and abstract data types.

(15 Lectures)

UNIT – V
Program design and evaluation (module coupling and module strength); problem solving using structured programming - coding, debugging and testing using C.

(10 Lectures)

RecommendedBooks

1. Brian W. Kernighan, Dennis M. Ritchie,*The C Programming Language (ANSI C Version)*,PHI Learning.
2. Balaguruswamy,*Computing Fundamentals and C Programming,*McGraw Hill Education.
3. Doris Appleby, Julius J. VandeKopple,*Programming Language-Paradigm and Practice*,McGraw Hill Education.
4. J.B. Dixit,*Mastering C Programs,* Laxmi Publications; Reprint edition, 2013.

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ENG-AE-111 : COMMUNICATIVE ENGLISH

Credit:4(L3–T1–P0)

CourseObjectives

The course aims to train learners to be more effective at communicating successfully in interviews, public speaking, letter writing, report writing, presentations, and inter-personal debates and conversations. The learner also imbibes the fundamentals of communication and the art of persuasive speaking and writing which depends crucially on clarity of thought and contextual understanding expressed through appropriate vocabulary.

LearningOutcomes

After completion of the course, learners will be able to master the art of persuasive speech and writing, the art of listening, reading, and analysing; spend the bulk of their time in class in practical exercises of reading and writing; develop critical thinking skills; and they will be introduced to established principles of academic reading and writing. Other specific outcomes:

- *Identify deviant use of English both in written and spoken forms*
- *Recognize the errors of usage and correct them and write simple sentences without committing errors of spelling and grammar*
- *Developing own competence in using the language*
- *Understand and appreciate English spoken by others*
- *Use language for speaking with confidence in an intelligible and acceptable manner*
- *Understand the importance of reading for life and develop an interest for reading*
- *Read independently unfamiliar texts with comprehension*
- *Understand the importance of writing in academic life and career.*

UNIT – I
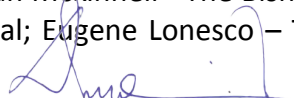
Poetry: William Shakespeare – All the World is a stage; William Wordsworth – I wondered lonely as a Cloud; Ralph Waldo Emerson – The Mountain and the Squirrel; Emily Dickinson – Success is Counted Sweetest; Robert Frost - Stopping by Woods on a Snowy Evening; Rabindranath Tagore – Where the Mind is without Fear; A. K. Meherotra – Songs of the Ganga.

UNIT – II

Short Stories: R.K. Narayan – Lawly Road; Mulk Raj Anand – Barbar's Trade Union; Somerset Mangham – The Luncheon; Guy De. Maupassant – The Necklace; Anton Chekhov – The Lament; O' Henry – The Last Leaf; Manoj Das – The Submerged Valley.

UNIT – III

One-Act Plays and Short Fiction: (a) Norman Mckinnell - The Bishop's Candle Sticks; Anton Chekov – A Marriage Proposal; Eugene Lonesco – The Lesson;

August Strandberg – Miss Jullie; Fritz Karinthy– Refund; (b) Harper Lee – To kill a Mocking Bird, (Or) R. K. Narayan – Vendor of Sweets.

UNIT – IV

Fundamentals of Grammar: Parts of speech, Articles and Intensifiers, use of tense forms, Use of Infinitives, Conditionals, Adjectives and Adverbs, Prepositions, Making Affirmative, Negative and Interrogative, Making Question Tag.

UNIT – V

Composition Practice: (a) Comprehension, Précis Writing, Paragraph Writing (150 words), Letter writing – Personal, Official, Demi-official, Business, Public speaking, Soft Skills, Interviews, Preparing Curriculum Vitae, Report (Meetings and Academic) writing; (b) Communication Practice – Introducing yourself, Introducing people to others, Meeting People, Exchanging Greetings, Taking Leave, Answering the Telephone, Asking Someone for Some Purpose, Taking and Leaving Messages, Call for help in emergency.

Module	Weightage of Marks	Theory	Practical
Module – 01	20%	✔	
Module – 02	20%	✔	
Module – 03	20%	✔	
Module – 04	20%	✔	✔
Module – 05	20%	✔	✔
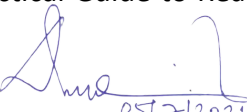
Practical Exercises

The students are required to:
1. know dictionary and its types, mapping a dictionary to locate words, and multiple uses of dictionary/ies
2. know the uses of Thesaurus/Lexicon/Activator/Encyclopaedia
3. know Note making/taking
4. know information transfer exercises
5. know the usage library resources properly
6. know citing references or developing a bibliography
7. Edit a piece of self and peer writing, writing and revising the drafts and preparing the final draft
8. Understand and appreciate the principle of politeness in relation to the speaker/ listener, debating, ex-tempore speeches, and other discourses.
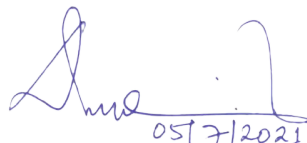
Suggested Readings

1. For reading the texts available sources of texts and help of the Web source may be taken.
2. Crystal, David (1985) Rediscover Grammar with David Crystal. Longman.
3. Hewings, M. (1999) Advanced English Grammar. Cambridge University Press.
4. Bakshi, R. N. A course in English Grammar, Orient Longman
5. Krishnaswamy, N. Modern English – A Book of Grammar, Usage and Composition. MacMillan India Ltd.
6. Bailey, Stephen (2003). Academic Writing. London and New York, Routledge.
7. Grellet, F (1981). Developing Reading Skills: A Practical Guide to Reading Skills. New York, CUP

8. Hedge, T. (2005). Writing. London, OUP
9. Kumar, S and Pushp Lata (2015). Communication Skills. New Delhi, OUP
10. Lazar, G. (2010). Literature and Language Teaching. Cambridge, CUP
11. Nuttall, C (1996). Teaching Reading Skills in a Foreign Language. London, Macmillan
12. Raman, Meenakshi and Sangeeta Sharma (2011). Technical Communication: Principles and Practice. New Delhi, OUP

Note: Students are advised to use latest edition of text books.

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HIN-AE-111 : हिंदी शिक्षण (Hindi Sikshan(

Credit:4(L3–T1–P0)

CourseObjectives / उद्देश्यः

- राष्ट्रीय एवं अन्तरराष्ट्रीय परिप्रेक्ष्य में हिन्दी का महत्त्व; मानक हिन्दी और बोलचाल की हिन्दी में अन्तर; स्वागत भाषण, भाषण, विषय प्रवर्तन तथा धन्यवाद ज्ञापन ।
- आलेख रचना: सम्पादक के नाम पत्र, सम्पादकीय लेखन, स्तम्भ लेखन, पत्रपत्रिकाओं के लिये - आलेख रचना; आकाशवाणी एवं दूरदर्शन हेतु वार्ता, साक्षात्कार एवं परिचर्चा तैयार करने की विधियाँ ।
- व्यावहारिक लेखन: कार्यालयी पत्राचार; प्रेस विज्ञप्ति; सूचना ; ज्ञापन; कार्यसूची; कार्यवृत्त; प्रतिवेदन; सम्पादन; संक्षेपण; आत्मविवरण तथा ईमेल लेखन-, फेसबुक, ब्लॉग और ट्वीटर लेखन।
- सृजनात्मक लेखन: कविता, कहानी, नाटक तथा एकांकी, निबंध, यात्रावृत का स्वरूप विवेचन ।

LearningOutcomes / उपलब्धियां:

हिंदी शिक्षण से सम्बन्धित इस पत्र में विद्यार्थी हिन्दी भाषा के व्यावहारिक स्वरूप तथा प्रयोजनमूलक हिन्दी के क्षेत्र लेखन से जुड़ी बहुविध जानकारियों से परिचित हुए। हिन्दी भाषा की बढ़ती लोकप्रियता और बढ़ते अन्तरराष्ट्रीय महत्त्व के सन्दर्भ में हिन्दी भाषा आधारित कौशल विकास से विद्यार्थियों को अवगत कराया गया। विशेषकर आलेख रचना के अतिरिक्त व्यावहारिक एवं सर्जनात्मक लेखन से जुड़ी बारीकियों को जान सके।

इकाई 1:   (व्याख्यान-10)

राष्ट्रीय एवं अन्तरराष्ट्रीय परिप्रेक्ष्य में हिन्दी का महत्त्व; मानक हिन्दी और बोलचाल की हिन्दी में अन्तर; स्वागत भाषण, भाषण, विषय प्रवर्तन तथा धन्यवाद ज्ञापन ।

इकाई 2:   (व्याख्यान-10)

आलेख रचना: सम्पादक के नाम पत्र, सम्पादकीय लेखन, स्तम्भ लेखन, पत्रपत्रिकाओं के - लिये आलेख रचना; आकाशवाणी एवं दूरदर्शन हेतु वार्ता, साक्षात्कार एवं परिचर्चा तैयार करने की विधियाँ ।

इकाई 3:   (व्याख्यान-10)

व्यावहारिक लेखन: कार्यालयी पत्राचार; प्रेस विज्ञप्ति; सूचना ; ज्ञापन; कार्यसूची; कार्यवृत्त; प्रतिवेदन; सम्पादन; संक्षेपण; आत्मविवरण तथा ईमेल लेखन-, फेसबुक, ब्लॉग और ट्वीटर लेखन।
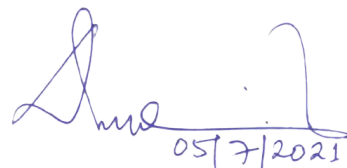
इकाई 4:   (व्याख्यान-10)

सृजनात्मक लेखन: कविता, कहानी, नाटक तथा एकांकी, निबंध, यात्रावृत का स्वरूप विवेचन।
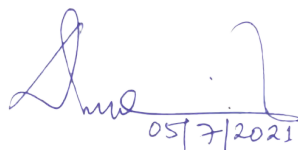
RecommendedBooks / सहायक ग्रन्थ:

1. अच्छी हिन्दी   : रामचन्द्र वर्मा
2. व्यवहारिक हिन्दी व्याकरण और रचना   : हरदेव बाहरी
3. हिन्दी भाषा   : डॉ भोलानाथ तिवारी
4. रेडियों लेखन   : मधुकर गंगाधर
5. टेलीविजनः सिद्धान्त और टैकनिक   : मथुरादत्त शर्मा
6. प्रयोजनमूलक हिन्दी   : डॉदंगल झाल्टे
7. सरकारी कार्यालयों में हिन्दी का प्रयोग   : गोपीनाथ श्रीवास्तव, राजकमल, दिल्ली
8. टेलीविजन लेखन   : असगर वजाहत / प्रेमरंजन; राजकमल, दिल्ली
9. रेडियो नाटक की कला   : डॉ सिद्धनाथ कुमार, राजकमल, दिल्ली
10. रेडियो वार्ता शिल्प   : सिद्धनाथ कुमार, राजकमल, दिल्ली

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SEMESTER II

BCA-CC-121 : COMPUTER ORGANISATION AND ARCHITECTURE

Credit:6(L5–T1–P0)

Total Lectures: 90 (Theory – 75; Tutorial – 15 Practical –0)

CourseObjectives

CO-1. Describe basic organization of computer and the architecture of 8086 microprocessor.

CO-2. Implement assembly language program for given task for 8086 microprocessors.

CO-3. Demonstrate control unit operations and conceptualize instruction level parallelism.

CO-4. Demonstrate and perform computer arithmetic operations on integer and real numbers.

CO-5. Categorize memory organization and explain the function of each element of a memory hierarchy.

LearningOutcomes

On completion of this course the students will be able to:

1. Understand the basics of instructions sets and their impact on processor design.
2. Demonstrate an understanding of the design of the functional units of a digital computer system.
3. Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
4. Design a pipeline for consistent execution of instructions with minimum hazards.
5. Recognize and manipulate representations of numbers stored in digital computers

UNIT – I
Instruction set architecture- types, formats, addressing modes; Register set; Processor organization, Register organization and stack organization. Assembly language

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programming. Data path organization, Control unit design - Hardwired control, Microprogramming.

(17 Lectures + 03 Tutorials)

UNIT – II
Computer arithmetic- Review of addition and subtraction; Multiplication- Booth's, Array; Division- Restoring and non-restoring; Floating point arithmetic. ALU.

(17 Lectures+ 03 Tutorials)

UNIT – III
Memory Organization: Interfacing of memory with processor, Memory hierarchy, Multiple-module memory, Cache memory, Virtual memory. Memory Devices.

(12 Lectures+ 03 Tutorials)

UNIT – IV
Input/ output Organization: Synchronization of data transfer- strobed and handshaking; I/O mapping and control- Program controlled, Interrupt driven, DMA, Interrupt and DMA mechanisms and controllers.

(17 Lectures+ 03 Tutorials)
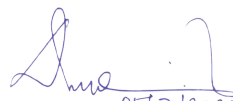
UNIT – V
CISC and RISC architecture, Instruction pipelining. Concept of parallel processing.

(12 Lectures+ 03 Tutorials)

RecommendedBooks
1. Williams Stallings, *Computer organization and architecture*, PHI Pvt. Ltd.
2. Tanenbaum, *Structured Computer organization,* PHI Pvt. Ltd.
3. Carl Hamachar, ZvonkoVranesic and SafwatZaky,*Computer organization*, McGraw Hill International/Tata McGraw Hill.

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BCA-CC-122 : DATA STRUCTURES

Credit: 6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO-1. Select appropriate data structures as applied to specified problem definition.

CO-2. Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.

CO-3. Students will be able to implement Linear and Non-Linear data structures.

CO-4. Implement appropriate sorting/searching technique for given problem.

CO-5. Design advance data structure using Non-Linear data structure.

LearningOutcomes
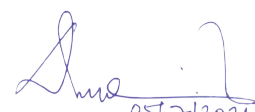
On completion of this course the students will be able to:

1. Ability to select the data structures that efficiently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations orcombinations.
3. Implement and know the application of algorithms for sorting and pattern matching.
4. Design programs using a variety of data structures, including hash tables, binary and general
5. Implement and know the application of tree structures, search trees, tries, heaps and graphs

UNIT – I
Basic Concepts: Data Structures; Algorithms; Complexity of algorithms, Basic data types, Lists, Stacks, Queues.

(10 Lectures)

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UNIT – II

Trees: Definition and Implementation; Binary trees, Tree traversal, Postfix, Prefix notations.

(10 Lectures)

UNIT – III

Sets: Implementation; Dictionary, Hash table, Priority queues; Advanced Set Representation Methods - Binary search tree, AVL tree, Balanced tree, Sets with Merge and Find operation.

(15 Lectures)

UNIT – IV

Directed graphs: Representation; Single source shortest path problem, All pair shortest path problem, Transitive closure, Undirected graph: Minimum spanning tree

(15 Lectures)

UNIT – V

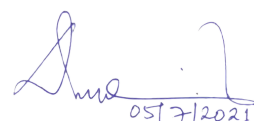Sort Algorithms: Bubble Sort; Quick-sort; Heap-sort; Bin-sort; Selection sort; Merge Sort,Memory management, Garbage Collection.

(10 Lectures)

RecommendedBooks

1. YedidyahLangsam, Moshe J. Augenstein, Aaron M. Tenenbaum,*Data Structures using C and C++,* PHI (EEE)
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman,*Data Structures and Algorithms*, Pearson
3. N.S. Kutti, P.Y. Padhye, *Data Structures in C++*, PHI

EVS-AE-121 : ENVIRONMENTAL STUDIES

Credit:4(L4–T0–P0)

Total Lectures: 60 (Theory – 60; Tutorial – 0 Practical – 0)

CourseObjectives

The objective of this paper is to provide basic concept of on Environment, Ecology, Natural Resources, Importance of biodiversity and need for their conservation along with various environmental issues and Govt. policies, and Environmental movements.

LearningOutcomes

- Learners will be able to understand environment science and its importance.
- Learners will understand the various types of pollution and hazards caused by them.
- Learners will understand ways to monitor environment and the various green technologies.
- Learners will know the various Acts enacted for the protection of the environment.

UNIT – I

Basic Concept of Environment   **12 Lectures**

Environment: Definition, scope and importance; Multidisciplinary nature of environmental studies. Concept of sustainability and sustainable development.

Ecosystem – Concept, Structure and function; Energy flow in an ecosystem: food chains, food webs, ecological pyramid. Ecological succession. Ecosystem services.

UNIT – II

Natural Resources   **12 Lectures**

Land as a resource, Land use patterns, land degradation, soil erosion and desertification.
Forest Resources, Use and over-exploitation; Deforestation - causes and impacts on environment.
Water Resources, Use and over-exploitation of surface and ground water; floods, droughts, Case studies on conflicts over water (international & inter-state).
Energy Resources, Renewable and non-renewable energy sources, growing energy needs, use of alternate energy sources. Traditional ecological knowledge.

UNIT – III

Biodiversity and Conservation   **12 Lectures**

Biodiversity: Definition, levels (genetic, species and ecosystem diversity) and values; Biogeographic zones of India; Biodiversity hot spots. Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions.
Conservation of biodiversity: *In-situ* and *Ex-situ* conservation of biodiversity.

Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

UNIT – IV

Environmental Issues and Policies   24 Lectures

Environmental pollution: types, causes, effects and controls of Air, water, soil, noise, solid waste and nuclear pollution.

Global environmental issues: Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture.

Salient features of Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). Paris agreement, Nagoya Protocol.

Human Communities and the Environment: Human population growth: Impacts on environment, human health and welfare.

Disaster management: Floods, Earthquake, Cyclones and Landslides.

Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.

Suggested readings

Bharucha, E. 2020. Textbook for Environmental Science for undergraduate students. University Grants Commission, New Delhi.

Gupta Abhik and Gupta Susmita. 2021. Environmental Studies: Principles and Practices. 344 pages, SAGE Texts.

Ahluwalia, V.K.. Environmental Studies. 2nd Ed. TERI Press.
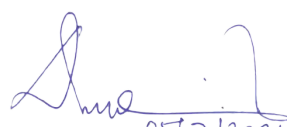
Kaushik Anubha and Kaushik, C.P. 2018. Perspectives in Environmental Studies. 6th Ed. New Age International Pvt. Ltd.

Krishnamurthy, K. V. 2020.An advanced textbook on Biodiversity: Principles and Practice. CBS Publisher and Distributors
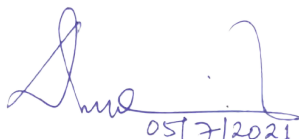
Ambasht, R. S. and Ambasht, P.K. 2017. Environment and Pollution an Ecological Approach 5th Ed. CBS Publisher and Distributors.

Ambasht, R. S. and Ambasht, N.K. 2017. A textbook of Plant Ecology. 15th Ed. CBS Publishers and Distributors, New Delhi.

Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.

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SEMESTER III

BCA-CC-231 : THEORETICAL COMPUTER SCIENCE

Credit:6(L5–T1–P0)

Total Lectures: 90 (Theory – 75; Tutorial – 15 Practical –0)

CourseObjectives

CO1: Describe and explain key concepts of algorithm design, formal models of computation and complexity theory.

CO2: Expertly applies techniques of logic, information theory and finite mathematics to the analysis of algorithms.

CO3: Think critically and assimilate information from different disciplines in order to solve problems related to computer science.

CO4: Evaluate and critically analyze scientific literature to extend their knowledge in the field.
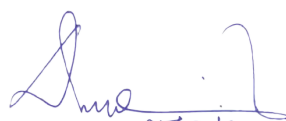
CO5 Evaluate and critically analyze scientific literature to extend their knowledge in the field.

CO6: Communicate and present their knowledge of computer science clearly to diverse audiences.

LearningOutcomes

On completion of this course the students will be able to:

1. Discuss key notions of computation, such as algorithm, computability, decidability, reducibility, and complexity, through problem solving.
2. Explain the models of computation, including formal languages, grammars and automata, and their connections.
3. State and explain the Turing thesis and its significance.
4. Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.
5. Solve computational problems regarding their computability and complexity and prove the basic results of the theory of computation

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UNIT – I

Basics of Theory of Computation; Discrete Structure, Logic Automata, Computational Complexity. Algorithm Design Techniques: Recursion, Iteration, etc. Static & Dynamic Data Structures.

(15 Lectures+ 03 Tutorials)

UNIT – II

Alphabets, classes of Languages, formal Grammars. Finite automata: regular expressions, regular languages.

(15 Lectures+ 03 Tutorials)

UNIT – III

Time complexity and NP-completeness. Applications to programming languages and analysis of algorithms.

(15 Lectures+ 03 Tutorials)

UNIT – IV

Context free languages: pushdown automata, DCFLs, LL(k) and LALR grammars. Context sensitive languages: linear bound automata.

(15 Lectures+ 03 Tutorials)
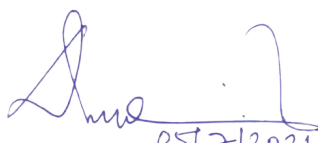
UNIT – V

Turing machines: recursively enumerable languages. Operations on formal languages and their properties. Decision questions on languages, decidable and Undecidable problems.

(15 Lectures+ 03 Tutorials)

RecommendedBooks
1. K L P Mishra, N Chandrasekaran,*Theory of Computer Science*; PHI Pvt. Ltd.
2. A Tamilarasi, P Balasubramani,A M Natarajan, *Theory of Computation* New Age International.
3. Ralph P Grimaldi,Discrete and Combinatorial Mathematics, Pearson Education.
4. John E Hopcroft, Rajeev Motwani, Jeffrey D Ullman,*Introduction to Automata Theory*; Pearson Education.

BCA-CC-232 : OBJECT ORIENTED PROGRAMMING

Credit:6(L4–T0–P2)
Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO1: Describe the procedural and object-oriented paradigm with concepts of streams, classes, functions, data and objects.

CO2: Understand dynamic memory management techniques using pointers, constructors, destructors, etc.

CO3: Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.

CO4: Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.

CO5: Demonstrate the use of various OOPs concepts with the help of programs.

LearningOutcomes

On completion of this course the students will be able to:

1. Codes basic programs in Java programming language
2. Understand the Uses of objects and classes
3. Understand Names of special functions
4. Understand and handles exceptions
5. Understand Writes multithreaded Java programs
6. Understand Uses of generic classes and methods

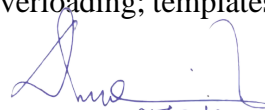## UNIT – I
OOPS languages, characteristics of OOP's languages, application of OOP's, OOP's Paradigm. Structured Programming &Object-oriented Programming Paradigms.
(10 Lectures)

UNIT – II
Classes, objects, abstraction and encapsulation; constructors and destructors; friend functions and class; inheritance, polymorphism and overloading; templates; exception handling, RTTI, STL.

UNIT – III

Object-oriented design basics: finding objects (informal descriptions, domain analysis, etc.), finding classes, classification techniques, class roles, finding interactions, etc., Dynamic Model and functional Model; Phases of Object-oriented Development.

(15 Lectures)

UNIT – IV

Unified Modeling Language (UML): History, Goals, Concepts of UM, UML Views: Static View, Case View, Interaction View, State Machine View, Activity View, Physical View, and diagrammatic representations.

(10 Lectures)

UNIT – V

Exception Handling: Introduction, Exception Handling Mechanism,Concept of throw & catch with example
Case studies in object-oriented application design.

(10 Lectures)

RecommendedBooks
1. Herbert Shield, *The Complete Reference to C++*, Tata McGraw Hill.
2. Ram Baugh et al, *Object Oriented Modeling and Design*, PHI(EEE).
3. Ram Baugh, Booch, Jacobson,*Unified Modeling Language Reference Manual*., Addison-Wesley; 2nd edition,2010

BCA-CC-233 : OPERATING SYSTEM

Credit:6(L5–T1–P0)

Total Lectures: 90 (Theory – 75; Tutorial – 15 Practical –0)

CourseObjectives

CO1: Understand the basics of operating systems like kernel, shell, types and views of operating systems.

CO2: Describe the various CPU scheduling algorithms and remove deadlocks.

CO3: Explain various memory management techniques and concept of thrashing.

CO4: Use disk management and disk scheduling algorithms for better utilization of external memory.

CO5: Recognize file system interface, protection and security mechanisms.

LearningOutcomes

On completion of this course the students will be able to:
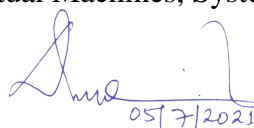
1. Will be able to control access to a computer and the files that may be shared
2. Demonstrate the knowledge of the components of computer and their respective roles incomputing.
3. Ability to recognize and resolve user problems with standard operating environments.
4. Gain practical knowledge of how programming languages, operating systems, andarchitectures interact and how to use each effectively

UNIT – I
Introduction: Operating System, Multiprocessor Systems, Distributed Systems, Parallel Systems, Real-Time System, Batch processing System, Computing Environments.
Computer- System Structures:Computer- System Operation, I/O Structure, Storage Structure, Storage Hierarchy, Hardware Protection, Network Structure.
Operating System Structures:System Components, Operating- System Services, System Calls, System Programs, System Structure, Virtual Machines, System Design and Implementation, System Generation.

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UNIT – II

Processes and Multithreading: Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Communication in Client –Server Systems, Multithreading Models.

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Algorithm Evaluation, Process Scheduling Models.

(15 Lectures+ 03 Tutorials)

UNIT – III

Memory Management:Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging.

(15 Lectures+ 03 Tutorials)

UNIT – IV

File System Interface: File-system interface, File Concept, Access Methods, Directory Structure, File- System Mounting, File Sharing, Protection.

File System implementation: File- System Structure, File- System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and performance, Recovery.

(15 Lectures+ 03 Tutorials)

UNIT – V
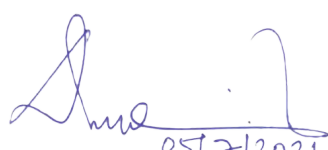
I/O Systems: I/O Systems: I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations, STREAMS, Performance.

Mass Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management.

(15 Lectures+ 03 Tutorials)

RecommendedBooks
1. Tanenbaum, *Modern Operating Systems*, Prentice Hall India Learning Private Limited; 3rd edition, 2009
2. Milenkovic, *Operating Systems: Concepts and Design*, McGraw Hill.
3. Sillberschatz et. al, *Operating Systems*, Wiley India.

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राजीव गांधी विश्वविद्यालय
Jt. Registrar (Acad. & Conf.)
Rajiv Gandhi University
Rono Hills, Doimukh (A.P.)

SEMESTER IV

BCA-CC-241 : DATA COMMUNICATION AND COMPUTER NETWORK

Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO1: Understand and explain the concept of Data Communication and networks, layered architecture and their applications.

CO2: Analyze and Set up protocol designing issues for Communication networks.

CO3: Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction.

CO4: Apply various network layer techniques for designing subnets and supernets and analyse packet flow on basis of routing protocols.

CO5: Estimate the congestion control mechanism to improve quality of service of networking application

CO6: Understand and design application layer protocols and internet applications such as network security, Email and DNS.

LearningOutcomes
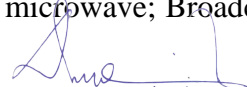
On completion of this course the students will be able to:

1. Gain the knowledge of the basic computer network technology.
2. Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
3. Obtain the skills of subnetting and routing mechanisms.
4. Familiarity with the essential protocols of computer networks, and how they can be applied innetwork design and implementation.

UNIT – I
Data Communication –
Data Communication concepts and terminologies: Data representation; Data transmission; Transmission channels; Signal encoding; Transmission impairments. Transmission media: Guided transmission media - Twisted pair; Coaxial and Optical fiber, Wireless transmission - Terrestrial microwave; satellite microwave; Broadcast Radio and Infrared

Data communication interface: Asynchronous and Synchronous transmission; Baseband and Broadband transmission; Modulation methods; Modems; Multiplexing.

(15 Lectures)

UNIT – II
Evolution of computer networks:Circuit switching; Development of packet switching: 1961-1972; Proprietary networks and internetworking: 1972-1980; Proliferation of networks: 1980-1990; The internet explosion: 1990s.
Network standards and protocols:The IEEE standards, OSI 7-layer model, TCP/IP protocol suit.

(10 Lectures)

UNIT – III
OSI model implementation -
Data Link Layer: Frame design; Flow control; Error handling; HDLC; PPP; Sliding window protocol.
Network Layer: IPv6; X.25; Frame Relay; ATM; Routing; Queuing theory
Transport Layer: TCP; UDP; Congestion control; Flow control; Socket interface.
Application Layer: SNMP; Authentication; Encryption; Web and HTTP; FTP; Email; DNS; Network File System (NFS) and File sharing; Remote Procedure Calling (RPC).

(15 Lectures)

UNIT – IV
Local Area Network (LAN):Needs; Architecture and Technology
Ethernet: CSMA/CD operation; parameters and specifications
Cabling: 10Base5; 10Base2; 10BaseT; 10BaseF; Hubs; patch panels and wiring closets
Bridges; Switches; 100BaseT;Gigabit Ethernet ; FDDI; Token Ring; Wireless; ISDN; B-ISDN.

(10 Lectures)
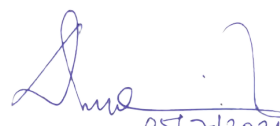
UNIT – V
VSAT technology, Multimedia networks, Network Computing, Network security and management

(10 Lectures)

RecommendedBooks
1. Stallings, W.; *Data and Computer Communications*; Prentice Hall of India.
2. Tanenbaum A.S.; *Computer Networks*; Prentice Hall of India.
3. Kurose and Ross; *Computer Networking*; Addison Wesley
4. Prakash C. Gupta; *Data Communication*; Prentice Hall of India

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BCA-CC-242 : DATABASE MANAGEMENT SYSTEM

Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO1: Explain the features of database management systems and Relational database.

CO2: Design conceptual models of a database using ER modeling for real life applications and also construct queries in Relational Algebra.

CO3: Create and populate a RDBMS for a real-life application, with constraints and keys, using SQL.

CO4: Retrieve any type of information from a data base by formulating complex queries in SQL.

CO5: Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.

LearningOutcomes
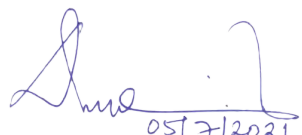
On completion of this course the students will be able to:

1. comprehend and evaluate the role of database management systems in information technology applications within organizations
2. design and implement properly structured databases that match the standards based under realistic constraints and conditions.
3. comprehend how to use Structured Query Language (SQL) to define and manipulate database information
4. describe and develop Relational Algebra and Relational Calculus queries
5. explain the principle of transaction management design.
6. work in a group on the design, and implementation of a database system project.

UNIT – I
Overview: Concept of database, data independence, redundancy Control; Database architecture - ANSI model.

(10 Lectures)

UNIT – II

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Database design and ER Model: overview, ER-Model, Constraints, ER-Diagrams, ERD

Issues, weak entity sets, Codd's rules, Relational Schemas

Relational database model: Logical view of data, keys, integrity rules.

Relational Database design: features of good relational database design, atomicdomain and Normalization (1NF, 2NF, 3NF, BCNF).

(15 Lectures)

UNIT – III

Relational data model: DDL, DML: relational algebra and calculus; functional dependencies, normal forms, decomposition, integrity rules; Query languages for relational systems: SQL, QBE, query optimization, embedded SQL.

(10 Lectures)

UNIT – IV

What are constraints, types of constrains, Integrity constraints

Views: Introduction to views, data independence, security, updates on views,comparison between tables and views

SQL: data definition, aggregate function, Null Values, nested sub queries, Joined Relations, Triggers.

(15 Lectures)

UNIT – V

Brief treatment of: Client-server models, distributed databases, object-oriented databases, deductive databases, multimedia databases, active databases.

(10 Lectures)

RecommendedBooks
1. Silberschatz and Korth,*Database system concepts*; McGraw Hill.
2. Elmasri and Navathe,*Fundamentals of database systems ,* Narosa Publishing
3. Rajesh Narang,*Database Management System*: PHI Pvt. Ltd.
4. NIIT,*Database Development: An Overview*, PHI Pvt. Ltd.

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BCA-CC-243 : SYSTEM SOFTWARE AND COMPILERS

Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO1: Understand SIC architecture, features of utility software's such as assemblers, loaders, linkers, editors and macro processor.

CO2: Design simple assembler for Simple instruction computer.

CO3: Design linker and loaders for simple instruction computer.

CO4: Design elementary macro processor for simple assembly level language.

CO5: Design and implement simple laxer and parser using lex and yacc tools.

LearningOutcomes

On completion of this course the students will be able to:

1. Explain and classify different methodologies, concepts and approaches to System Software Programming.
2. Identify elements of language processors with various data structures used in development of one-pass and multi-pass assemblers.
3. Examine macro processor, its usage and compare various loading and linking schemes.
4. Build various system programs using language processor development tools such as YACC and Lex.
5. Design code optimization-based solution for the given system problems by applying various techniques of compiler, interpreter and debugger.

UNIT – I
Introduction, Software, Software Hierarchy, Systems Programming, Machine Structure, Interfaces, Address Space, Computer Languages, Tools, Life Cycle of a Source Program, Different Views on the Meaning of a Program, System Software Development, Recent Trends in Software Development, Levels of System Software.
(10 Lectures)

UNIT – II
Elements of Assembly Language Programming, Design of the Assembler, Assembler Design Criteria, Types of Assemblers, Two-Pass Assemblers, One-Pass Assemblers, Single pass Assembler for Intel x86 , Algorithm of Single Pass Assembler, Multi-Pass

Assemblers, Advanced Assembly Process, Variants of Assemblers Design of two pass assembler, assembler macros and microprocessors.

(15 Lectures)

UNIT – III

Introduction, Relocation of Linking Concept, Design of a Linker, Self- Relocating Programs, Linking in MSDOS, Linking of Overlay Structured Programs, Dynamic Linking, Loaders, Different Loading Schemes, Sequential and Direct Loaders, Compile-and-Go Loaders, General Loader Schemes, Absolute Loaders, Relocating Loaders, Practical Relocating Loaders, Linking Loaders, Relocating Linking Loaders, Linkers v/s Loaders, overlays.

(15 Lectures)

UNIT – IV

Programming Language Grammars, Classification of Grammar, Ambiguity in Grammatic Specification, Scanning, Parsing, Top-Down Parsing, Bottom-up Parsing, Language Processor Development Tools, LEX, YACC

(10 Lectures)
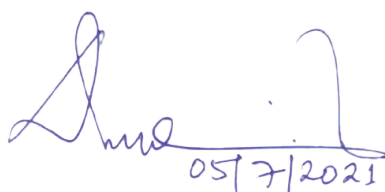
UNIT – V

Compilers: Introduction and phases of a compiler: Causes of Large Semantic Gap, Binding and Binding Times, Data Structure used in Compiling, Scope Rules, Memory Allocation, Compilation of Expression, Compilation of Control Structure, Code Optimization

(10 Lectures)

RecommendedBooks
1. Aho, Ullman, Sethi, *Compiler Design*, Pearson
2. Dhamdhere, *System Programming & Operating system*, Tata Mc Graw Hill.

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SEMESTER V

BCA-CC-351 : WEB TECHNOLOGY

Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO-1. Get introduced to core parts of a web.

CO-2. Analyze a webpage, identify its elements and attributes

CO-3. Create webpage with HTML, XHTML and various cascading style sheets.

CO-4. Build dynamic webpages using JavaScript (client-side programming).

CO-5. Create XML documents and schemas.

LearningOutcomes

On completion of this course the students will be able to:

1. Analyze a web page and identify its elements and attributes.
2. Create web pages using XHTML and Cascading Style Sheets.
3. Build dynamic web pages using JavaScript (Client-side programming).
4. Create XML documents and Schemas.
5. Build interactive web applications using CSS2. Explain the principle of transaction management design.

UNIT – I
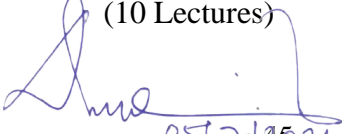
Introduction to WWW: Protocols and programs, secure connections, application and development tools, the web browser, what is server, choices, setting up UNIX and Linux web servers, Logging users, dynamic IP, Web Design: Web site design principles, planning the site and navigation.

(10 Lectures)

UNIT – II

Introduction to HTML: The development process, Html tags and simple HTML forms, web site structure Introduction to XHTML: XML, Move to XHTML, Meta tags, Character entities, frames and frame sets, inside browser.

(10 Lectures)

UNIT – III

Dynamic HTML: Introduction of DHTML- HTML vs. DHTML, Advantages of DHTML, CSS of DHTML, Event Handling, Data Binding, Browser Object Models. Style sheets: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2,CSS3

(15 Lectures)

UNIT – IV

JavaScript:Client-side scripting, what is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition.

(10 Lectures)

UNIT – V

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application.XML, XSL and XSLT. Introduction to XSL, XML transformed simple example, XSL elements, transforming with XSLT.

(15 Lectures)

RecommendedBooks
1. Steven Holzner,*HTML Black Book*, Dremtech press.
2. Jeffrey C. Jackson ,*Web Technologies: A Computer Science Perspective*, Prentice Hall, 2006.
3. Craif Knuckles, David Yuen, *Web Applications: Concepts and Real-World Design*, Wiley India Pvt Ltd, 2006.

BCA-CC-352 : ALGORITHM DESIGN

Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO1: Ability to write programs in java to solve problems using algorithm design techniques such as Divide and Conquer, Greedy, Dynamic programming, and Backtracking. Able to implement Quick sort, Merge sort algorithm, BFS and DFS algorithms.

CO2: Able to implement backtracking algorithm for the N-queens problem.

CO3: Able to implement greedy algorithm for job sequencing with deadlines.

CO4: Get awarded with Dijkstra's, Prim's algorithm, Kruskal's algorithm.

CO5: On spanning tree, Able to implement Floyd's algorithm for the all pairs shortest path problem.

LearningOutcomes

On completion of this course the students will be able to:

1. Analyze correctness of algorithms using inductive proofs and invariants.
2. Analyze worst-case running times of algorithms using asymptotic analysis.
3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
5. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
6. Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key

components, and analyze them.

7. Explain the different ways to analyze randomized algorithms (expected running time, probability of error). Recite algorithms that employ randomization. Explain the difference between a randomized algorithm and an algorithm with probabilistic inputs.
8. Analyze randomized algorithms. Employ indicator random variables and linearity of expectation to perform the analyses. Recite analyses of algorithms that employ this method of analysis.
9. Explain what amortized running time is and what it is good for. Describe the different methods of amortized analysis (aggregate analysis, accounting, potential method). Perform amortized analysis.
10. Explain what competitive analysis is and to which situations it applies. Perform competitive analysis.
11. Compare between different data structures. Pick an appropriate data structure for a design situation.

UNIT – I
Review of basic data structures such as stack, queue, linked list, trees and graphs.
Algorithm Design Methods: General Consideration, Algorithm design paradigms.

(10 Lectures)

UNIT – II
Divide and Conquer: Binary search, Merge Sort, Quick Sort, Arithmetic with Large integers
Greedy Method: Minimal Spanning Tree, Shortest Paths, Knapsack.

(10 Lectures)

UNIT – III
Dynamic Programming: Chained Matrix Multiplication, Optimal Storage on Tapes, Shortest Paths, Optimal Search Trees
Backtracking: 8-queens problem, Graph Coloring, Hamiltonian Cycles.

(15 Lectures)

UNIT – IV
Branch and Bound: 0/1 Knapsack problem, Travelling Salesperson
Approximation: Graph Coloring, Task Scheduling, Bin Packing.

(15 Lectures)

UNIT – V
Probabilistic Algorithms: Numerical Integration, Primality Testing.

(10 Lectures)

RecommendedBooks
1. Aho, J. Hopcroft and J.Ullman, *The design and Analysis of Computer Algorithms*, Addison Wesley.
2. E. Horowitz and S. Sahani, *Fundamentals of Computer Algorithms*, Galgotia, New Delhi.
3. S.E. Goodman and S.T. Hedetniemi, *Introduction to the Design and Analysis of Algorithms*, McGraw Hill.

4. G. Brassard and P.Bratley, *Algorithmics*, PHI.
5. S.K. Basu, *Design Methods and Analysis of Algorithms*, PHI.
6. T.H. Coremen, et. al, *Introduction to Algorithm*, PHI

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SEMESTER VI

BCA-CC-361 : SYSTEMS AND NETWORK ADMINISTRATION

Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO1: Design and configure peer-to-peer networks to share resources.

CO2: Analyze requirements and design network architecture for a given scenario.

CO3: Design and configure IP addressing schemes for a given scenario.

CO4: Design and configure a client-server network and required network services for a given scenario.

CO5: Evaluate and critique a design for a systems and network solution.

LearningOutcomes

On completion of this course the students will be able to:

1. Design configuration, and optimization of networks administration
2. Formulation of technical solutions
3. Demonstrate and administration of operating systems
4. Applying analysis and design according to business requirements
5. Develop strategies for Information Security
6. Description and analysis-software and hardware and network components
7. Knowledge of networking protocols and comparison of protocols models
8. Management of operating systems, systems software, network services and security.
9. Skills assessment and comparison of software systems and new technologies.
10. Identification of infrastructure components and the roles they perform to design infrastructure, including equipment, topology, protocols, software systems, and security management
11. Analyze the performance of the enterprise networking systems

UNIT – I
Major components of the Linux operating systems. File system, setting user and group ownership of files and directories and access permissions, basic commands for starting and stopping processes, basic process attributes and their role in access control,

mounting and unmounting file systems and partitions.

(10 Lectures)

UNIT – II

Linux kernel program, starting and stopping a Linux system, setting up user and group accounts on single machines, the basics of backup and restore procedures.

Linux system monitoring and logging. Examining the list of running processes on the system and understand the data presented there. Monitoring memory usage and disk space usage on the system. Customizing system log configuration.

(10 Lectures)

UNIT – III

The rules governing IP address classes and netmasks, Configuring the resolver library to arrange for TCP/IP name service, bringing interfaces up and down, and set their IP addresses and netmasks, Setting the default route in the kernel routing table. Understanding the significance of the /etc/services file and well-known port numbers, Configuring the inet daemon, Using telnet to contact servers directly, using the ping command to test network connectivity, netstat command to examine kernel tables pertaining to networking, traceroute command to discover network paths, tcpdump to examine all network traffic. Methods used to bring interfaces up and down.

(15 Lectures)

UNIT – IV

Basics of configuring and using the Domain Name Service, sendmail, the Network Information System, Network File System: Structure and function of the Domain Name Service (DNS), Setting up a Linux machine to function as a DNS server, Configuring and using sendmail, Setting up an NIS domain with an NIS master server and NIS clients.

(15 Lectures)
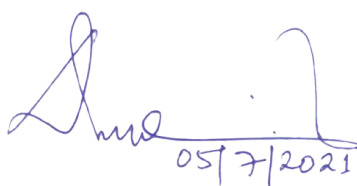
UNIT – V

Basic network security issues and solutions, setting up a Linux machine to act as an NFS server, setting up a Linux machine to act as an NFS client Incremental back up. Monthly back. Mail server setup.

(10 Lectures)

RecommendedBooks
1. Proffitt,*Red Hat Linux X Fast and Easy (Fast & Easy)*, PHI
2. Stevens,*UNIX Network Programming- Vol-I and Vol-II*: Stevens, PHI
3. Firos A, *Systems And Network Administration: A handbook for beginners*,Notion Press; 1st edition, 2021

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BCA-CC-362 : SOFTWARE ENGINEERING

Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO1: How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment

CO2: An ability to work in one or more significant application domains

CO3: Work as an individual and as part of a multidisciplinary team to develop and deliver quality software

CO4: Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle

CO5: Demonstrate an ability to use the techniques and tools necessary for engineering practice.

LearningOutcomes

On completion of this course the students will be able to:

1. Translate end-user requirements into system and software requirements, using e.g.UML, and structure the requirements in a Software Requirements Document (SRD).
2. Identify and apply appropriate software architectures and patterns to carry out high leveldesign of a system and be able to critically compare alternative choices.
3. Will have experience and/or awareness of testing problems and will be able to develop asimple testing report.

UNIT – I
Introduction to software engineering: Concept of a software project, size factor, quality and productivity factor different phases of Software development life cycle.

(10 Lectures)

UNIT – II
Software Requirements: Functional and non-functional requirements, user

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requirements, system, requirements, interface specification, the software requirements document.

Requirements engineering process: Feasibility studies, requirements elicitation and analysis,requirements validation, requirements management.

System models: Context models, behavioral models, data models, object models, structuredmethods.

(10 Lectures)

UNIT – III

Software design: Design process and design quality, design concepts, the design mode, function oriented, object-oriented approaches, user interfaces.

Software programming: Structured coding techniques, coding styles, standards, software architecture, data design, architectural styles andpatterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams,sequence diagrams, collaboration diagrams, use case diagrams, component diagrams

(15 Lectures)

UNIT – IV

Software verification and validation: theoretical foundation, black box and white box approaches, integration and system testing.

Software reliability: definition and concept of reliability, software faults, errors, repair and availability.

(15 Lectures)

UNIT – V
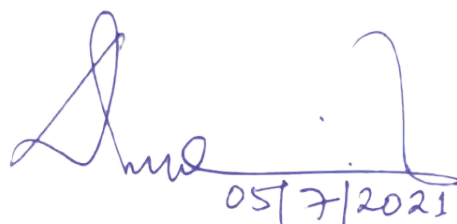
Metrics for Process and Products: Software measurement, metrics for software quality.

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, riskprojection, risk refinement, RMMM, RMMM plan.

(10 Lectures)

RecommendedBooks
1. Jalote, P., *An Integrated approach to software engineering*, Narosa Publishing House.
2. Pressman, R. S., *Software Engineering: A practical Approach*; McGraw-Hill.
3. Humphery, W. S*., Managing software Procedures*, Addission-Wesley

DISCIPLINE SPECIFIC ELECTIVES (DSE)

Semester-V :

Choices for DSE-1 (Choose any ONE)

1. BCA-DE-351: Python Programming
2. BCA-DE-352: Data Analytics
3. BCA-DE-353: Computer Ethics
4. BCA-DE-354: Cyber Crime and Legal Framework

DSE-2 (Compulsory)

1. BCA-DE-002: Project-I

Semester-VI :

Choices for DSE-3 (Choose any ONE)

1. BCA-DE-361: Computer Graphics and Multimedia
2. BCA-DE-362: Data Mining
3. BCA-DE-363: Cloud Computing
4. BCA-DE-364: Internet of Things

DSE-4 (Compulsory)

1. BCA-DE-004: Project-II

Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO1: Able to learn and understand Python programming basics and paradigms.

CO2: Understand and use various flow control of the programming language such as conditionals, looping.

CO3: Understand the concept of functions and its implementation in python

CO4: Ability to design an object – oriented programs with python.

CO5: Understand and use file processing in the python programming language.

LearningOutcomes

On completion of this course the students will be able to:

1. Define and demonstrate the use of built-in data structures "lists" and "dictionary".
2. Design and implement a program to solve a real-world problem.
3. Design and implement GUI application and how to handle exceptions and files.
4. Make database connectivity in python programming language.

UNIT – I
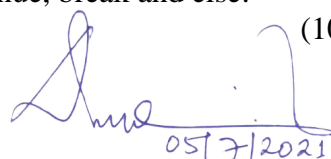Introduction: Installation and working with Python, Python interpreter. Introduction to Python Programming Language: operators, variables, data types, Lists, Dictionaries, Sets, Tuples and Strings.

(10 Lectures)

UNIT – II
Program Flow Control: Statements and Expressions, Control structures: if, else, elif, while loop, Loop manipulation using pass, continue, break and else.

(10 Lectures)

UNIT – III

Functions: Definition, call, positional and keyword parameter. Default parameters, variable number of arguments. Modules: import mechanisms, Functional programming: map, filter, reduce, max, min. lambda function.

(15 Lectures)

UNIT – IV

Object Oriented Programming: classes and objects, inheritance, polymorphism, error processing, Exceptions handling.

(15 Lectures)
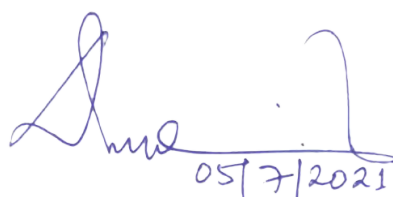
UNIT – V

File Processing: reading and writing files, manipulating file pointer using seek.

(10 Lectures)

RecommendedBooks

1. Charles Dierbach, *Introduction to Computer Science Using Python: A Computational Problem-Solving Focus*, John Wiley, 2012
2. Kenneth A. Lambert, *The Fundamentals of Python: First Programs*, 2011 Cengage Learning, ISBN: 9781111822705
3. Paul Barry, *Head First Python*, 2nd Edition, O'Reilly

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BCA-DE-352 : DATA ANALYTICS

Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO1:Develop in-depth understanding of the key technologies in data science and business analytics: data mining, machine learning, visualization techniques, predictive modeling, and statistics

CO2:Apply principles of Data Science to the analysis of business problem

Demonstrate knowledge of statistical data analysis techniques utilized in business decision making.

CO3:To understand the applications using Map Reduce Concepts.

CO4:To implement mathematical aggregation operators and Statistical operations.

CO5:To explore the fundamental concepts of big data analytics.

CO6:To learn the big data using intelligent techniques.

CO7:To understand the various search methods and visualization techniques.

CO8:To learn to use various techniques for mining data stream.

LearningOutcomes

On completion of this course the students will be able to:

1. Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
2. Understand the concepts of Hadoop Distributed file system and hadoop file system interfaces.
3. Illustrate the concepts of PIG and HIVE K2
4. Identify the characteristics of datasets and compare the trivial data and big data for various applications.
5. Demonstration the various methodologies of descriptive statistics

6. Understanding of modeling uncertainty and statistical inference
7. Understanding of analytical frameworks
8. Apply analytical and critical thinking to identify, formulate, analyze, and solve complex problems in order to reach authenticated conclusions.

UNIT – I
Data Definitions and Analysis Techniques: Elements, Variables, and Data Categorization, Levels of Measurement, Data Management and Indexing.

(10 Lectures)

UNIT – II
Descriptive Statistics: Measures of Central Tendency, Measures of Location of Dispersions, Error Estimation and Presentation (Standard Deviation, Variance), Introduction to Probability.

(10 Lectures)

UNIT – III
Data Analysis Techniques-I: Regression Analysis, Classification Techniques, Clustering Techniques (K-Means, K-Nearest Neighborhood).

(15 Lectures)

UNIT – IV
Data Analysis Techniques-II: Association Rules Analysis, Decision Tree
Introduction to R Programming: Introduction to R Software Tool, Statistical Computations using R (Mean, Standard Deviation, Variance, Regression, Correlation etc.).

(15 Lectures)

UNIT – V
Practice and Analysis with R and Python Programming, Sensitivity Analysis. Basic Analysis Techniques: Statistical Hypothesis Generation and Testing, Chi-Square Test, T-Test, Analysis of Variance, Correlation Analysis, Maximum Likelihood Test.

(10 Lectures)

RecommendedBooks
1. Ronald E Walppole, Raymond H Myres, Sharon L. Myres and Leying Ye, *Probability and statistics for Engineers and Scientists*, (9th Ed.), Prentice Hall Inc.,(2006)
2. Travor Hastie Robert Tibshirani Jerome Friedman ,*The Elements of Statistical Learning, Data Mining, Inference, and Prediction,* (2nd Ed.), Springer, (2014).

3. John M. Chambers,*Software for Data Analysis: Programming with R (Statistics and Computing)*, Springer, (2008)

BCA-DE-353 : COMPUTER ETHICS

Credit:6(L5–T1–P0)

Total Lectures: 90 (Theory – 75; Tutorial 15 Practical –0)

CourseObjectives

CO1:Recognize milestones in computing, networking, and information storage and retrieval

CO2:Be familiar with the language and content of ethical discourse

CO3:Understand modern debates surrounding intellectual property

CO4:Appreciate the threats to privacy posed by modern information gathering techniques

CO5:Be familiar with a range of other ethical issues raised by modern information technology and relevant to computer professionals

LearningOutcomes

On completion of this course the students will be able to:

1. Describe and distinguish between the various ethical theories which can be used to form the basis of solutions to moral dilemmas in computing.
2. Identify traditional and current Issues related to Computers, Information Systems, Ethics, Society and Human Values;
3. Identify and define the components of a structured plan for solving ethical problems and, in the process, will be able to understand the basis for her/his own ethical system.
4. Given several examples of professional codes of ethics related to computing, the student will be able to compare and contrast these examples, discussing their commonalties, differences, and implications.
5. Develop skills of critical analysis and applying ethical principles to situations and dialectical thinking

UNIT – I
The Need for Computer Ethics Training and Historical Milestones.

(15 Lectures+ 03 Tutorials)

UNIT – II

Defining the Field of Computer Ethics, Computer ethics codes, Sample Topics in Computer Ethics : Computer crime and computer security; Software theft and intellectual property rights; Computer hacking and the creation of viruses; Computer and information system failure ; Invasion of privacy. Privacy in the Workplace and on the Internet ;Social implications of artificial intelligence and expert systems; The information technology salesman issues.

(20 Lectures+ 04 Tutorials)

UNIT – III

Transparency and Virtual Ethics, Free Speech, Democracy, Information Access.

(15 Lectures+ 03 Tutorials)

UNIT – IV

Developing the Ethical Analysis Skills and Professional Values, Privacy, Accountability, Government Surveillance.

(15 Lectures+ 03 Tutorials)

UNIT – V

Boundaries of Trust, Trust Management, Wikipedia, Virtual Trust, Plagiarism in Online Environment, Intellectual Property, Net neutrality.

(10 Lectures+ 02 Tutorials)

RecommendedBooks

1. Deborah G.Johnson, Helen Nissenbaum, *Computing, Ethics & Social Values*, Prentice Hall, (1995).

2. Richard A. Spinello, Herman T. Tavani, *Readings in Cyberethics*, Jones and Bartlett Publishers, (2001).

3. Simon Rogerson, Terrell Ward Bynum, *Computer Ethics and Professional Responsibility*, Blackwell, (2004)

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BCA-DE-354 : CYBER CRIME AND LEGAL FRAMEWORK

Credit:6(L4–T0–P2)
Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO1: understand the basics of cyber-crime and to apply theoretical concepts to different cybercrimes

CO2: understand the needs of security and various threats to it.

CO3: Understand the investigation of cyber frauds and crimes with various techniques.

CO4: Cyber Crime – Sociological and Criminological Perspectives

CO5: Understand the legal and related issues in cyber cases and learn the Indian laws related to cyber security.

LearningOutcomes

On completion of this course the students will be able to:
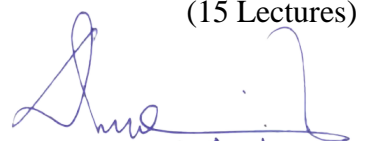
1. Understand organized crime and criminal groups that engage in cyber organized crime
2. Identify and discuss the structures and characteristics of organized criminal groups that engage in cyber organized crime
3. Identify different types of cyber organized crime
4. analyse the ways in which information and communication technology is used to commit cyber organized crime
5. Critically evaluate the measures used to counter cyber organized crime.

UNIT – I

Overview of Cybercrime, Computer Intrusions and Attacks (Unauthorized Access) Computer Viruses, Time Bombs, Trojans, Malicious Code (Malware), Online Fraud and Identity Theft; Intellectual Property Theft; Virtual Crime, Online Vice, International Aspects and Jurisdiction.

(15 Lectures)

UNIT – II

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Security Needs: The Need for Security, Business Needs, needs to protect against Threats and Attacks, Security in Emails. Secure Software Development.

(10 Lectures)

UNIT – III
Investigating Cybercrime: Digital Evidence and Computer Forensics, Interception, Search and Seizure, and Surveillance.

(10 Lectures)

UNIT – IV
Information Warfare, Cyber terrorism and Hacktivism, Terrorism, Radicalization, and The War of Ideas, Trade Secret Theft and Economic Espionage, National Security.

(10 Lectures)
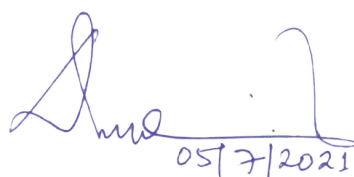
UNIT – V
Legal Framework: Indian legal system, federalism and constitutionalism, Legislation, Enforcement of laws and Adjudication, Judicial system in India and hierarchy of courts, Criminal and Civil legal and justice system, Concept of Jurisdiction, Regulatory tribunals and their functions, Principles of administrative law, Alternative dispute resolution mechanism.

(15 Lectures)

RecommendedBooks
1. Nilakshi Jain and Ramesh Menon, *Cyber Security and Cyber Laws*, Wiley India, 2020
2. Nina Godbole and SunitBelapure, *Cyber Security*, Wiley India, 2011
3. Sushila Madan, *Cyber Crime and Cyber Laws*, Scholar Tech Press, 2020

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Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO1: To list the basic concepts used in computer graphics.

CO2: To implements various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.

CO3: To describe the importance of viewing and projections.

CO4: To define the fundamentals of animation, virtual reality and its related technologies.

CO5: To understand a typical graphics pipeline.

LearningOutcomes

On completion of this course the students will be able to:
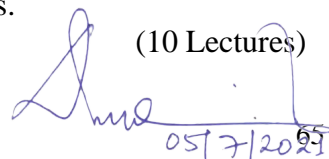
1. Acquire familiarity with the relevant mathematics of computer graphics.
2. design basic graphics application programs, including animation
3. design applications that display graphic images to given specifications

UNIT – I
Introduction: A Survey of Computer Graphics- Computer Aided Design, Presentation Graphics, Computer Art, Entertainment, Education and Training, Visualization, Image Processing, Graphics User Interface.
Overview of Graphics Systems: Video Display Devices – Refresh Cathode-Ray Tubes, Raster-Scan Displays, Random-scan Displays, Color CRT Monitors, Direct-View Storage Tubes, Flat-Panel Displays, Three-Dimensional Viewing Devices, Stereoscopic and Virtual-Reality Systems; Raster-Scan Systems; Random-Scan Systems; Graphics Monitors and Workstations; Input Devices.

(10 Lectures)

UNIT – II

Display and drawing of graphics primitives: Points and Lines; Line Drawing Algorithms-General Line Equation, DDA Algorithms, Bresenham's Line Algorithm; Circle-Generating Algorithm- Equation of a Circle, Bresenham's Circle Algorithm; Curves and Text;

Filled Area Primitives: Scan-Line Polygon Fill Algorithm, Boundary-Fill Algorithm, Flood-Fill Algorithm.

(10 Lectures)

UNIT – III

Geometric Transformations: Basic 2D Transformations – Translation, Rotation, Scaling; Matrix Representation and Homogeneous Coordinates; Translation along x-axis, y-axis; Rotation about origin, Rotation about a pivot point; Scaling about origin, Scaling relative to a fixed Point; Three Dimensional Transformations.

(15 Lectures)

UNIT – IV

Two-Dimensional Viewing: Coordinate Conventions-world coordinates, device coordinates, normalized device coordinates, view-port and window; Clipping Operations – Point Clipping, Line Clipping, Cohen-Sutherland Line Clipping, Polygon Clipping, Sutherland-Hodgeman Polygon Clipping, Other Polygon-Clipping Algorithms, Transformations in 2D and 3D: translation, rotation, scaling, reflection, Projection: perspective and parallel projections, isometric projection, Transformation matrices.

(15 Lectures)

UNIT – V

Volume and Surface Representation, Fractal modelling; Hidden surface and line elimination; Computer Animation: fundamental concepts.

(10 Lectures)

RecommendedBooks

1. James D. Foley, AndriesVan dam, Steven K. Feiner& John F. Hughes, *Computer Graphics - Principles and Practices*, Pearson Education.
2. Donald Hearn and M Pauline Baker, *Computer Graphics*, PHI
3. Woo, Neider, Davis, Shreiner, *Open GL Programming Guide*, Pearson Education.
4. David F. Rogers, *Procedural Elements for Computer Graphics*, Tata-McGraw Hill

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BCA-DE-362 : DATA MINING

Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO1:To introduce students to the basic concepts and techniques of Data Mining.

CO2:To introduce a wide range of clustering, estimation, prediction, and classification algorithms.

CO3:To introduce mathematical statistics foundations of the Data Mining Algorithms.

CO4:To introduce basic principles, concepts and applications of data warehousing.

LearningOutcomes

On completion of this course the students will be able to:

1. Identify the key processes of data mining, data warehousing and knowledge discovery process.
2. Understand the basic principles and algorithms used in practical data mining and their strengths and weaknesses.
3. Apply data mining techniques to solve problems in other disciplines in a mathematical way.

UNIT – I
Introduction, Data Mining Issues, Data Mining Metrics, Data Mining from a Database Perspective.
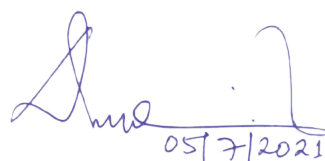
(10 Lectures)

UNIT – II
Classification: Statistical-Based Algorithms, Decision Tree -Based Algorithms, Neural Network -Based Algorithms, Rule-Based Algorithms, Combining Techniques. Clustering: Similarity and Distance Measures, Hierarchical Algorithms, Partitioned Algorithms, Clustering Large Databases, Clustering with Categorical Attributes

(15 Lectures)

UNIT – III

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Association Rules: Basic Algorithms, Advanced Association Rule Techniques, Measuring the Quality of Rules.

(10 Lectures)

UNIT – IV
Introduction to Data Warehousing: Definition, difference between database system and data warehouse, multidimensional data model, data cubes, process architecture.

(15 Lectures)
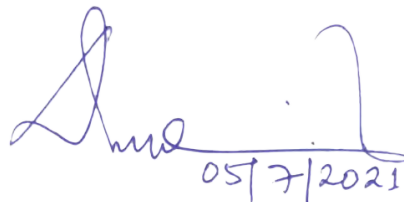
UNIT – V
Applications and other DM Techniques: Mining Event Sequences, Visual DM, Text Mining, Web Mining.

(10 Lectures)

RecommendedBooks
1. Ville, *Decision Trees for Business Intelligence and Data Mining: Using SAS Enterpris e Miner*, SAS, 2006.
2. Pang-Ning Tan, *Introduction to Data Mining*, Addison Wesley, 2006.
3. J. Han and M. Kamber, *Data Mining: Concepts and Techniques*, Morgan Kaufman, 2001.
4. Tom Soukup, Davidson, *Visual Data Mining: Techniques and Tools for Data Visualization and Mining*, Wiley, 2002.
5. Alex Berson, Stephen J. Smith, *Data Warehousing, Data Mining*, and OLAP, MGH, 1998.

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BCA-DE-363 : CLOUD COMPUTING

Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO5: Provide with the fundamentals and essentials of Cloud Computing.

CO5: Provide a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.

CO5: Enable exploring some important cloud computing driven commercial systems and applications.

CO5: Expose themselves to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

LearningOutcomes

On completion of this course the students will be able to:

1. Analyze the trade-offs between deploying applications in the cloud and over the local infrastructure.
2. Compare the advantages and disadvantages of various cloud computing platforms.
3. Deploy applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and GoogleApp Engine.
4. Program data intensive parallel applications in the cloud.
5. Analyze the performance, scalability, and availability of the underlying cloud technologies and software.
6. Identify security and privacy issues in cloud computing.
7. Explain recent research results in cloud computing and identify their pros and cons.
8. Solve a real-world problem using cloud computing through group collaboration

UNIT – I

Definition, characteristics, components, Cloud service provider, the role of networks in Cloud computing, Cloud deployment models- private, public & hybrid, Cloud service models, multitenancy, Cloud economics and benefits, Cloud computing platforms - IaaS: Amazon EC2, PaaS: Google App Engine, Microsoft Azure, SaaS.

(10 Lectures)

UNIT – II

Virtualization concepts , Server virtualization, Storage virtualization, Storage services, Network virtualization, Service virtualization, Virtualization management, Virtualization technologies and architectures, virtual machine, Measurement and profiling of virtualized applications. Hypervisors: KVM, Xen, VMware hypervisors and their features.

(10 Lectures)

UNIT – III

Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo. MapReduce and extensions: Parallel computing, the map-Reduce model, Parallel efficiency of MapReduce, Relational operations using Map-Reduce, Enterprise batch processing using MapReduce.

(15 Lectures)

UNIT – IV

Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud. Cloud computing security architecture: General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro - architectures; Identity Management and Access control, Autonomic security, Security challenges : Virtualization security management - virtual threats, VM Security Recommendations, VM - Specific Security techniques, Secure Execution Environments and Communications in cloud.

(15 Lectures)
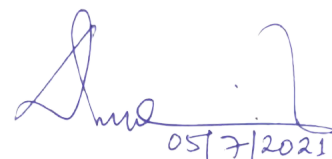
UNIT – V

Implementing real time application over cloud platform, Issues in Inter-cloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment. Cloud Middleware. Mobile Cloud Computing. Inter Cloud issues. A grid of clouds, Sky computing, load balancing, resource optimization, resource dynamic reconfiguration, Monitoring in Cloud

(10 Lectures)

RecommendedBooks
1. Gautam Shroff, *Enterprise Cloud Computing*, Cambridge publication
2. Ronald Krutz and Russell Dean Vines, *Cloud Security*, Wiley-India
3. Dr. Kumar Saurabh, *Cloud Computing*, Wiley Publication

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BCA-DE-364 : INTERNET OF THINGS

Credit:6(L4–T0–P2)

Total Lectures: 120 (Theory – 60; Practical – 60)

CourseObjectives

CO1: Understand the definition and significance of the Internet of Things

CO2: Discuss the architecture, operation, and business benefits of an IoT solution

CO3: Examine the potential business opportunities that IoT can uncover

CO4: Explore the relationship between IoT, cloud computing, and big data

CO5: Identify how IoT differs from traditional data collection systems.

CO6: Design & develop IOT Devices..

LearningOutcomes

On completion of this course the students will be able to:

1. Learn the concepts of Sensors, Wireless Network and Internet
2. Learn and implement use of Devices in IoT technology.
3. Learn the different IoT Technologies like Micro-controller, Wireless communication like Bluetooth, GPRS, Wi-Fi and Storage and embedded systems
4. Understand how to program on embedded and mobile platforms including different Microcontrollers like ESP8266, Raspberry Pi, Arduino and Android programming
5. Understand how to make sensor data available on the Internet (data acquisition) and understand how to analyze and visualize sensor data
6. Understand analysis and evaluate different protocols used in IoT.
7. Learn basic python programming for IoT applications
8. Learn and design different applications in IoT.
9. Design, develop and test different prototypes in IoT

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UNIT – I

(Introduction to IoT, Sensors and Actuators) Introduction to IoT: Definition, Characteristics, Applications, Evolution, Enablers, Connectivity Layers, Addressing, Networking and Connectivity Issues, Network Configurations, Multi-Homing, Sensing: Sensors and Transducers, Classification, Different Types of Sensors, Errors, Actuation: Basics, Actuator Types- Electrical, Mechanical Soft Actuators.

(10 Lectures)

UNIT – II

(Introduction to Networking, Communication Protocols and Machine-to-Machine Communication) Basics of Networking, Communication Protocols, Sensor Network, Machine to Machine Communication (IoT Components, Inter-Dependencies, SoA, Gateways, Comparison Between IoT& Web, Difference Protocols, Complexity of Networks, Wireless Networks, Scalability, Protocol Classification, MQTT & SMQTT, IEEE 802.15.4, Zigbee).

(10 Lectures)

UNIT – III

(Arduino Programming) Interoperability in IoT, Introduction to Arduino Programming, Integration Of Sensors And Actuators With Arduino
(Python Programming and Raspberry Pi) Introduction to Python Programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi, Implementation of IoT with Raspberry Pi.

(15 Lectures)

UNIT – IV

(Data Analytics and Cloud Computing) Data Handling and Analytics, Cloud Computing Fundamentals, Cloud Computing Service Model, Cloud Computing Service Management and Security, Sensor-Cloud Architecture, View and Dataflow.

(15 Lectures)

UNIT – V

(FOG Computing and Case Studies) FOG Computing: Introduction, Architecture, Need, Applications and Challenges. Industrial IoT, Case Studies: Agriculture, Healthcare, Activity Monitoring.

(10 Lectures)

RecommendedBooks
1. Pethuru Raj and Anupama C. Raman,*The Internet of Things: Enabling Technologies, Platforms, and Use Cases*, CRC Press.
2. A.Bahga and Vijay Madisetti, *Internet of Things: A Hands-on Approach*, Universities Press
3. Adrian McEwen, *Designing the Internet of Things*, Wiley Publishers, 2013,
4. Daniel Kellmereit, *The Silent Intelligence: The Internet of Things*. 2013.

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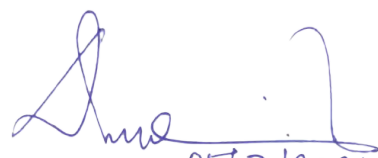72

SKILL ENHANCEMENT COURSE (SEC)

(Students have to choose different papers in different Semesters from the respective groups.)

Group-A: Choices for Semester-I and Semester-III

1. BCA-SE-001: Office Automation Tools
2. BCA-SE-003: ICT Hardware

Group-B: Choices for Semester-II and Semester-IV

1. BCA-SE-002: Mobile Application Development
2. BCA-SE-004: Java Programming

BCA-SE-001 : OFFICE AUTOMATION TOOLS

Credit:2(L1–T0–P1)

Total Lectures: 45 (Theory – 15; Tutorial – 0 Practical – 30)

CourseObjectives

CO-1. Explore the basic concepts of the desktop publishing through office tools.

CO-2. Creating Publications, Editing Publications through different formats.

CO-3. Explore the knowledge of data processing in worksheet.

CO-4. Students will surge their Knowledge about Presentation using Power Point.

CO-5. Groom the students with updated knowledge for online processing of data through Google office tools.

LearningOutcomes
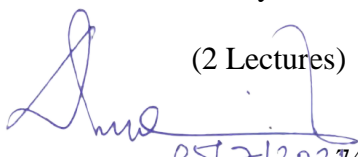
On completion of this course the students will be able to:

1. Documents, spreadsheets, make small presentations and would be acquainted with internet.
2. Efficient Internet Research
3. Spelling, Punctuation, and Grammar
4. General Office Skills; File Management, Record Filing, Telephone & Email Etiquette
5. Intuit QuickBooks Accounting
6. Creating Fillable Forms with Google forms

UNIT – I
Introduction to Open Office, Microsoft Office and LibreOffice. Features, Creating, Saving and Opening Documents, Interface, Toolbars, Ruler, Menus, Keyboard Shortcut.

(2 Lectures)

UNIT – II

Word/writer: Editing, Previewing, Printing & Formatting a Document, Find& Replace, Using Thesaurus, Using Auto- Multiple Functions, Mail Merge, Handling Graphics, Tables & Charts, Converting a word document into various formats like- Text, Rich Text format, Word perfect, HTML, PDF etc.

(2 Lectures)

UNIT – III

Excel/Calc: Creating, Saving, closing, editing a Workbook, Inserting, Deleting Work Sheets, entering data in a cell, Copying and Moving from selected cells, entering formula, handling operators in Formula, Functions: Mathematical, Logical, statistical, text, financial, Date and Time functions, Using Function Wizard. Formatting a Worksheet: Formatting Cells – changing data alignment, changing date, number, character or currency format, changing font, adding borders and colors, Printing worksheets, Charts and Graphs – Creating, Previewing, Modifying Charts, LOOKUP/VLOOKUP.

(5 Lectures)

UNIT – IV

PowerPoint/Impress: Creating, Opening and Saving Presentations, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and Correcting Typing Mistakes, Making Notes Pages and Handouts, Drawing and Working with Objects, Adding Clip Art and other pictures, Designing Slide Shows using templates, Rehearse timing, Narration, Multimedia effects- Apply Transitions between Slides, Animate Slide Content, Set Timing for Transitions and Animations, Insert and Format Media, Encrypting presentations with a password, Running and Controlling a Slide Show, Printing Presentations.

(4 Lectures)

UNIT – V

Google Office Tools: Creating, saving, downloading, sharing files/folders from Google drive, creating and sharing Google docs, import and export docs, creating and sharing Google sheet, import and export Google sheet, Google forms and form responses, creating Google slides for presentation.

(2 Lectures)

RecommendedBooks

1. Linda Foulkes, *Learn Microsoft Office 2019*, Packt Publishing Limited; Illustrated edition (29 May 2020)
2. Bittu Kumar, *Mastering MS Office*, V&S Publishers (1 January 2017)
3. Kevin Wilson, *Exploring Microsoft Office: The Illustrated, Practical Guide to Using Office and Microsoft 365*, Elluminet Press; 1st edition (30 November 2020)
4. Wallace Wang, *Microsoft Office 2019 For Dummies*, Wiley (1 January 2018)
5. Diane L. Martin, *Office in a Minute*, Createspace Independent Pub; 2nd

edition (8 September 2013)

6. https://blog.flipbuilder.com/2019/02/how-to-create-a-book-on-google-docs/
7. https://skillshop.exceedlms.com/student/path/61209-fundamentals-training.
8. https://applieddigitalskills.withgoogle.com/c/en/gsuitecertification.

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BCA-SE-003 : ICT HARDWARE

Credit:2(L1–T0–P1)

Total Lectures: 45 (Theory – 15; Tutorial – 0 Practical – 30)

CourseObjectives

CO-1.Indicate the names and functions of hardware ports and the parts of the motherboard.

CO-2. Identify the names and distinguishing features of different kinds of input and output devices.

CO-3. Describe how the CPU processes data and instructions and controls the operation of all other devices.
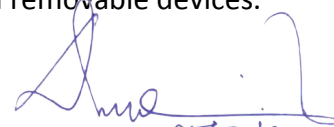
CO-4. Identify the names, distinguishing features, and units for measuring different kinds of memory and storage devices.

CO-5. Search your personal computer for the various hardware components it contains.

LearningOutcomes

On completion of this course the students will be able to:

1. Identify the hardware components of a computer.
2. List the hardware components such as processor, memory, disk, main board, etc.
3. Explain the features (speed, capacity, etc.)of the hardware components of a computer.
4. Explain the relationships between the components of a computer and how data are transferred among the components.
5. Identify the peripheral devices outside computer.
6. Use computer using input devices, such as keyboard and mouse.
7. Transfer data outside the computer using output devices, such as screen and printer.
8. Save files to removable devices and loads files from removable devices.
9. Connect to the Internet using network cards.
10. Identify the software running on a computer.
11. Identify BIOS and changes settings in BIOS.

12. List jobs of operating system.
13. Use the Windows and Linux operating systems.
14. Test the performance of hardware components on some specific programs.

UNIT – I

Evolution of computer system, Modern computer, Classification of computer, Personal Computer hardware: Monitor Keyboard, Mouse, Scanner, printer, speaker.

(2 Lectures)

UNIT – II

Hard Disk Drive: logical structure and file system, FAT, NTFS. Hard disk tools: Disk cleanup, error checking, defragmentation, scanning for virus, formatting, installing additional HDD. New trends in HDD. Floppy Disk Drive.

(2 Lectures)

UNIT – III

Optical Media, CDROM, theory of operation, drive speed, buffer, cache, CD-R, CD-RW, DVD ROM, DVD technology, preventive maintenance for DVD and CD drives. Recent trends and developments in related technologies. Driver installation, Writing and cleaning CD and DVD.
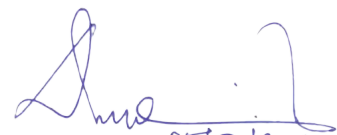
(5 Lectures)

UNIT – IV

Processor: Intel processor family. Latest trends in processor, Motherboard, Sockets and slots, power connectors. Peripheral connectors. Bus slots, USB, pin connectors. Different kinds of motherboards. RAM, different kinds of RAM. RAM upgradation. SMPS. BIOS.

(4 Lectures)

UNIT – V

Network Interface Card, network cabling, I/O Box, Switches, RJ 45 connectors, Patch panel, Patch cord, racks, IP address.

(2 Lectures)

RecommendedBooks
1. Vikas Gupta , *Comdex: Hardware and Networking Course Kit*, DreamTech press
2. Ron Gilster , *PC hardware: A beginners Guide*, Tata McGraw Hill

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BCA-SE-002 : MOBILE APPLICATION DEVELOPMENT

Credit:2(L1–T0–P1)

Total Lectures: 45 (Theory – 15; Tutorial – 0; Practical – 30)

CourseObjectives

CO1: Understand the concepts of android operating system and its development tools.

CO2: Gain conceptual understanding of Android Activities and GUI Design Concepts

CO3: Understand the concepts of Advanced UI Programming.

CO4: Able to demonstrate their ability to develop software with reasonable complexity in mobile platform.

LearningOutcomes

On completion of this course the students will be able to:

1. Install and configure Android application development tools.
2. Design and develop user Interfaces for the Android platform.
3. Save state information across important operating system events.
4. Apply Java programming concepts to Android application development

UNIT – I
Introduction and Basics of Android, android Versions, Features of android, architecture of android, the android market, Setting up development environment - android studio, android sdk, Android Virtual Device (AVD).
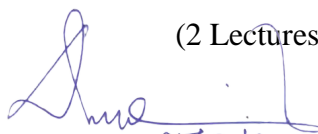
(2 Lectures)

UNIT – II
Basic Building blocks Activities, Fragments, and Intents: understanding Activities, Activity Lifecycle, Application Manifest, Activity Example, Intents, Intent example, Fragments, life Cycle of a Fragment.

(2 Lectures)

UNIT – III

Introduction to Android User Interface: Styles & Themes, Views and View groups, Types of Layout: Frame Layout, Linear Layout, Relative Layout ,Table Layout, scroll View, Grid Layout ,constraint layout, units of measurement, display orientation, action bar.

<div align="right">(4 Lectures)</div>

UNIT – IV
Basic UI Design: Text View ,Edit Text ,Button , Image Button , Check Box , Toggle Button , Radio Button , Radio Group, Toggle Button, Progress Bar ,AutoComplete Text Box ,timepickerView,DatepickerView,listViewView,spinnerView,Specialized fragment types, Alert Dialogs & Toast, Image View, Image Switcher view, Grid View, Web View, using menus With Views.
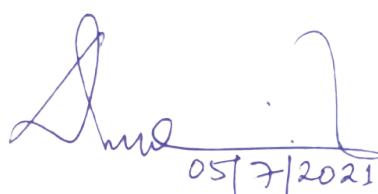
<div align="right">(5 Lectures)</div>

UNIT – V
Data Persistence: saving and loading user preferences, persisting data to files, Creating and using databases, Introducing SQLite. Content Providers: sharing Data in android, using a Content provider. Web Services: Receiving HTTP Response (XML, JSON), Parsing JSON and XML, Using Web View. Messaging: SMS Messaging, sending email, Location: Based Services- Displaying Maps, Google API for Maps, getting location Data.

<div align="right">(2 Lectures)</div>

RecommendedBooks

1. J.F. DiMarzio,*Beginning Android Programming with Android Studio 4th Edition*, Wiley &Son s.
2. John Horton,*Android Programming for Beginners - Second Edition: Build in-depth, full-featured Android 9 Pie apps starting from zero programming experience*, Ingram short title; 2nd edition,2010.
3. RetoMeierPaul,*Professional Android 4 Application Development*,Wiley

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BCA-SE-004 : JAVA PROGRAMMING

Credit:2(L1 –T0–P1)

Total Lectures: 45 (Theory – 15; Tutorial – 0; Practical – 30)

CourseObjectives

CO1: Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.

CO2: Read and make elementary modifications to Java programs that solve real-world problems.

CO3: Validate input in a Java program.

CO4: Identify and fix defects and common security issues in code.

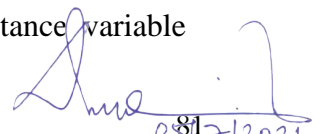CO5: Document a Java program using Javadoc.

LearningOutcomes

On completion of this course the students will be able to:

1. List and use Object Oriented Programmingconcepts forproblem solving.
2. Write programs using Java collection API aswell as thejava standard class library.
3. Solve the inter-disciplinary applications usingtheconcept of inheritance.
4. Apply JDBC to provide a program levelinterface forcommunicating with database using javaprogramming.
5. Apply the garbage collection for saving theresourcesautomatically

UNIT – I

Introduction - History-Java and the Internet-Java Applets and Applications-Features of Java-Data types -Literals-Variables-Type conversion and casting-Arrays-one and Multidimensional Arrays-Operators-Arithmetic, Boolean logical, Relational and Bitwise operators-Operator Precedence. Classes and Objects - General form of a class-Creating objects-Constructors-Parameterized constructors-Defining methods-Overloading methods-Returning a value-Returning an object-Recursion-Access control-Garbage collection-finalize () method-this keyword and instance variable hiding-Static variables and methods-Defining constants using final.

String Handling - String Constructors-String length-String Literals-String Concatenation-String concatenation with other data types-String conversion and toString()- Character Extraction- String Comparison-Searching Strings- Modifying a String- Data Conversion and valueOf()-Changing the case of characters-String Buffer.

(3 Lectures)

UNIT – II
Inheritance - Basics-Member Access and Inheritance- Super class variable referring to a sub class-Applications of keyword super- Creating a Multilevel Hierarchy-Order of calling constructors-Method Overriding-Dynamic method dispatch-Abstract classes -Using final with Inheritance. Packages and Interfaces - Defining a package-CLASSPATH -Defining an Interface - Implementing interfaces -Variables in interfaces-Extending interfaces.

(3 Lectures)

UNIT – III
Exceptions- Types - Uncaught Exceptions - try and catch - Multiple catch - Nested try-throw, throws and finally-Built-in Exceptions. Multithreaded Programming - The Java Thread Model- Thread Priorities- Synchronization.
Java.io Package-I/O Basics-Reading console Input-Writing console output-PrintWriter class-Reading and Writing files-Java I/O classes and interfaces-File class-Stream classes-Byte Streams-Character Streams.
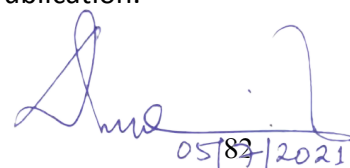
(3 Lectures)

UNIT – IV
Applets-Applet basics-Applet Architecture-Applet life cycle-Applet display methods-Repaint-Status window-passing parameters to applets-getDocumentBase() and getCodeBase()-AppletContext and showDocument().Event Handling-Event handling mechanisms-Delegation Event Model-Event classes-Sources of events-Event listener interfaces-Handling mouse and keyboard events-Adapter classes-Inner classes.

(3 Lectures)

UNIT – V
AWT-AWT classes-Window fundamentals-working with frame windows-Creating a frame window in an applet-Creating a windowed program-Displaying information within a window AWT Controls, Layout Managers and Menus – Control Fundamentals-Labels-Buttons-CheckBoxes-CheckBoxGroup-ChoiceControl-Lists-ScrollBar-TextField-TextArea-LayoutManagers-MenuBars and Menus-Dialog Boxes- File Dialog- Handling events by extending AWT components.

(3 Lectures)

RecommendedBooks
1. Herbert Schildt, *Java: The Complete Reference*, TMH Publication
2. Deitel and Deitel, *Java Programming*, PHI
3. E. Balagurusamy, *Programming with JAVA a Primer*, TMH Publication.

GENERIC ELECTIVES

First Semester:

BCA-GE-001 Mathematics – I

Second Semester:

BCA-GE-002 Mathematics – II

Third Semester :

BCA-GE-003 Financial Management Techniques

Fourth Semester (Choose Any One):

4. BCA-GE-004Discrete Mathematics
5. BCA-GE-005Principles of Management
6. BCA-GE-006 Digital Marketing

SEMESTER I

BCA-GE-001 : MATHEMATICS-I

Credit:6(L5–T1–P0)

Total Lectures: 90 (Theory – 75; Tutorial – 15 Practical – 0)

CourseObjectives

CO-1. To learn Set theory and Relation concepts.

CO-2. To learn predicate calculus and Boolean algebra.

CO-3. To learn different matrices and its operations

CO-5. Identify the permutations and combinations.

CO-6. Understand different graphs and trees.

LearningOutcomes

On completion of this course the students will be able to:

1. Understand the foundations of mathematics for computing
2. Perform basic computations in higher mathematics
3. Read and understand middle-level proofs
4. Write and understand basic proofs
5. Develop and maintain problem-solving skills
6. Use mathematical ideas to model real-world problems
7. Communicate mathematical ideas with others
8. Have experience using technology to address mathematical ideas.
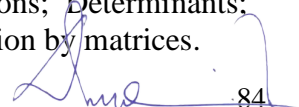
UNIT – I

Set Theory: Set, relations, equivalence relations; mappings-one-one and onto; Definition of an algebraic structure; Introduction to groups, subgroups, normal subgroups, isomorphism, homeomorphism; automorphism of groups; semigroups, monoids, rings, vector space.

(17 Lectures+ 03 Tutorials)

UNIT – II

Matrix and Determinant:Matrices and system of linear equations; Determinants; Algebra of Matrices, Inverse of Matrices, Solution of linear equation by matrices.

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(17 Lectures+ 03 Tutorials)

UNIT – III

Logic: Logic operators, Truth table, Normal forms, Theory of inference and deduction, Mathematical induction, Predicate calculus; predicates and quantifiers.Boolean algebra.   Lattice.

(17 Lectures+ 03 Tutorials)

UNIT – IV

Combinatorics:Basic counting techniques, Permutations and combinations, the Binomial theorem, Recurrence relations and their solutions, Generating functions.

(12 Lectures+ 03 Tutorials)
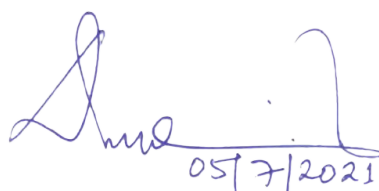
UNIT – V

Graph Theory:Elements of graph theory; Circuits and graph theory; Trees; Applications of graphs as models.

(12 Lectures+ 03 Tutorials)

RecommendedBooks
1. D. P. Acharjya,*Discrete Mathematics*,New Age International.
2. Ralph P Grimaldi, *Discrete and Combinatorial Mathematics,*Pearson Education.

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SEMESTER II

BCA-GE-002 : MATHEMATICS-II

Credit:6(L5–T1–P0)

Total Lectures: 90 (Theory – 75; Tutorial – 15 Practical – 0)

CourseObjectives

CO-1. Perform operations on various discrete structures such as sets, functions, relations, and sequences.

CO-2. Ability to solve problems using Counting techniques, Permutation and Combination, Recursion and generating functions.

CO-3. Apply algorithms and use of graphs and trees as tools to visualize and simplify Problems

CO-4. Use of K-Maps and Truth Tables to construct and verify correctness of a Boolean expression.

CO-5. Understand the various properties of algebraic systems like Rings, Monoids and Groups.

LearningOutcomes

On completion of this course the students will be able to:

1. Understand operations on various discrete structures such as sets, functions, relations, and sequences.
2. Solve problems using Counting techniques, Permutation and Combination, Recursion and generating functions.
3. Understand the use of graphs and trees as tools to visualize and simplify Problems
4. Understand the use K-Maps and Truth Tables to construct and verify correctness of a Boolean expression.
5. Understand the various properties of algebraic systems like Rings, Monoids and Groups.

UNIT – I
Limits & continuity, Differentiation & its applications, Integration & its applications, Derivatives of elementary functions and their inverse, L'Hospital's rule, Extreme

values of functions.

<div align="right">(17 Lectures+ 03 Tutorials)</div>

UNIT – II

Techniques of integration:substitution; by parts; partial fraction; trigonometric integrals; trigonometric substitution.

<div align="right">(17 Lectures+ 03 Tutorials)</div>

UNIT – III

Elementary ideas of Series and Sequence of real numbers and their convergences by GP series and ratio test.

<div align="right">(17 Lectures+ 03 Tutorials)</div>

UNIT – IV

Elementary ideas of Functions of several variables and partial derivatives, Introduction to ordinary differential equations.

<div align="right">(12 Lectures+ 03 Tutorials)</div>
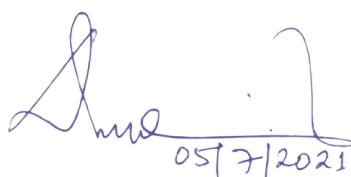
UNIT – V

Error analysis, Solving linear and nonlinear equations by approximation, Newton Raphson method, Interpolation and extrapolation, Numerical integration.

<div align="right">(12 Lectures+ 03 Tutorials)</div>

RecommendedBooks
1. B. C. Das and B. N. Mukherjee,*Differential Calculus*, U. N. Dhur& Sons Pvt. Ltd., 55th edition,1949
2. B. C. Das and B. N. Mukherjee,*Integral Calculus - Differential Equations*, U. N. Dhur& Sons Pvt. Ltd.; 57th edition,1938
3. H. C. Saxena,*Finite Difference and Numerical Analysis*, S Chand,2010

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BCA-GE-003 : FINANCIAL MANAGEMENT ECHNIQUES

Credit:6(L5–T1–P0)

Total Lectures: 90 (Theory – 75; Tutorial – 15 Practical –0)

CourseObjectives

CO1: Students who complete this course will be able understand the use of finance for decision making by the end of the course students will able to describe time value of money, how a project is made and appraised.

CO2: Students of the course will able to differentiate between the various sources of finance and their pros & cons.

CO3: Students who completes this course will be able to outline capital requirements for starting a business & management of working capital Students of the course will able to recommend whether and why an investment should be accepted or rejected.
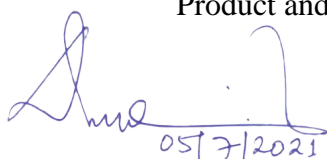
LearningOutcomes

On completion of this course the students will be able to:

1. comprehend and evaluate the role of database management systems in information technology applications within organizations
2. Perform analytical reviews of financial results, proposals, and plans
3. Identify funding sources, instruments, and markets
4. Demonstrate knowledge of the value of money over time and its uses
5. Demonstrate knowledge of a basic financial vocabulary
6. Recognize the importance of ethics

UNIT – I

An overview of entrepreneurship, Entrepreneurial characteristics, Rewards and drawbacks of entrepreneurship, Entrepreneurship and innovation, Entrepreneurial creative- innovative process, Planning finance for entrepreneurial ventures, Organizing and financing the new venture, Marketing and new venture development, Product and service concept for new ventures, Managing entrepreneurial ventures.

(17 Lectures+ 03 Tutorials)

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UNIT – II

Financial Management: Meaning and role. Ratio Analysis, Fund Flow statements: Meaning of the terms- fund, flow and fund, working capital cycle, preparation and interpretation of the fund flow statement. Costing: Nature, Importance and basic principles. Budget and Budgetary Control: Nature and scope, Importance, Method of finalization of master budgets and functional budgets.

(17 Lectures+ 03 Tutorials)

UNIT – III

Financial records and statements. Principles and practices of financial managements. Tools for financial management. IT as a tool for financial management.
Current trends in electronic financial management.

(12 Lectures+ 03 Tutorials)

UNIT – IV

Accounting: Principles, Concepts and conventions, Double entry system of Accounting, Introduction of basis books of accounts of sole proprietary concern, Control accounts for debtors and creditors, closing of books of accounts and preparation of Trail Balance. Final Accounts: Trading, Profit and Loss Accounts and Balances Sheet of Sole Proprietary concern with normal closing entries.
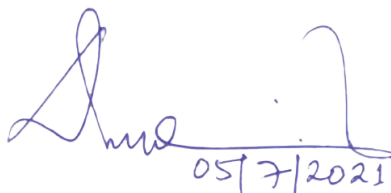
(17 Lectures+ 03 Tutorials)

UNIT – V

Introduction to Computerized Accounting Systems: Master files, Transaction files, Introduction to documents used for data collection, processing of different file and output obtained.

(12 Lectures+ 03 Tutorials)

RecommendedBooks
1. Maheswari S. K,*Financial Accounting,* TMH publishers
2. Khan M. Y. and Jain, P K,*Financial Management*, TMH publishers
3. Y. K. Bhusan,*Fundamentals of Business Organisation and Management,* S Chand Publication.

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BCA-GE-004 : DISCRETE MATHEMATICS

Credit:6(L5–T1–P0)

Total Lectures: 90 (Theory – 75; Tutorial – 15 Practical –0)

CourseObjectives

CO1: Construct mathematical arguments using logical connectives and quantifiers.

CO2: Verify the correctness of an argument using propositional and predicate logic and truth tables.

CO3: Demonstrate the ability to solve problems using counting techniques and combinatorics in the context of discrete probability.

CO4: Solve problems involving recurrence relations and generating functions.

CO5: Use graphs and trees as tools to visualize and simplify situations.

CO6: Perform operations on discrete structures such as sets, functions, relations, and sequences.

CO7: Construct proofs using direct proof, proof by contraposition, proof by contradiction, proof by cases, and mathematical induction.

CO8: Apply algorithms and use definitions to solve problems to prove statements in elementary number theory.

LearningOutcomes

On completion of this course the students will be able to:

1. Construct simple mathematical proofs and possess the ability to verify them
2. Have substantial experience to comprehend formal logical arguments
3. Express mathematical properties formally via the formal language of propositional logic and predicate logic
4. Specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess
5. Describe computer programs (e.g. recursive functions) in a formal

mathematical manner
6. Apply basic counting techniques to solve combinatorial problems
7. Use various techniques of mathematical induction (weak, strong and structural induction) to prove simple mathematical properties of a variety of discrete structures
8. Describe and develop Relational Algebra and Relational Calculus queries
9. Explain the principle of transaction management design.

UNIT – I
Set Theory:
Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions, Growth of Functions,
Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter - example, Proof by contradiction.

(17 Lectures+ 03 Tutorials)

UNIT – II
Algebraic Structures:
Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo n.

(17 Lectures+ 03 Tutorials)

UNIT – III
Partial order sets:
Definition, Partial order sets, Combination of partial order sets, Hasse diagram.
Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.
Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.
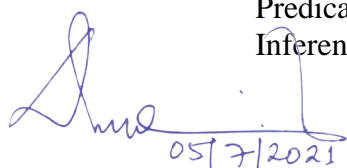
(17 Lectures+ 03 Tutorials)

UNIT – IV
Propositional Logic:
Proposition, well-formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference
Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic.

(12 Lectures+ 03 Tutorials)
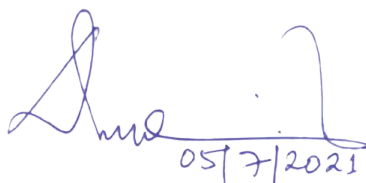
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UNIT – V

Trees:

Definition, Binary tree, Binary tree traversal, Binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences. Combinatory, Introduction, Counting Techniques, Pigeonhole Principle.

(12 Lectures+ 03 Tutorials)

RecommendedBooks

1. Jean Paul Trembley and R Manohar,*Discrete Mathematical Structures with Application to Computer Science*, McGraw-Hill Publications
2. Kenneth H. Rosen,*Discrete Mathematics and Its Applications*, McGraw-Hill
3. C. L Liu,*Elements of Discrete Mathematics*, McGraw-Hill Inc, 1985.
4. Alan Tucker, *Applied Combinatorics*,John Wiley & Sons; 4th Edition , 2007.
5. Ronald Graham, Donald Knuth, and Oren Patashnik,*Concrete Mathematics*, 2nd Edition, Pearson Education Publishers ,1996.

BCA-GE-005 : PRINCIPLE OF MANAGEMENT

Credit:6(L5–T1–P0)

Total Lectures: 90 (Theory – 75; Tutorial – 15 Practical – 0)

CourseObjectives

CO1: Recognize the role of a manager and how it relates to the organization's mission.

CO2: Define management, its four basic functions and skills.

CO3: Know critical management theories and philosophies and how to apply them.

CO4: Recognize the concept of social responsiveness and its benefits.

CO5: Explain the relationship between strategic, tactical, and operational plans.

LearningOutcomes

On completion of this course the students will be able to:

1. Evaluate the global context for taking managerial actions of planning, organizing and controlling.
2. Assess global situation, including opportunities and threats that will impact management of an organization.
3. Integrate management principles into management practices.
4. Assess managerial practices and choices relative to ethical principles and standards.
5. Specify how the managerial tasks of planning, organizing, and controlling can be executed in a variety of circumstances.
6. Determine the most effective action to take in specific situations.
7. Evaluate approaches to addressing issues of diversity.

UNIT – I
Management: Meaning, nature, importance and elements of management. Administration and management, limitations of management. Levers of management. Development of management through different schools of management. Critical study of Taylor, Fayol, Siman and Peter Brucker, Hawthorre experiments and contribution of behavioral scientists.
Planning: Nature of planning, problems of planning, types of planning, steps in

planning. Management by Objectives.

(17 Lectures+ 03 Tutorials)

UNIT – II

Organization: Definition, Theories of organization,Classical, Neoclassical and modern theory.Principles of organization, different approaches of analysis, decision approach, empirical approach etc. Types of organizational line functional line of staff, formal and informal etc. Departmentation, delegation, de-centralization.

Staffing: Nature and object, manpower planning, sources of supply of manpower, recruitment, training & development and leadership.

(17 Lectures+ 03 Tutorials)

UNIT – III

Motivation: Meaning, importance, Financial and Non-financial incentives
Coordination: Meaning, importance, methods.

(12 Lectures+ 03 Tutorials)

UNIT – IV

Controlling: steps involved in controlling, essentials of a good control system, budgetary and non-budgetary control.

Decision making: Meaning, importance, process and quantitative techniques of decision making.

Forecasting: elements of forecasting, methods of forecasting.
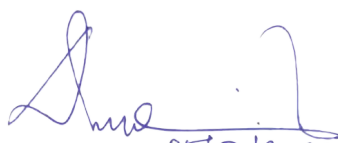
(17 Lectures+ 03 Tutorials)

UNIT – V

Direction and communication: Meaning, types and importance.

Management and Society: Need of management in society, Social responsibility of management.

(12 Lectures+ 03 Tutorials)

RecommendedBooks
1. Harold Koontz, *Principles of Management(Ascent Series)*, Tata McGraw Hill Education, First Edition ,2004
2. D.K.Sharma, *Business Administration*, Centrum Press
3. Tripathi, *Principles of management*, Tata McGraw Hill Education.

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संयुक्त कुलसचिव (शैक्षणिक एवं सम्मेलन)
राजीव गांधी विश्वविद्यालय
Jt. Registrar (Acad. & Conf.)
Rajiv Gandhi University
Rono Hills, Doimukh (A.P.)

BCA-GE-006 : DIGITAL MARKETING

Credit:6(L5–T1–P0)

Total Lectures: 90 (Theory – 75; Tutorial – 15 Practical –0)

CourseObjectives

CO1: Analyze the confluence of marketing, operations, and human resources in real-time delivery.

CO2: Demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets, as well as in identifying, assessing and selecting digital market opportunities.

CO3: Explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying relevant marketing theories and frameworks.

CO4: Investigate and evaluate issues in adapting to globalised markets that are constantly changing and increasingly networked.

CO5: Interpret the traditional marketing mix within the context of a changing and extended range of digital strategies and tactics.
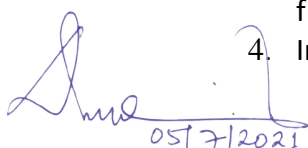
CO6: Comprehend the importance of conversion and working with digital relationship marketing.

CO7: Analyse cross-cultural and ethical issues in globalised digital markets.

LearningOutcomes

On completion of this course the students will be able to:

1. Analyze the confluence of marketing, operations, and human resources in real-time delivery.
2. Demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets, as well as in identifying, assessing and selecting digital market opportunities.
3. Explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying relevant marketing theories and frameworks.
4. Investigate and evaluate issues in adapting to globalised markets that are

constantly changing and increasingly networked.

5. Interpret the traditional marketing mix within the context of a changing and extended range of digital strategies and tactics.
6. Comprehend the importance of conversion and working with digital relationship marketing.
7. Analyse cross-cultural and ethical issues in globalised digital markets

UNIT – I
Introduction of the digital marketing, Digital vs. Real Marketing, Digital Marketing Channel, Creating initial digital marketing plan, Content management, SWOT analysis, Target group analysis.

(15 Lectures+ 03 Tutorials)

UNIT – II
Internet Marketing and Digital Marketing– Internet Marketing, opportunities and challenges; Digital marketing framework; Digital Marketing mix, Impact of digital channels on Integrated Marketing Communication (IMC).

(15 Lectures+ 03 Tutorials)

UNIT – III
Search Engine Advertising: - Pay for Search Advertisements, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation Display marketing: - Types of Display Ads - Buying Models - Programmable Digital Marketing - Analytical Tools - YouTube marketing.

(15 Lectures+ 03 Tutorials)

UNIT – IV
Social Media Marketing :Introduction to social media platforms, penetration & characteristics; Building a successful social media marketing strategy Facebook Marketing: Business through Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools Linkedin Marketing: - Introduction and Importance of Linkedin Marketing, Framing Linkedin Strategy, Lead Generation through Linkedin, Content Strategy, Analytics and Targeting.
Twitter Marketing: Introduction to Twitter Marketing, how twitter Marketing is different than other forms of digital marketing, framing content strategy.
Twitter Advertising Campaigns Instagram and Snapchat: Digital Marketing Strategies through Instagram and Snapchat Mobile Marketing, Mobile Advertising, Forms of Mobile Marketing, Features, Mobile Campaign Development, Mobile Advertising Analytics Introduction to social media metrics.

(15 Lectures+ 03 Tutorials)

UNIT – V
Introduction to SEO, SEM, Web Analytics, Mobile Marketing, Trends in Digital Advertising, Introduction and need for SEO, How to use internet & search engines; search engine and its working pattern, On-page and off-page optimization, SEO Tactics. Introduction to SEM Web Analytics: Google Analytics & Google AdWords; data collection for web analytics, multichannel attribution, Universal analytics,
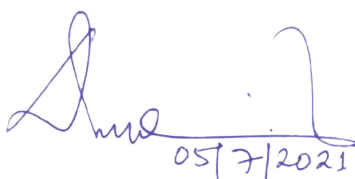
Tracking code.

<div align="right">(15 Lectures+ 03 Tutorials)</div>

RecommendedBooks

1. Seema Gupta, *Digital Marketing*,McGraw Hill; Second edition,2020.
2. Puneet Bhatia, *Fundamentals of Digital Marketing*, Pearson, Second Edition, 2019.
3. Ian Dodson, *The Art of Digital Marketing*, Wiley; 1st edition, 2016.
4. Vandana Ahuja, *Digital Marketing*, Oxford University Press; Illustrated edition,2015.
5. Philip Kotler, *Marketing 4.0 - Moving from Traditional to Digital*, Pan Macmillan, 2017.

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