

Department of Computer Science & Applications

A Revised Syllabus of

BCA - (Semester I to VI)



Session 2019-2020 and onwards

(Effective from July 2019)

(Approved by BoS on dated 05-07-2019)

DR. HARISINGH GOUR VISHWAVIDYALAYA, SAGAR (M.P.)
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In view of letter no. DOAA/2017/171 dated 24-05-2017 and another letter no. DOAA/2017/179 dated 01-06-2017 and decision of Board of Studies the following shall be rules and regulations regarding conduct of academic activities of the teaching programme:

1. Name of the program : Bachelor of Computer Applications (BCA)
2. Duration of the program: 3 Years
 - (a) Minimum duration : 3 Years
 - (b) Maximum duration : As per University Ordinance
3. Structure of the program:

BCA Course Credit Distribution

Semester	Core Course (CC) Credits	Elective Course (EC) Credits	Language Course (LN) Credits	Skill Based Course (SE) Credits	Total Credits
I	19	--	02	--	21
II	20	--	02	--	22
III	19	--	--	05	24
IV	20	03	--	02	25
V	20	03	--	--	23
VI	-	06	--	02	08
TOTAL	98	12	04	09	123

4. The medium of instruction shall be English (during examination). However lectures may be in Hindi and English both.
5. The minimum 50% listed practicals must have to be completed by the student before appearing in the End Semester Examination.
6. Every student has to attain minimum of 75% of attendance in every course of the programme, failing to which the student will be debarred from appearing in the End Semester Examination. He/ She has to appear in the same in next year as a backlog student after re-registration.

7. Scheme of Examination:

- (a) Mid Semester Examination (ME) : 20 Marks
- (b) Internal Assessment (IA) : 20 Marks
- (c) End Semester Examination (ESE) : 60 Marks

8. Internal Assessment (IA) :

(a) **Theory:** Each theory course shall have the methodology of Internal Assessment using assignment, presentation, group discussion, etc. depending on the number of students in the class and feasibility of adopting a particular methodology. The distribution of marks for internal assessment shall be as follows.

- (i) Evaluation of the assignment.
Presentation, group discussion etc. : 15 marks.
- (ii) Attendance : 05 Marks

The marks of attendance shall be awarded as follows:

- (i) 75 % and below : 00 Marks
- (ii) > 75 % and upto 80 % : 01 Marks
- (iii) >80 % and upto 85 % : 02 Marks
- (iv) >85 % and upto 90 % : 03 Marks
- (v) >90 % and upto 95 % : 04 Marks
- (vi) >95 % : 05 Marks

Note : 8.1 A student shall be eligible to appear in the End Semester Examination only if he/she has appeared in Mid Semester Examination and in Internal Assessment of the same semester.

(b) Practical/ Lab Courses:

Evaluation of Practical/ Lab Courses shall be as follows:

- (i) Performing and getting the experiment checked regularly and incorporating the suggestions in the practical note book : 15 marks
- (ii) Attendance : 05 marks

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- (i) 75 % and below : 00 Marks
- (ii) > 75 % and upto 80 % : 01 Marks
- (iii) >80 % and upto 85 % : 02 Marks
- (iv) >85 % and upto 90 % : 03 Marks
- (v) >90 % and upto 95 % : 04 Marks
- (vi) >95 % : 05 Marks

(c) **End Semester Examination for Practical/ Lab Courses :**

It will consist of 60 marks as follows:

- (a) Assessment of performance in the experiment : 50 Marks
- (b) Viva-Voce of Experiment : 10 Marks

9. **Evaluation of Minor Project:**

If minor project is a full paper (course) then its evaluation shall be based on periodic assessment of the progress of the project and End Semester Examining as follows:

- (i) First periodic assessment of the progress after 08 weeks : 20 Marks
- (ii) Second periodic assessment after 04 weeks : 20 Marks
- (iii) End Semester Examination will consisted of
 - a. Evaluation of the project report : 50 Marks
 - b. Viva – Voce of the project report : 10 Marks

10. **Evaluation of Field-Work/ Out-station-Visit:**

If field work/visit is a full paper (course) then it will be evaluated as follows:

- (i) Performance in the Field-Work / Out-station -visit and aptitude : 40 Marks
- (ii) End Semester Examination :
 - a. Evaluation of the report on the Field Work : 50 Marks
 - b. Viva-Voce on the report : 10 Marks

11. **Evaluation of Seminars (other than major projects):**

- (1) Documentation for the seminar : 20 Marks
- (2) First presentation of the seminar : 20 Marks
- (3) End Semester Examination : 60 Marks

End Semester Examination will consist:

- (i) Presentation of the seminar : 50 Marks
- (ii) Defend of the presentation : 10 Marks

12. **The credit and teaching hours shall be distributed as under (Minimum)**

Theory	1- Credit = 15 hours / per sem. 2- Credit = 30 hours / per sem. 3- Credit = 45 hours / per sem. 4- Credit = 60 hours / per sem.
Practical	1- Credit = 30 hours / per sem. 2- Credit = 60 hours / per sem.
Tutorial	1- Credit = 15 hours / per sem.

- 13. In practical courses students have to maintain a practical file which will be regularly evaluated and signed by the course Incharge/ coordinator.
- 14. The conflict raised, if any, shall be resolved in the meeting of Departmental council or through the guidelines issued by HoD.
- 15. A tutorial shall be an interactive session with students and mode of conduct of tutorial shall be decided by concerned teacher/ course-in-charge.
- 16. If seminar, workshop, ,group discussion, training or any similar academic event is a part of a course then its score allocation , evaluation shall be decided by the course coordinator.

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BCA (Sem. – I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-LN-111	English - I	02	-	-	02	20	20	60	100
CSA-CC-112	Fundamentals of Computer Science	03	-	-	03	20	20	60	100
CSA-CC-113	Digital Principles	03	-	-	03	20	20	60	100
CSA-CC-114	Fundamentals of Programming using C	03	-	-	03	20	20	60	100
CSA-CC-115	Mathematics for Computer Science	03	-	-	03	20	20	60	100
CSA-CC-116	Fundamentals of Accountancy	03	-	-	03	20	20	60	100
Software laboratory (Practical)									
CSA-CC-117	Software Laboratory - A	-	-	04	02	20	20	60	100
CSA-CC-118	Software Laboratory - B	-	-	04	02	20	20	60	100
		17	-	08	21	--	--	--	800

BCA (Sem. – II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-LN-211	English - II	02	-	-	02	20	20	60	100
CSA-CC-212	PC-Software	04	-	-	04	20	20	60	100
CSA-CC-213	Fundamentals of Data Structures	04	-	-	04	20	20	60	100
CSA-CC-214	Object Oriented Programming	04	-	-	04	20	20	60	100
CSA-CC-215	Probability and Statistics	04	-	-	04	20	20	60	100
Software laboratory (Practical)									
CSA-CC-216	Software Laboratory - A	-	-	04	02	20	20	60	100
CSA-CC-217	Software Laboratory - B	-	-	04	02	20	20	60	100
		18	-	08	22	-	-	-	700

C : Credit, L : Lecture, T : Tutorial, P : Practical, ME : Mid Exam., IA : Internal Assessment, ESE : End Semester Exam.

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BCA (Sem. – III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-311	Computer Organization	04	-	-	04	20	20	60	100
CSA-CC-312	Java Programming	04	-	-	04	20	20	60	100
CSA-CC-313	Fundamentals of Computer Algorithm	04	-	-	04	20	20	60	100
CSA-CC-314	Operation Research	03	-	-	03	20	20	60	100
CSA-SE-315	Organizational Behavior	03	-	-	03	20	20	60	100
Software laboratory (Practicals)									
CSA-CC-316	Software Laboratory - A	-	-	04	02	20	20	60	100
CSA-CC-317	Software Laboratory - B	-	-	04	02	20	20	60	100
Participation / Presentation/ Visit									
CSA-SE-318	Department Seminar, Workshop Participation, Poster Presentation, Training, Group Discussion	-	-	-	02	20	20	60	100
TOTAL		18	-	08	24	-	-	-	800

BCA (Sem. – IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-411	Operating Systems	04	-	-	04	20	20	60	100
CSA-CC-412	Data Communication and Networks	04	-	-	04	20	20	60	100
CSA-CC-413	Visual Programming	04	-	-	04	20	20	60	100
CSA-CC-414	Database Management Systems	04	-	-	04	20	20	60	100
Elective (Opt Any One of Following)									
CSA-EC-411	Inventory Management (SAD)	03	-	-	03	20	20	60	100
CSA-EC-412	Data Warehousing and Mining	03	-	-	03	20	20	60	100
CSA-EC-413	IT Project Management	03	-	-	03	20	20	60	100
Software laboratory (Practicals)									
CSA-CC-415	Software Laboratory - A	-	-	04	02	20	20	60	100
CSA-CC-416	Software Laboratory - B	-	-	04	02	20	20	60	100
Participation / Presentation/ Visit									
CSA-SE - 417	Seminar, workshop Participation , Training, Minor project	-	-	-	02	20	20	60	100
TOTAL		19	-	08	25	-	-	-	800

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BCA (Sem. – V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-511	Software Engineering	04	-	-	04	20	20	60	100
CSA-CC-512	Linux Programming	04	-	-	04	20	20	60	100
CSA-CC-513	Web Technology	04	-	-	04	20	20	60	100
CSA-CC-514	Computer Graphics & Multimedia	04	-	-	04	20	20	60	100
Elective Course (Opt Any One of Following)									
CSA-EC-511	Introduction to Microprocessors	03	-	-	03	20	20	60	100
CSA-EC-512	Advanced Java	03	-	-	03	20	20	60	100
CSA-EC-513	Discrete Mathematical Structures	03	-	-	03	20	20	60	100
CSA-EC-514	Programming using PHP	03	-	-	03	20	20	60	100
Software Laboratory (Practical)									
CSA-CC-515	Software Laboratory - A	-	-	04	02	20	20	60	100
CSA-CC-516	Software Laboratory - B	-	-	04	02	20	20	60	100
	TOTAL	-	-	-	23	-	-	-	700

BCA (Sem. – VI)

Major Project

Code	Title	L	T	P	Credit	Sessional	End Sem.	Total
CSA-EC-611	Major Project (External) based on Industrial Training	-	-	-	06	40	60	100
CSA-SE-612	Seminar and Viva-Voce on project	-	-	-	02	40	60	100
	TOTAL	-	-	-	08	-	-	200

For CSA-EC-611, CSA-SE-612, the Sessional will be held twice as mid term periodic evaluation, each of 20 marks, as per convenience and mode of evaluation of the course-incharge/ teacher-concern. The content, design, methodology, technology, coding, presentation etc. shall be parameters of evaluation. For CSA-SE-612, defending the questions asked during viva-voce shall be additional parameter. Additional seminars may be arranged by the course-incharge, if required. Evaluation of Paper CSA-EC- 611 and CSA-SE-612 shall be by the panel of Internal & External examiners.

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BCA (Sem. – I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-LN-111	English - I	02	-	-	02	20	20	60	100

- Objectives :**
- (1) To trained students about basics of English Grammar.
 - (2) To develop ability to use idioms and word formation.
 - (3) To develop habit of practice to use English dictionary.
 - (4) To develop ability of spoken English for conversation debate and writing.

A. The Basic -Applied Grammar and Usage

UNIT - I Rules of the Language: Parts of Speech: Nouns and Pronouns- Correct usage; Adjectives and Degrees of 'Comparison; Verbs -kinds; Tenses; Tense forms; Adverbs; Agreement of the subject with the verb; Phrasal verbs, voice change; Auxiliaries; prepositions -common errors; conjunctions - their correct uses, Clauses -kinds -usage; Articles -determiners, question, tags; Direct and Indirect speech, correction of sentence; Punctuation. **(6 Hours)**

UNIT-II Vocabulary Building: Idioms -different kinds. Phrases, Fixed Expressions, common foreign words and expressions (e.g. adhoc) -Word for formation - different processes; spelling; one-word substitutes; word often confused and misused. **(6 Hours)**

B. Spoken English

UNIT -III Pronunciation Drills (Identifying problem areas), vowels consonants, IPA, Phonetic Notations -how to look up a word Dictionary for correct pronunciation. **(6 Hours)**

UNIT - IV Conversational English (both theory and practical) stress, Tonal Variations, their importance; what is an interview? How to face an interview?; How to participate in a debate?; What is a Meeting? - Procedures -How to convene?; Discussion -How to participate. **(6 Hours)**

C. Process of writing

UNIT - V Sentence Patterns and Paragraph writing. Logical writing - topical sentences - arrangement of facts - supporting materials. **(6 Hours)**

Learning Outcomes :

After completing this course students will be able to write and communicate in English language including participation in debate & discussion.

Essential Reading:

1. Tickoo and Subramanian, Functional Grammar
2. Pink and Thomas, English Grammar. Composition and Commercial Correspondence

Suggested Reading with links :

1. Hema Srinivasan, Alamelu Ramakrishna, Valli Arunachalam Communication Skills -A Practical Approach, Frank Bros. and Co.
2. Dr. V. Ayothi and Dr. R. Vedavali , English for competitive examination , New century book house, 2002.
3. <http://tutorialpoint.org/EnglishGrammar/Introduction.html>
4. https://www.tutorialspoint.com/spoken_english_errors/introduction.htm

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

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BCA (Sem. – I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-112	Fundamentals of Computer Science	03	-	-	03	20	20	60	100

- Objectives :**
- (1) To aware about classification, components, attachments and peripherals of Computer System.
 - (2) To provide knowledge about digital storage , memories and storing device.
 - (3) To introduce the low level programming languages.
 - (4) To describes basics steps of software development.

UNIT –I	Introduction to Computers- Generations of Modern Computers Classification of digital Computer Systems- Anatomy of a Digital Computer. (9 Hours)
UNIT -II	Boolean Algebra and Logic Circuits Input Devices: Keyboard, Mouse, Track ball, Joystick, Scanner, Digital Camera, MICR, OCR, Barcode Reader, Touch Screen, Light Pen. Output Devices: Monitor, Printer, Plotter, Sound Card and Speaker. (9 Hours)
UNIT- III	Memory Units: RAM, ROM, PROM, EPROM, and EEPROM Auxiliary Storage Devices: Magnetic storage devices-Floppy Diskettes, Hard disks, Removable Hard disks, Magnetic Tapes. Optical Storage- CD-ROM. (9 Hours)
UNIT -IV	Programming Languages; Machine Language, Assembly Language, High Level Language, Types of High Level Language, Compiler and Interpreters (9 Hours)
UNIT -V	Introduction to Software Development: Defining the Problem, Program Design, Coding, Testing, Documenting, and maintaining the program. (9 Hours)

Learning Outcomes : After completing this course student will learn the classification, types, components memories of a computer system alongwith processing of low level programming language and approach to software development.

Essential Reading:

1. Alexis Leon and Mathews Leon Introduction to Computers , Leon TECH World, 1999
2. Peter Norton s Introduction to Computers, Fifth edition , Tata McGraw Hill Publications 2004

Suggested Reading and links :

1. Information Technology Concepts, Satish Jain (BPB).
2. Fundamental of Computers, V. Rajaraman (PHI).
3. Prof. Satish Jain, O Level Made Simple Internet Technology and Web Design (BPB).
4. https://www.tutorialspoint.com/basics_of_computer_science/
5. https://code.org/files/CSF_CoursesA-F_Curriculum_Guide.pdf

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BCA (Sem. – I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-113	Digital Principles	03	-	-	03	20	20	60	100

- Objectives :**
- (1) To learn the basic functioning of processors in the form of number conversion.
 - (2) To be aware of mathematical operations of processing unit & decisions.
 - (3) To be acquainted with architecture of different types of circuit.

UNIT -I	Number System: Binary, Decimal, Octal, Hexadecimal, Conversion binary to decimal, decimal to binary, binary to octal, octal to binary, binary to hexadecimal, hexadecimal to binary etc. Sign magnitude numbers, 1's and 2's complement, Grey code. (9 Hours)
UNIT- II	Boolean algebra: Boolean equation of logic gates, AND, OR, NOT, NOR and NAND gates, truth tables De Morgan's theorems, XOR, XNOR gates, Boolean laws and theorems, Duality theorem. POS and SOP. (9 Hours)
UNIT-III	Karnaugh map, Pairs, Quads and Octets, Karnaugh simplification, condition, POS and, SOP methods. (9 Hours)
UNIT- IV	Combinational circuits: Adder, Subtractor, Decoder, Encoder, Multiplexer and Demultiplexer. (9 Hours)
UNIT -V	Sequential Circuits: Flip Flops, R S, D, JK, Shift registers, Types of shift registers, Asynchronous and Synchronous counters, Semiconductor memories: ROM, PROMS, EPROM, RAM, DRAM, SRAM. (9 Hours)

Learning Outcomes : After completing this course student will learn the functioning of processor using number conversion, gate structure and circuit applications.

Essential Reading:

1. Malvino A. P. & Leech, D. P. - "Digital Principles and Applications"- TMH
2. Malvino "Digital Computer Electronics" TMH

Suggested Reading and links :

1. M.Morris Mano, "Digital Logic and Computer Design", Pearson Publications
2. https://www.tutorialspoint.com/digital_electronics/index.asp
3. <https://www.studytonight.com/computer-architecture/basics-of-digital-components>

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BCA (Sem. – I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-114	Fundamentals of Programming using C	03	-	-	03	20	20	60	100

- Objectives :**
- (1) To aware about fundamentals of programming language.
 - (2) To introduce the pre-defined structure of C-language.
 - (3) To teach features of C-languages with skill of writing computer program.

UNIT -I	Introduction to Programming Algorithms, Flowchart, Source Program, Object Program, Compilers, Interpreters, Assemblers, Modular Programming: Structured Programming, Top- down approach, Stages of Program Development. (9 Hours)
UNIT -II	Introduction to C : character set, Identifiers and keywords. Data type, Declarations, Expressions, statements and symbolic constants, Input-Output: getchar, putchar, scanf, printf, gets, puts, functions, Pre-processor commands, #include, #define, preparing and running a complete C program. Operators and expressions: Arithmetic, Unary, Logical, bit-wise, assignments and conditional Operator, Library functions. (9 Hours)
UNIT- III	Control statements: While, do-while, statement, nested loops, if-else, switch, break, continue and goto statements, comma operator. Arrays: Defining and processing. Multi dimensional arrays. Strings and operations on strings. (9 Hours)
UNIT- IV	Functions: Defining and accessing: Passing arguments, Function prototypes, Recursion. Use of library functions, Storage classes: Automatic, external and static variables. (9 Hours)
UNIT -V	Pointers: Declarations, Passing to a function. Operations on pointers, pointer and arrays. Array of pointers. Structure: Defining and processing. Passing to a function, Union. Data Files: Open, close, create, process unformatted data files. (9 Hours)

Learning Outcomes : After the completion of this course student will learn to write a program in C-language using features like pointers and ~~actions~~ *functions*.

Essential Reading:

1. Y. Kanetkar, "Let's us C" –BPB.
2. Byron S. Gottfried, Programming with C, Schaum Outline Series, TMH, 2nd Edition 1998
3. Kernighan, B.W. and Ritchie, D.M., "The C Programming Language P H I.

Suggested Reading and links :

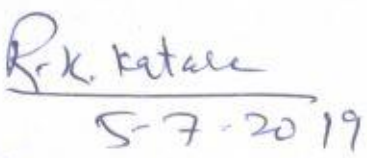
1. Kris A. Jamsa, Programming in C, Galgotia Publications PVT. Ltd.
2. Balaguruswamy, E. 'Computer Concepts and Programming in C', Tata Mc-Graw Hill Education.
3. <https://www.tutorialspoint.com/cprogramming/>
4. <https://fresh2refresh.com/c-programming/c-basic-program/>

e-books (at IP 14.139.234.164):

1. Kamthane, 'Programming in C++', Noida, Pearson (available at: <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)

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BCA (Sem. – I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-115	Mathematics for Computer Science	03	-	-	03	20	20	60	100

Objectives : (1) To introduce concept of matrices, set theory and logical structure.
(2) To aware about graphical structure, linking rules and connections.

UNIT -I	Matrices definition special types of matrices operations symmetric matrices skew symmetric matrices, Inverse Orthogonal matrices Solutions of Simultaneous equations Rank of a matrix, Eigen values. (9 Hours)
UNIT -II	Mathematical Logic Connectives Statement Forms Parenthesis Truth Table Tautology and Contradiction/Logical Implications and equivalences Disjunctive and Conjunctive normal forms. (9 Hours)
UNIT -III	Sets , types of set, Venn diagram, operation on set, Relation, types of relations, functions , types of functions, gof, fog,etc. (9 Hours)
UNIT- IV	Graph Theory: Introduction application of graphs Finite and Infinite Graphs Incidence and Degree Isolated Vertex, Pendant Vertex. Paths and Circuits Connected Graph, Disconnected Graphs and components, Euler Path & Circuit Graphs, Hamiltonian Paths and Circuits. (9 Hours)
UNIT -V	Trees, Types of Tree, Some property of tress, traversal tree. (9 Hours)

Learning Outcomes : After completing this course student will learn the mathematical and graphical structure frequently used in programming decision making and networking.

Essential Reading:

1. R.D.Sharma,"Mathematics" by Dhanpat Rai Publications.
2. Narsingh Deo, Graph Theory with applications to Engineering and Computer Science, PHI, 1997.

Suggested Reading and links :

1. Trembly & Manohar, Discrete Mathematics for Computer Science, TMH, 1997 (Units 2, 3)
2. <https://courses.csail.mit.edu/6.042/spring17/mcs.pdf>
3. <https://www.iith.ac.in/~aravind/Files-DM/LLM-MFCS-2004.pdf>

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BCA (Sem. – I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-116	Fundamentals of Accountancy	03	-	-	03	20	20	60	100

Objectives :

- (1) To learn basic tools of accountancy.
- (2) To aware about classifications of accounts.
- (3) To be acquainted with account creation, calculations & applications.

UNIT-I	Meaning and Scope of Accounting : Meaning, Definition, Features, Objectives, Scope and Branches of Accounting, Distinction between Book-Keeping and Accounting, Systems of Book Keeping (or Recording), Systems of Accounting, Accounting Principles, Concepts and Conventions. (9 Hours)
UNIT-II	Types of Accounts : Personal, Real and Nominal Accounts Rules of Debit and Credit of Journal, Compound & Complex Journal Entry, Opening & Closing Entry, Sub division of journal, Accounting Transactions. (9 Hours)
UNIT-III	Cash Book and other Subsidiary Books-Meaning, kinds and its Preparation, Rules regarding Posting to Ledger and Preparation of Trial Balance, Capital and Revenue Items. (9 Hours)
UNIT-IV	Final Accounts : Meaning, Objectives, Limitations and its Preparation with Adjustments. (9 Hours)
UNIT-V	Depreciation-Meaning, Causes, objectives and Methods of Charging Depreciation, Numerical on Straight Line and Diminishing Balance Method – with and without Provision for Depreciation Account. (9 Hours)

Learning Outcomes : After completion of this course, student will learn the basic tools of accountancy, types of accounts, creation of accounts with calculation and decision thereon.

Essential Reading:

1. S.N. Maheswari, Advanced Accountancy, Vol I, Vikas Publishing
2. R.L.Gupta, Advanced Accounting, S.Chand & Co. New Delhi
3. T.S.Reddy & Murthy, Financial Accounting

Suggested Reading and links :

1. Jain & Narang, Financial Accounting, Kalyani Publications
2. M.C.Shukla & T.S. Grewal Financial Accounting.
3. https://icmai.in/upload/Students/Syllabus-2012/Study_MaterialNew/Foundation-Paper2-Revised.pdf
4. <https://www.accountingcoach.com/accounting-basics/explanation>

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

Approved by BoS on dated 05-07-2019.

D. Shukla
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5-7-2019

AK
5/7/19

Gurpreet
5-7-19

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Computer Science & Applications

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BCA (Sem. – I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-117	Software Laboratory - A	-	-	04	02	20	20	60	100

Objectives : (1) To introduce students with basic Hardware design and internal architecture of computer system.
(2) To make ~~aware~~ ^{aware} about basics of DOS.

Computer Hardware System

- (a) Basic structure of computer system along with all elements.
- (b) Computer Memory, Cache Memory
- (c) Structure of Hard Disk
- (d) Different types of I/O devices and their use.
- (e) Different devices used to provide power to a Computer System.

DOS Operating System

- (a) Booting process.
- (b) Concept of Internal and External Commands.
- (c) Internal commands of Dos along with syntax and example. CLS, Date, Time, Vol., Ver, Dir, MD, CD, RD, Copy, Type, Copy, Del/Erase, Ren, Prompt, Echo.
- (d) External commands. Move, Help, Attrib, Sort, More, Tree, Xcopy, Diskcopy, Backup, Recover, Restore, Format, Unformat.
- (e) Directory and sub directories.
- (f) Printing in Dos.
- (g) Removal of subdirectory.
- (h) Config. Sys, Autoexe.bat and command .com files.

Practice of DOS Commands by students for file creation, file search, file saving, file updation, file merge, file deletion, file copy, file change in directory etc.

Any other as per teacher concern

Learning Outcomes : student will be able to learn the internal architecture of computer system and use of DOS commands.

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

Approved by BoS on dated 05-07-2019.

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BCA (Sem. – I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-118	Software Laboratory - B	-	-	04	02	20	20	60	100

Objectives : (1) To provide practice to students for executing computer programmes developed by them in C-language.

Programmes based on C- Language on following:

1. Check for Prime Number, Armstrong number, Fibonacci
2. Summation of the series: Sin (x) , Cos(x), Exp(x)
3. String Manipulations
 - a. Counting number of vowels, consonants, words, white spaces in a string
 - b. Reversing a string and check for palindrome
 - c. Finding the number of occurrences of a sub string in a given string
 - d. Sub string replacing and removal
4. Recursion
 - a. Factorial
 - b. Reversing a string
 - c. Fibonacci Sequence
 - d. Tower of Hanoi
5. Matrix Manipulations using functions and Case structure
 - a. Addition & Subtraction
 - b. Multiplication
 - c. Transpose
 - d. Check if the given matrix is a Magic square
6. Searching
7. Sorting
8. Structures
9. Pointers
10. Files

Any other as per teacher concern

Learning Outcome : After completing this course, students will be able to run computer programmes in c-language.

ME – Mid – I Exam.;

IA – Internal Assessment;

ESE – End Semester Exam.

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BCA (Sem. – II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-LN-211	English - II	02	-	-	02	20	20	60	100

- Objectives :**
- (1) To develop effective writing in English language.
 - (2) To learn reading comprehension of a text in English language.
 - (3) To make student skilled for drafting letters in English.

UNIT - I Study Skills:	
a) How to use a dictionary and a library.	
b) Effective writing -reasoning out passages.	
c) Reading Comprehension.	
d) Note-taking	(6 Hours)
UNIT -II Precise writing	(6 Hours)
UNIT-III Report writing -Technical and Scientific report writing. Information Transfer -Tables, Graphs, Organograms, Pie-charts, Bar-charts, Schematic diagrams.	(6 Hours)
UNIT -IV Commercial Correspondence (The form and arrangement of commercial letters -varieties)	
a) Trade Inquiries	
b) Orders, Offers, Quotations	
c) Confirmation and Execution of orders	
d) Refusal and Cancellation of orders	
e) Letters of Complaints	
f) Circular letters	
g) Sales letters	(6 Hours)
UNIT - V Drafting	
a) Drafting of official/non-technical reports (routine and non-routine)	
b) Drafting of minutes, short speeches, memoranda, News releases, Postal cards and Reply cards, Telegrams, Mailgrams, Cablegrams, and Radiograms.	
c) Application for a situation (Curriculum vitae etc.)	(6 Hours)

Learning Outcomes : After completing this course student will be able to write effectively the text, letters, drafts in English.

Essential Reading:

1. Hema Srinivasan, Communication Skills: A Practical Approach
2. Fletcher & Growing, The Business Guide to Effective Writing, New light Publications, New Delhi.

Suggested Reading and links :

1. Wilna R. Ebbit & David R. Ebbit, Writers Guide (6th edition).
2. Technical Communication, Ramon, Oxford University Press.
3. Technical Communication, Gerson/ Gerson: (Pearson Education India)
4. <https://www.englishpage.com/>
5. http://toefl.uobabylon.edu.iq/papers/itp_2015_12653122.pdf

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BCA (Sem. – II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-212	PC-Software	04	-	-	04	20	20	60	100

Objectives : (1) To aware students working commands, MS-Word, of MSWord.
 (2) To teach MS-Excel with specific features of graph, charts and wizard.
 (3) To teach the technique of power-point presentation.

UNIT -I	MS-Word: Introduction, Word Processing, Advantages of word processing, Creating, Saving and editing a document: Selecting, Deleting, Replacing Text, Copying text to another file. Formatting Text and Paragraph: Using the Font Dialog Box, Paragraph Formatting using Bullets and Numbering in Paragraphs, Checking Spelling, Line spacing, Margins, inserting Space before and after paragraph. (12 Hours)
UNIT -II	Defining Tabs: using Ruler Bar, Mouse and Tabs Dialog Box. Enhancing Document: Inserting page Breaks, Adding Border, Opening and Closing Toolbars, Using Header and Footers in the Document. Creating and Formatting Tables: Changing Row height, inserting columns, Merging cells Calculations in a Table, Sorting Text, Using Graphics, Using the Drawing Toolbar using word art, Mail merge: Definition, a Practical Example of mail merge, creating charts. (12 Hours)
UNIT -III	MS Excel: Introduction, Definition Excel Screen parts of worksheet, Entering information: Numbers, Formula, Editing Data in a cell, Excel functions, Using a Range with SUM, Moving and copying data, Inserting and Deleting Row and Columns in the worksheet, Using the format cells Dialog box, Using chart wizard to create a chart, Naming ranges, classification of Excel Functions, performing what if analysis with Data Table. (12 Hours)
UNIT -IV	Protecting a workbook with Password, Macro Recording and Running a Macro, Linking workbook files Using Pivot table, Inserting Hyper links. (12 Hours)
UNIT -V	Power Point - Introduction, Slide show, Formatting, Creating a Presentation, Inserting clip Arts, Adding Objects, Applying Transitions, Animation effects, formatting and checking text, Modifying Visual elements, Preparing a complete presentation, Case studies. (12 Hours)

Learning Outcomes : After this course student will be able to work on MS-Word, MS-Excel and MS-Power Point.

Essential Reading:

1. PC Software for Windows 98, R. K. TAXALI, Made Simple" TMH.
2. PC Software- Made Simple by Satish Jian, Published by BPB Pub.
3. Microsoft Office 2016 Step by Setp by Lambert Joan, Publisher – Microsoft Press.
4. Microsoft Office 2016 All –in- One for Dummies by Peter Weverka, Publisher – Wiley.
5. Microsoft Office -2010, By Bittu Kumar, Publisher – V & S Publisher.

Suggested Reading and links :

1. Will Train, Gini Corter, Annette Marquis "Microsoft Office" BPB.
2. MS-Office by S. S. Shrivastava Publisher – Laxmi Publications.
3. <https://www.keynotesupport.com/menu-pc.shtml>
5. <https://nptel.ac.in/courses/106106092/2>

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BCA (Sem. – II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-213	Fundamentals of Data Structures	04	-	-	04	20	20	60	100

Objectives : (1) To teach students various methods of data storage in memory of computer system.
(2) To acquaint students with searching and sorting procedure about the stored data.

UNIT-I	Arrays: One-dimensional Array, Two- dimensional array, Address calculation for 1D and 2 D array, Sparse Matrices, Data structure, classification of data structure. Search - Linear search, Binary search and Hashing. (12 Hours)
UNIT- II	Stack and Queue: Stack- Operations on stack, Implementation of stack as an array, Application Evaluation of Expression & Conversion -Queues: Queue, Operations on Queues, Implementing the queue. (12 Hours)
UNIT -III	Linked List: types of link list, Self Referential, List representations, various insertion and deleting from single link list, Doubly linked list, stack implementation using single linked list, queue implementation using single linked list,. Polynomial- Linked list representations. (12 Hours)
UNIT -IV	Trees: Basic terminology, Binary tree, representation, traversal, Binary search tree (BST) and its traversal, Graph: Definition and Terminology, representation, traversals, and Spanning Tree, Shortest Path. (12 Hours)
UNIT - V	Searching and Sorting: Linear and Binary Searching, Bubble, Selection, Merge, Quick, Insertion sorting. (12 Hours)

Learning Outcomes : After completing this course student will learn storing pattern of the data and appropriate search, sorting procedure for their access when required.

Essential Reading:

1. Ellis Horowitz & Sahani, Fundamentals of Data Structures, Galgotia Publications, New Delhi.
2. Data Structures Using C; Aaron M. Tanenbaum (Pearson Education India)
3. Data Structures Using C and C++ by Yedidyah Langsam, Moshe J. Augenstein, Publisher: Pearson.
4. C Programming and Data Structures by Manjunath Aradhya M. Publisher: Cengage India Private Ltd.
5. Data Structures using C++ by Yashavant P. Kanetkar, Publisher: BPB Publications.

Suggested Reading and links :

1. Data Structures with C, Seymour Lipschutz, Publisher: McGraw Hill Education.
2. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>
3. <https://nptel.ac.in/courses/106102064/>

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BCA (Sem. – II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-214	Object Oriented Programming	04	-	-	04	20	20	60	100

- Objectives :**
- (1) To introduce basics & fundamentals of object oriented programming (OPP).
 - (2) To teach C++ programming language in reference to OPP.
 - (3) To train students about writing computer program in C++/special features of C++.

UNIT -I	Introduction to Object Oriented Programming (OOP), C++ programming basics, Loops and decisions: Relational operators, loops, decision, logical operators, precedence. (12 Hours)
UNIT -II	Structures, enumerated data types. Functions: Simple functions, passing argument to functions, returning values from functions, reference arguments, overloaded functions, inline functions. (12 Hours)
UNIT -III	Objects and classes: classes and Objects, Specifying the class, using the class, constructors, deconstructions, and objects as function arguments, returning objects from function. Arrays: Arrays fundamentals, Arrays a Class member data, Array of objects, Strings. Operator overloading: unary operator, overloading binary operators, Data conversion, Pitfalls of Operator overloading and conversion. (12 Hours)
UNIT -IV	Inheritance: Derived Base class, derived class constructors, overloading member functions, class hierarchies, public and private inheritance, levels of inheritance, multiple inheritance. (12 Hours)
UNIT -V	Virtual functions and other functions: Virtual functions, Friend functions, Static functions this pointer. (12 Hours)

Learning Outcomes : Student will be able to write computer programs using OOP features and specific functions available in C++.

Essential Reading:

1. Robert Lafore, Object Oriented Programming in C++, Golgotha Publication.
2. Timothy Budd, An Introduction to Object-Oriented Programming (3rd Edition), Addison Wesley Longman.
3. Object Oriented Programming with C++ (Sixth Edition): E. Balagurusamy. Published by Tata McGraw-Hill Education Pvt. Ltd.
4. Let us C++, Yashwant Kanetkar, BPB Publications.

Suggested Reading and links :

1. Peter Coad, "Object-Oriented Design" First Edition, Yourdon Press Computing Series
2. <https://nptel.ac.in/courses/106103115/36>
3. <https://nptel.ac.in/courses/106103115/module9/1.pdf>

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Approved by BoS on dated 05-07-2019

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BCA (Sem. – II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-215	Probability and Statistics	04	-	-	04	20	20	60	100

Objectives :

- (1) To make students aware about basic probability theory, probability distributions and their applications.
- (2) To introduce basic statistics and data representation.
- (3) To learn summarization of data and descriptive statistics.

UNIT - I	Events and sets sample space concept of probability addition and multiplication theorem on probability conditional probability and independence of events Baye s Theorem. (12 Hours)
UNIT -II	Concept of random variable Discrete and Continuous random variable - Mathematical expectation Simple problems based on Binomial, Poisson and Normal distribution (12 Hours)
UNIT -III	Introduction to Statistics Nature and scope of statistical methods and their limitations - Primary and Secondary data Classification, tabulation and diagrammatic representation of statistical data - Bar-charts, Pie-diagrams– Graphical Representation of data Histograms, Frequency polygon, Ogives. (12 Hours)
UNIT -IV	Measures of central tendency Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean-properties merits and demerits. (12 Hours)
UNIT - V	Measures of dispersion Quartile deviation mean deviation & standard deviation characteristics coefficient of dispersion coefficient of variation moments. Simple correlation, Karl Pearson coefficient, Rank correlation, Linear Regression, Two lines of regression. Properties of regression coefficient. (12 Hours)

Learning Outcomes : After completing this course, students will learn the basic probability theory and basic descriptive statistics with related calculations and data presentation.

Essential Reading:

1. Gupta S. C and Kapoor V. K., Fundamentals of Mathematical Statistics , 11th Edition, S. Chand and Sons 2002.
2. Fundamental of Statistics, Gupta, S. C., Himalaya Publishing House New Delhi.
3. Fundamentals of Statistics, Goon. A. M., Gupta, M. K. and Dasgupta, B. The World Press Private Limited.
4. Trivedi K. S. "Probability and Statistics with Reliability, Queuing and Computer Science Applications " PHI
5. Meyer, P. L. "Probability theory and Statistical Applications" IBH, Oxford, New Delhi -1980.

Suggested Reading and links :

1. Hooda R.P., Statistics for Business and Economics, 3 rd Edition, Macmillan 2003.
2. Probability and Queneing Theory, Moorthy, M. B. K., Subramani K., Santha A., SciTech Publication Pvt. Ltd.
3. Comprehensive Statistical Method, Arora P. N., Arora Sumeet, Arora, S. and Arora, Amit, S. Chand & Company, Ltd, New Delhi.
4. <https://nptel.ac.in/downloads/111104032/>
5. <http://textofvideo.nptel.ac.in/111105090/lec45.pdf>

e-books (at IP 14.139.234.164):

1. Walpole;Myers ;Myers, 'Probability & Statistics for Engineers & Scientists', Noida, Pearson, (available at : <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)

Learning Outcomes : After completing this course, student will be able to type and edit the text document alongwith data handing on worksheet and preparation of power point presentation.

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

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BCA (Sem. – II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-216	Software Laboratory- A	-	-	04	02	20	20	60	100

Objectives : To provide practicals training to students on MS-Word, MS-Excel & MS – Power point

Practicals based on followings :

MS-WORD

1. Text Manipulations and Text Formatting
2. Usage of Bookmarks, Footnotes, Columns & Hyperlink
3. Usage of Header, Footer, Bulleting and Numbering & Borders and Shading
4. Usage of Tables - Sorting & Formatting
5. Usage of Spell Check, Find and replace
6. Picture insertion and alignment
7. Creation of documents using templates
8. Mail Merge, Envelopes and Labels

MS-EXCEL

9. Cell Editing and Formatting
10. Usage of Formulae and Built-in functions
11. Data Sorting, filter, form, subtotal, validation, Goal seek
12. Inserting Clip arts, objects, pictures and Data Filter, Validation, Subtotals
13. Usage of auditing, comments
14. Graph
15. Usage of Auto Formatting, Conditional Formatting & Style

MS- POWER POINT

16. Inserting New slides, text box, object, charts, tables, pictures, movies and sound
17. Slide layout, Colour Scheme, Background and Design template
18. Preparation of organizational charts
19. Preset and custom animation, action buttons and settings, Slide Transitions and animations, view show, slide sorter view
20. Presentation using Wizards
21. Usage of Design templates

Any other as per teacher concern

Learning Outcomes : After completing this course, student will be able to type and edit the text document alongwith data handing on worksheet and preparation of power point presentation.

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

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BCA (Sem. – II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-217	Software Laboratory- B	-	-	04	02	20	20	60	100

- Objectives :**
- (1) To run program made in C++, by students on computer system.
 - (2) To provide practical training to students relating to data structure using C++.

Practicals based on following :

OOP (Programs using C++)

1. Simple Programs using decisions, loops and arrays
2. Simple functions & Inline functions
3. Function overloading & Operator Overloading
4. Usage of classes and Objects
5. Constructors and Destructors
6. Inheritance & Multiple Inheritances
7. Pointers
8. Virtual Functions, Friend functions, this pointer and Static functions
9. Files
10. Streams

Data Structures

11. Linear Search
12. Binary Search
13. Sort by Selection
14. Sort by Exchange
15. Quick sort
16. Stacks, Queues using arrays
17. Linked List: Insertion and Deletion
18. Polynomial addition using linked list
19. Stack and Queue using Linked List
20. Doubly linked List: Insertion and Deletion
21. Binary tree Traversal [inorder, preorder, postorder]
22. Graph Traversal [breadth first, depth first]

Any other as per teacher concern

Learning Outcomes : By completing this course student will be competent enough to write program in C++ on the problems assigned.

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

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BCA (Sem. – III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-311	Computer Organization	04	-	-	04	20	20	60	100
CSA-CC-312	Java Programming	04	-	-	04	20	20	60	100
CSA-CC-313	Fundamentals of Computer Algorithm	04	-	-	04	20	20	60	100
CSA-CC-314	Operation Research	03	-	-	03	20	20	60	100
CSA-SE-315	Organizational Behavior	03	-	-	03	20	20	60	100
Software laboratory (Practicals)									
CSA-CC-316	Software Laboratory - A	-	-	04	02	20	20	60	100
CSA-CC-317	Software Laboratory - B	-	-	04	02	20	20	60	100
Participation / Presentation/ Visit									
CSA-SE-318	Department Seminar, Workshop Participation, Poster Presentation, Training, Group Discussion	-	-	-	02	20	20	60	100
TOTAL		18	-	08	24	-	-	-	800

BCA (Sem. – IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-411	Operating Systems	04	-	-	04	20	20	60	100
CSA-CC-412	Data Communication and Networks	04	-	-	04	20	20	60	100
CSA-CC-413	Visual Programming	04	-	-	04	20	20	60	100
CSA-CC-414	Database Management Systems	04	-	-	04	20	20	60	100
Elective (Opt Any One of Following)									
CSA-EC-411	Inventory Management (SAD)	03	-	-	03	20	20	60	100
CSA-EC-412	Data Warehousing and Mining	03	-	-	03	20	20	60	100
CSA-EC-413	IT Project Management	03	-	-	03	20	20	60	100
Software laboratory (Practicals)									
CSA-CC-415	Software Laboratory - A	-	-	04	02	20	20	60	100
CSA-CC-416	Software Laboratory - B	-	-	04	02	20	20	60	100
Participation / Presentation/ Visit									
CSA-SE - 417	Seminar, workshop Participation, Training, Minor project	-	-	-	02	20	20	60	100
TOTAL		19	-	08	25	-	-	-	800

C : Credit, L : Lecture, T :Tutorial, P : Practical, ME : Mid Exam., IA : Internal Assessment, ESE : End Semester Exam.

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BCA (Sem. – III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-311	Computer Organization	04	-	-	04	20	20	60	100

- Objectives :**
- (1) To teach the basic tools and structure of Computer Organization.
 - (2) To acquaint students special features internal architecture of Computer System.

UNIT- I	Introduction: The Von Neumann model, the system Bus model, A Typical computer system. Data Representation: Binary numbers, binary codes, fixed point representation, floating point representation, error detection codes. (12 Hours)
UNIT -II	Functional units of computer operational concepts stored program concept. Processor Logic Design Processor Organization Arithmetic Logic Unit Design of Arithmetic Circuit Design of Logic Circuit Design of Arithmetic and Logic Unit status register Design of Accumulator. (12 Hours)
UNIT- III	Memory Organization: Memory hierarchy Main memory operations memory mapping. (12 Hours)
UNIT -IV	Addressing Methods and Machine Program Sequence: Instruction Formats Instruction Sequencing Addressing Modes Stacks Subroutine and linkage. (12 Hours)
UNIT -V	Input-Output Organization: Peripheral Devices I/O Interface Asynchronous Data Transfer Modes of Transfer DMA. (12 Hours)

Learning Outcomes : After completing this course, students will be able to learn the structure, features and functioning of internal hardware of computer system.

Essential Reading:

1. Morris Mano, Digital Logic and Computer Design, PHI 1987.
2. M.Morris Mano, Computer System Architecture, PHI 1986.

Suggested Reading and links :

1. V.Karl Hamacher, Zvokog G. Vranesic and Safwat G. Zaky, Computer Organization, McGraw Hill ISE, 1984
2. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>
3. <https://nptel.ac.in/downloads/106104073/>

e-books (at IP 14.139.234.164):

1. GHOSH, 'COMPUTER ORGANIZATION', Noida, McGraw Hill, (available at <http://mcgrawhilleducation.pdn.ipublishcentral.com/bookshelf>)
2. GOVINDARA, JALU, 'COMPUTER ARCHITECTURE & ORGANIZATION' Noida, McGraw Hill, (available at: <http://mcgrawhilleducation.pdn.ipublishcentral.com/bookshelf>)

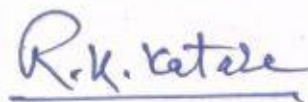
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BCA (Sem. – III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-312	Java Programming	04	-	-	04	20	20	60	100

- Objectives :** (1) To teach the basic tools of JAVA programming language.
(2) To acquaint students special features of JAVA language.

UNIT -I	Object oriented fundamentals, Features of Java, Java Virtual Machine (JMV), Byte-Code, JAVA buzzwords, JAVA Environments, Command Line Arguments, Java program structure, Reserved keywords, Identifiers, Literals, Operators, Separators, Variables, Declaring a variable, Scope and lifetime of variables, Data types, Control Statements. (12 Hours)
UNIT- II	Arrays: One-Dimensional Arrays, Two-dimension Array, Strings, String Handling, Class Fundamentals ,The General Form of a Class, A Simple Declaring Objects, Assigning Object Reference Variables. Methods: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing Returning Objects, Recursion Introducing Access Control, Overriding Methods, Final Variables and Methods, Final class, Finalizer Methods, Abstract Methods and Class, Visibility Control. (12 Hours)
UNIT- III	Inheritance: basic, Types of Inheritance, Member Access, Creating a Multilevel Hierarchy, When Constructors Are Called Method Overriding, Dynamic Method Dispatch, Why Overridden Methods?, Applying Method Overriding, Using Abstract Classes, Using final with Inheritance, Using final to Prevent Overriding. (12 Hours)
UNIT -IV	Exception Handling: Exception as Objects, Exception hierarchy, Try, Catch, Finally, Throw. (12 Hours)
UNIT -V	Multi threading: Creating threads, Thread Life Cycle, Main Thread, Multiple Threads, Isalive() and join(), Simple thread program ,Threads Priorities, Thread synchronization. (12 Hours)

Learning Outcomes : After completing this course, students will be able to write computer program in JAVA using special features of languages.

Essential Reading Material:

- Herbert Schildt Java2 (The Complete reference) Fourth Edition TMH, Fifth Reprint Chapters 2,3,4,5,6,7,8,9,10,11,12,13,17,19,20,21,22)
- R Lafore "Object Oriented Programming": Pearson
- Programming with JAVA (A premier), E. Balaguruswamy, Tata-MC-Graw Hill Publisher Com. Ltd.

Suggested Reading and links :

- E. Balaguruswami "OOps using Java"-TMH
- Bill Verrens, Inside the Java Virtual Machine, Tata McGraw Hill
- Sierra and Bates, Head First Java , O'Reilly
- Horstmann Cay, Big Java , Wiley –India
- Horstmann, "CORE JAVA" Pearson Education
- Jan. Grave, "An Introduction to Network Programming with JAVA" JAVA 7 Compatible.

1. <http://textofvideo.nptel.ac.in/106106147/lec1.pdf>

2. <https://nptel.ac.in/courses/106106147/>

e-books (at IP 14.139.234.164):

- Pandey, 'Java Programming', Noida, Pearson (available at ; <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)

ME – Mid – I Exam.;

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BCA (Sem. – III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-313	Fundamentals of Computer Algorithm	04	-	-	04	20	20	60	100

Objectives : (1) To introduce the analysis of computer algorithm.
 (2) To make aware to students some specific algorithms supporting to algorithm analysis procedure.

UNIT -I	Notion of Algorithm, Growth of functions, Summations, Recurrences: The substitution method, The iteration method, The master method (including proof), Asymptotic Notations Sorting and Searching Techniques, Selection Sort, Bubble Sort, Insertion Sort, Sequential Search, Binary Search. (12 Hours)
UNIT -II	Depth first Search and Breadth First Search, Balanced Search trees, AVL Trees, Heaps and Heap sort, Hash Tables, disjoint set and Divide and conquer. (12 Hours)
UNIT -III	Greedy Techniques, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's and Bellman Ford Algorithm, Huffman trees. Knapsack Problem. (12 Hours)
UNIT -IV	Dynamic Programming paradigm, Warshall's and Floyd's Algorithm, Optimal Binary Search trees, Matrix multiplication Problem, 0/1 Knapsack Problem, maximum network flow problem, naive string matching algorithm, Rabin-Karp Algorithm. (12 Hours)
UNIT -V	Backtracking, n-Queen's Problem, Hamiltonian Circuit problem, Subset-Sum problem, Branch and bound, Assignment problem, Traveling salesman problem. Introduction to Computability, Polynomial-time verification. (12 Hours)

Learning Outcomes : After completion of this course, students will be able to do comparative analysis of algorithms of various procedures.

Essential Reading:

1. Jon Kleinberg and Eva Tardos, Algorithm Design, Pearson Edition.
2. Algorithms" Sanjoy Dasgupta, Christos Papadimitriou Umesh Vazirani TMH

Suggested Reading and links :

1. TH Cormen, CE Leiserson, RL Rivest and C. Stein, Introduction to Algorithms, Introduction of Algorithms, PHI
 2. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>
 3. <https://nptel.ac.in/courses/106101060/>
- e-book :** <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action> Levitin 'Introduction to the Design and Analysis of Algorithms' Noida, Pearson

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BCA (Sem. – III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-314	Operations Research	03	-	-	03	20	20	60	100

- Objectives :**
- (1) To introduce fundamentals of operations research useful for analysis of computer system.
 - (2) To learn some special problems used in operations research for solutions to the phenomena of computer languages.

UNIT -I	Introduction to Operations Research-Principal components of decision problems – Applications of OR in Industry, business, defense with examples. (9 Hours)
UNIT -II	Linear Programming- component of LPP, types of LPP problems, graphical solution-simplex method including artificial variable technique. (9 Hours)
UNIT -III	Sequencing Game theory - optimal solution of two-person zero-sum games - mixed strategies - graphical solution of (2 X n) and (m X 2) games - solution of (m X n) games by linear programming. (9 Hours)
UNIT -IV	PERT and CPM: Concept, definition, terms, network diagrams - determination of floats and critical path- Problem solving using PERT & CPM, Probability considerations in project scheduling. (9 Hours)
UNIT -V	Transportation problem, VAM, NWC-method, minimum cost method, Matrix minima method, Assignment models , Hungarian method, problem solving. (9 Hours)

Learning Outcomes : After completing this course student will be able to apply procedures laid down in operations research to analyze computer oriented problems.

Essential Reading:

1. Operations Research, Hamdy A.Taha , PHI Publication.
2. Operation Research, S. D. Sharma, Kedar Nath Ram Nath Publications, Delhi.
3. Operations Research, Kanti Swarup, Gupta, P. K. & Man Mohan, Sultan Chand & Sons, New Delhi.
4. Operation Research, P. K. Gupta & D. S. Hira, S. Chand & Company Ltd, New Delhi.

Suggested Reading and links :

1. Fundamentals of O.R., R.L. Ackoff and M.W. Sasieni, Wiley Publication.
2. https://onlinecourses.nptel.ac.in/noc18_mg41/preview
3. <http://textofvideo.nptel.ac.in/112106134/lec1.pdf>

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

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BCA (Sem. – III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-SE-315	Organizational Behavior	03	-	-	03	20	20	60	100

- Objectives :**
- (1) To teach tools and procedure laid down in Psychology for understanding human behavior.
 - (2) To leadership skill, personality, perception, positive attitude required ^{or} development.

UNIT -I	Fundamentals of Organizational Behavior: Nature, Scope, Definition and Goals of Organizational Behavior; Fundamental Concepts of Organizational Behavior; Models of Organizational Behavior. (9 Hours)
UNIT -II	Perception, Attitude, Values and Motivation: Concept, Nature, Process, Importance, Management Behavioral aspect of Perception. Effects of employee attitudes; Personal and Organizational Values. (9 Hours)
UNIT -III	Personality: Definition of Personality, Determinants of Personality; Theories of Personality- Trait and Type Theories. (9 Hours)
UNIT- IV	Work Stress - Meaning and definition of Stress, Symptoms of Stress; Sources of Stress: Individual Level, Group Level, Organizational Level. (9 Hours)
UNIT -V	Group Behavior and Leadership- Nature of Group, Types of Groups; Nature and Characteristics of team; Team Building, Effective Teamwork; Nature of Leadership, Leadership Styles; Traits of Effective Leaders. (9 Hours)

Learning Outcomes : After completion of this course, student will learn to understand the group behavior, stress management and perception about human being.

Essential Reading:

1. Organizational Behavior Text, Cases and Games- By K. Aswathappa, Himalaya Publishing House, Mumbai, Sixth Edition.
2. Organizational Behavior Human Behavior at Work- By J.W. Newstrom, Tata McGraw Hill Publishing Company Limited, New Delhi, 12th Edition.
3. Organizational Behavior – By Fred Luthans
4. Organizational Behavior – By Super Robbins

Suggested Reading and links :

1. Organizational Behavior – Anjali Ghanekar
2. Organizational Behavior Fundamentals, Realities and Challenges, Detra Nelson, James Campbell Quick Thomson Publications
3. Organizational Behavior through Indian Philosophy, By N.M. Mishra, Himalaya Publication.
4. Principles of Management, Franklin Terry,
5. Business Communication, 13th Edition, Lesiker and Petill, Pearson.
6. <https://nptel.ac.in/downloads/110105034/>
7. <https://nptel.ac.in/courses/110105051/m34l34.pdf>

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BCA (Sem. – III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-316	Software Laboratory- A	-	-	04	02	20	20	60	100

Objectives : (ii) To provide practical training to students for programming in JAVA on computer system.

Practicals on developing programme using Java

I- Application :

1. Finding area and Perimeter of a circle. Use buffered reader class
2. Substring removal from a string. Use String Buffer class
3. Determining the order of numbers generated randomly using random class
4. Implementation of Point class for image manipulation
5. Usage of calendar class and manipulation
6. String manipulation using char array
7. Database creation for storing telephone numbers and manipulation
8. Usage of vector classes
9. Implementing thread based applications and exception handling
10. Implementing Packages

II – Applets:

11. Working with frames and various controls
12. Dialogues and Menus
13. Panel and Layout
14. Graphics
15. Color and Font

Any other as per teacher concern

Learning outcomes: After completing this course student will be able to execute the computer program written in JAVA language on computer system under ~~problem~~ ^{problem} solving approach.

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BCA (Sem. – III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-317	Software Laboratory- B	-	-	04	02	20	20	60	100

Objectives : (1) To provide training to students to enter data on statistical softwares.
(2) To develop insight among students for data analysis and conclusion.

Problem solving using Statistical packages by Programming in C / MS-Excel on following topics:

1. Diagrammatic Representation: Bar-charts, Pie-diagrams
2. Graphical Representation of data Histograms, Frequency polygon
3. Measures of central tendency Arithmetic mean, Median, Mode
4. Measures of dispersion
5. Skewness and Kurtosis
6. correlation coefficients
7. Regression lines of regression

Note: The above mentioned statistical problems may also be solved using SPSS/ R-software.

Practicals as per teacher concern

Learning Outcome: After completing this course student will be able to draw valid conclusions after data analysis.

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BCA (Sem. – III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-SE-318	Seminar, workshop Participation, Poster Presentation , Group Discussion , training	--	---	---	02	20	20	60	100

Objectives :

- (1) To provide platform for participation by students for academic activities (other than class-room teaching).
- (2) To explore and enhance capabilities, creativity of students on subject.
- (3) To provide opportunities to student for additional knowledge, skill, training and higher level academic development.

It will be decided by the department or teacher(s) concern. Students have to participate and earn the credit.

This is activity & participation based course:

Note:

- (i) Students have to participate in Seminar, Poster Presentation, Group Discussion, training program, minor project (any three) as decided by course coordinator.
- (ii) Course coordinator will arrange the activities for ME, IA, ESE.
- (iii) A summary of academic content of activity will have to be submitted by students to the course coordinator for mid-term & internal evaluation.
- (iv) There may participation by students in three different (or some similar) activities relating to Mid exam., assessment and ESE evaluation.
- (v) There will be individual (or paired) participation of students in each activity. In some cases group may be considered.

Objectives : After completing this course, student will be strengthen in terms of capabilities, skill, expression, and knowledge other than in curriculum.

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BCA (Sem. – IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-411	Operating Systems	04	-	-	04	20	20	60	100

- Objectives :**
- (1) To introduce historical development and basic concept of operating system.
 - (2) To learn tasks of operating for managing computer resources.
 - (3) To make aware about problems appearing in operating systems.

UNIT -I	Introduction to Operating System: Operating System: Introduction, Objectives and functions. Evolution of Operating System. (12 Hours)
UNIT -II	Process Description and control: process definition, process states, two state & five state process model, process creation & termination, CPU Scheduling : Types of scheduling, scheduling and performance criteria, scheduling algorithm. (12 Hours)
UNIT- III	Memory Management: Memory partitioning, paging, segmentation, virtual memory. Concurrency and Synchronization: Interposes communication and synchronization. Principles of concurrency, Mutual exclusion: Software approaches, hardware support, semaphores. (12 Hours)
UNIT- IV	Deadlock & starvation: Principles of deadlock, deadlock prevention, deadlock avoidance, deadlock detection and recovery, starvation. Input/ Output Management: Principles of I/O hardware: I/O devices, I/O modules, I/O communication Techniques. Principles of I/O software: Goals, Interrupt handlers, device drivers. (12 Hours)
UNIT -V	File Management: File system, file organization, file directories, file sharing, Record blocking, Error handling. (12 Hours)

Learning Outcomes : After completing this course student will learn ~~the~~ about the functions, roles, tasks and duties of operating system including problems ^{occurring} ~~occurring~~ during execution.

Essential Reading:

1. Stuart E. Madnick and John Donovan Operating System ,TMH Fifth Reprint 2000
2. Silberschatz and Galvin" Operating System Concept", Addison Wesley.
3. Tanenbaum, A.S., "Modern Operating Systems", Prentice Hall of India Pvt. Ltd.

Suggested Reading and links :

1. Modern Operating System, Hed, Andrew S. Tanenbaum : (Pearson Education India).
2. Operating System Concept, Peter B. Galvin, Greg Gagne and Abraham Silberschatz, CBS Publishers
3. <https://epgp.inflibnet.ac.in/ah1.php?csrno=7>
4. https://nptel.ac.in/courses/106108101/pdf/Lecture_Notes/Mod%201_LN.pdf

e-books (at IP 14.139.234.164):

1. Stallings, William, 'Operating Systems: Internals and Design Principles, GI' , Noida, Pearson, (available at : <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>).

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BCA (Sem. – IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-412	Data Communication and Networks	04	-	-	04	20	20	60	100

- Objectives :**
- (1) To introduce concept of interlinking of device with methods and rules.
 - (2) To aware students about theory and properties of signals with communications.
 - (3) To introduce communication models with layers, protocols, techniques and devices.

UNIT -I	Introduction: Data Communications, Networks, Protocols and Standards. Basic Concepts: Line Configuration, Topology, Transmission mode, Categories of Networks. OSI Model: Layered architecture, Functions of the layers, TCP/IP Protocol suite. (12 Hours)
UNIT -II	Signals: Analog and digital, periodic and a periodic signals, analog signals, Digital signals. Transmission media: Guided media, unguided media. Multiplexing: FDM, WDM, TDM, Multiplexing Application-The Telephone system. LAN: Project, Ethernet, Other Ethernet networks, Token bus, Token Ring, FDDI, Comparison. (12 Hours)
UNIT -III	Switching: Circuit Switching, Packet Switching, Message Switching. Networking and internetworking devices-Repeaters, Bridges, Routers, Gateways, other devices, Routing algorithms, Distance vector routing, link state routing. (12 Hours)
UNIT- IV	Transport layer: Duties, Connection TCP/IP Protocol suite: Overview of TCP/IP: Internet protocol, Addressing, Sub netting. Protocols in the network layer: ARP, RARP, ICMP, IGMP Transport layer: TCP UDP. (12 Hours)
UNIT -V	TCP/IP Protocol suite: PART-2 Application layer: Client server model, BOOTP, DHCP, DNS, FTP, SMTP, WWW, HTTP. (12 Hours)

Learning Outcomes : After completing this course, student will learn about the process of data communication through techniques, protocols and media, alongwith description on connecting devices.

Essential Reading:

1. Data Communication & Networking ,Behouou A. Forouzan, ,Tata McGraw-Hill.
2. Computer Networks A.S Tanenbaum, Pearson Education.
3. Data Communication and Computer Network, Brijendra Singh, Prentice Hall of India (PHI).

Suggested Reading and links :

1. Data and Computer Communications, William Stallings, PHI.
2. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>
3. <https://nptel.ac.in/courses/106105080/pdf/M1L1.pdf>

e-books (at IP 14.139.234.164):

1. Forouzan, 'Computer Networks' Noida, McGraw Hill (available at: <http://mcgrawhilleducation.pdn.ipublishcentral.com/bookshelf>)
2. Forouzan, 'Computer Networks', Noida, McGraw Hill, (available at : <http://mcgrawhilleducation.pdn.ipublishcentral.com/bookshelf>)

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BCA (Sem. – IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-413	Visual Programming	04	-	-	04	20	20	60	100

- Objectives :**
- (1) To introduce concepts and tools of visual basic.
 - (2) To train students about writing computer program in visual basic using tools and techniques available in programming environment.

UNIT -I	Introduction to GUI - Visual Basic : Starting and Exiting Visual Basic Project Explorer Working with Forms Properties Window Using the Toolbox Toolbars Working with Projects Programming Structure of Visual Basic applications Event and Event driven procedures. (12 Hours)
UNIT -II	Adding code and using events: Using literals data types- declaring and using the operator subroutines and functions looping and decision control structures if then else structure select structure, for next, do. loop and while.. wend.- Using intrinsic Visual basic Controls with methods and Properties: Label ,Text box. (12 Hours)
UNIT- III	Command button, Frame, Checkbox, option button, List box, Combo box, Drive List box, directory List box and file list box Formatting controls control arrays. (12 Hours)
UNIT- IV	Functions and Procedure - Passing arguments by value and reference Arrays, dynamic arrays User defined data types symbolic constants using Dialog boxes: Input box, Message box functions - String functions, date and Time function, numeric functions. (12 Hours)
UNIT -V	Menus: creating menus, adding code to menus, using MDI forms - MDI form basic building MDI form creating MDI Child Forms. (12 Hours)

Learning Outcomes : After completing this course student will learn the skill of program writing , uses and applications of visual programming.

Essential Reading:

1. Gary Cornwell , Visual basic 6 , Tata McGraw Hill
2. Scott Warner, Teach yourself Visual basic 6 , Tata McGraw-Hill

Suggested Reading and links :

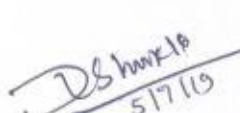
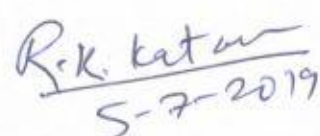
1. Noel Jerked "The Complete Reference", Tata McGraw-Hill
2. Eric A. Smith, Velar Whistler, and Hank Marquis , Visual Basic 6 programming"
3. <http://cs.baylor.edu/~maurer/aida/desauto/vbasic.pdf>
4. <https://www.visualchart.com/ContentManagement/Development/ Manuals/EN/vbNet programming.pdf>

e-books (at IP 14.139.234.164):

1. Bradley, Julia Case, 'Programming in Visual Basic 2010', Noida, McGraw Hill, (available at : <http://mcgrawhilleducation.pdn.i> , publishcentral.com/bookshelf)

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BCA (Sem. – IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-414	Database Management Systems	04	-	-	04	20	20	60	100

- Objectives :**
- (1) To introduce the tools and techniques of creating databases.
 - (2) To aware about techniques of access of data under various conditions.
 - (3) To introduce specific issues of data like validation, manipulation, recovery & security.

UNIT -I	Introduction to Database System-Objectives-Entities and Attributes. Data Models Database Management Systems Tree Structures Plex Structures Data Description Languages. (12 Hours)
UNIT -II	Relational data base design: function dependencies & normalization for relational databases: functional dependencies, normal forms based on primary keys, (1NF, 2NF, 3NF & BCNF), lossless join and dependency preserving decomposition. (12 Hours)
UNIT -III	Basic SQL reports and commands Data types and notations String functions Data functions Unions Joins DDL DML DLL. (12 Hours)
UNIT -IV	PL/SQL: Approach and Advantages PL/SQL Blocks -Variables-Manipulating Data Triggers Procedures, functions and packages - Exception handling. (12 Hours)
UNIT -V	Locking Techniques Time stamp ordering Validation techniques - Granularity of data items Recovery Concepts - log based Recovery Database Security issues Access Control Statistical Database Security. (12 Hours)

Learning Outcomes : After completing this course student will learn basic concept of designing data storage alongwith tools and techniques of data management including access, recovery, control and security issues.

Essential Reading:

1. James Martin, Computer Database Organization, PHI.
2. Henry F. Korth Abraham Silberschatz, Database System Concepts, McGraw Hill International Editions.
3. An Introduction to Database System, C. J. Date, Vol. 1, Norasa Publishing House

Suggested Reading and links :

1. Kevin Loney, George Koch, 'Oracle 8i', The Complete Reference.
2. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>
3. <https://nptel.ac.in/courses/105102015/37>

e-books (at IP 14.139.234.164):

1. ITL ESL, 'Database Management Systems Noida, Pearson (available at : <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)'
2. Naik 'Concepts of Database Management System' ' Noida Pearson (available at : <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)
3. Silberschatz, Abraham, 'Database System Concepts', Noida, McGrawHill, (available at : <http://mcgrawhilleducation.pdn.i publishcentral.com/bookshelf>)

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BCA (Sem. – IV) (Elective I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-411	Inventory Management (SAD)	03	-	-	03	20	20	60	100

Objectives : (1) To introduce the need and requirement of inventory in market.
 (2) To learn the techniques of inventory model creation.
 (3) To convey the item coding techniques and business processing engineering.

UNIT-I	Management of Inventory- Nature of Inventories, Need to hold Inventories, Objective of Inventory Management, Inventory management Techniques(EOQ Model) (9 Hours)
UNIT -II	Protecting Inventory - Introduction, Legal Duties, The Plan, The Assessment, Theft Analysis of Investment in Inventory, Selective Inventory control-ABC Analysis, The Inventory Management Process, EOQ : Illustrative Problems, Order Point. (9 Hours)
UNIT -III	The Basics of Bar Coding -Introduction, Elements of a Bar Code Symbol, Symbolologies – Bar Coding Structural Rules, Why Inventory Systems Fail and How To Fix Them:- Introduction, Inventory Record Accuracy. (9 Hours)
UNIT -IV	System Development Tools - Role and Benefits of case tools, Drawbacks of case tools, Taxonomy of case tools, Integrated Case Environment, Features of Turbo Analyst, Tools with which to uncover System Dysfunctions:- Flowchart, Run chart, Logic chart, Variance Report. (9 Hours)
UNIT -V	Re-engineering- Business Process Re-engineering, Business Processes, BPR Model, Software Re-engineering, Software Maintenance, Software Re-engineering process Models. (9 Hours)

Learning Outcomes : After completing this course, student will learn the basic feature of inventory management with model development, coding techniques and re-engineering features applicable in business process.

Essential Reading:

1. Essentials of Inventory Management - by Max Muller.
2. Financial Management - by I. M. Pandey 7th edition
3. Financial Management Theory & Practice - by Prasanna Chandra 6th edition

Suggested Reading and links :

1. Financial Management - by M. Y. Khan & P. K. Jain, 5th Edition
2. SADSE (System Analysis Design) –by Prof. Khalkar and Prof. Parthasarathy.
3. <https://nptel.ac.in/courses/110106045/9>
4. <https://nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/INDUSTRIAL-ENGINEERING/part3/inventory/lecture1.htm>

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BCA (Sem. – IV)(Elective I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-412	Data Warehousing and Mining	03	-	-	03	20	20	60	100

- Objectives :**
- (1) To learn the fundamentals of data-warehousing.
 - (2) To aware about different schema of warehousing.
 - (3) To convey tools and techniques of data mining.

UNIT- I	The Compelling Need for data warehousing: Escalating Need for strategic information, failures of Past decision-support systems, operational versus decision-support systems, data warehousing – the only viable solution, data warehouse defined Data warehouse. (9 Hours)
UNIT- II	The building Blocks: Defining Features, data warehouses and data marts, overview of the components, metadata in the data warehouse Defining the business requirements: Dimensional analysis. (9 Hours)
UNIT -III	Principles of dimensional modeling: Objectives, From Requirements to data design, the STAR schema, STAR Schema Keys, Advantages of the STAR Schema. (9 Hours)
UNIT- IV	OLAP in the Data Warehouse: Demand for Online analytical processing, need for multidimensional analysis, fast access and powerful calculations, limitations of other analysis methods, OLAP is the answer, OLAP definitions and rules. (9 Hours)
UNIT -V	Data Mining Basics: What is Data Mining, Data Mining Defined, The knowledge discovery process, OLAP versus data mining, data mining and the data warehouse, Major Data Mining Techniques, Cluster detection, decision trees, memory-based reasoning, link analysis, neural networks. (9 Hours)

Learning Outcomes : After completing this course student will learn the basic concept of data warehousing alongwith tools, techniques, schema applicable to data mining.

Essential Reading:

1. Paul Raj Poonia, "Fundamentals of Data Warehousing", John Wiley & Sons.
2. Sam Anahony, "Data Warehousing in the real world: A practical guide for building decision support systems", John Wiley.

Suggested Reading and links :

1. Kamber and Han, "Data Mining Concepts and Techniques", Harcourt India P. Ltd.
2. Principles of Data Mining, Handa : (Pearson Education India).
3. http://www.vssut.ac.in/lecture_notes/lecture1428550844.pdf
4. <https://nptel.ac.in/courses/106105174/>

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BCA (Sem. – IV) (Elective I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-413	IT Project Management	03	-	-	03	20	20	60	100

Objectives : (1) To learn the concept and implementation of project management and IT industry.
(2) To aware about tools and techniques used in project planning design, control and execution.

UNIT – I	Introduction- Characteristics of a project, types of projects, Project Management Body of Knowledge (PMBOK), role of project manager and his qualities, project organization and benefits, idea generation, needs of society, import substitution, project lifecycle, project charter, project sponsor. Project Planning- Customer needs, stake holder concept, Project scope, feasibility study and report, baseline plan, SWOT analysis, project organization structure and hierarchy, project teams, formation, attitude and aptitude. (9 Hours)
UNIT - II	Structure, project selection methods, breakeven analysis, DCF methods, project implementation, estimation, cost, price, value, scheduling, barcharts, network diagrams, PERT and CPM, schedule crashing, simple introduction to risk management, probability in project management, decision trees. (9 Hours)
UNIT- III	Procurement: Vendor selection methods, JIT, supply chains, quality ,quality circles, quality control and quality assurance, cause and effect analysis, ISO and concepts of total quality management and six sigma, resource planning and allocation, availability and constraints of resources, resource leveling and crashing. (9 Hours)
UNIT- IV	Project Control: Project scope, project change request, and control of schedule, resources, cost and quality, project communications, channels, means, meetings, project reports, project audits Project evaluation, project close-out reports, guidelines, audit reports, maintenance and shutdown projects, plant turn around and brief introduction to replacement analysis. (9 Hours)
UNIT- V	Engineering projects: Contour maps, sitemaps, plant layout, suitability of project site, preparation of site, selection and leasing of construction equipment special considerations in selection and location of projects, safety, health, human and environment al factors, project finance, international projects, joint ventures, collaborations, impact of culture, implementation, and handing over of projects. (9 Hours)

Learning Outcomes : After completion of this course student will learn the skill of project design, development, analysis for IT-industries.

Essential Reading:

1. Kamaraju Ramakrishna, "Essentials of Project Management", PHI Learning, New Delhi, 2010
2. Jack T. Marchewka, Information Technology and Project Management, John Wiley & sons P.Ltd, 2003.

Suggested Reading and links :

1. Prasanna Chandra, "Projects – Planning, analysis, selection, implementation and review", Tata McGraw-Hill, New Delhi, 2010.
2. Chitkara, "Construction Project Management", Tata McGraw- Hill, New Delhi.
3. Harold Kerzner, "Project Management", Wiley, New York.
4. http://www.cmaasc.org/pdfs/0814_%20SCCMAAPresentation.pdf
5. <https://ocw.mit.edu/courses/mechanical-engineering/2-000-how-and-why-machines-work-spring-2002/tools/management.pdf>

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BCA (Sem. – IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-415	Software Laboratory -A	-	-	4	02	20	20	60	100

Objectives : (B) To train students in visual programming by writing programs and their execution in VB environment.

Based on VB programming Lab

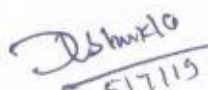
1. Building simple applications
2. Working with intrinsic controls and ActiveX controls
3. Application with multiple forms
4. Application with dialogs
5. Application with Menus
6. Application using data controls
7. Application using Common Dialogs
8. Drag and Drop Events and Events Management
9. Database Management
10. Creating ActiveX Controls
11. Cookies Management
12. Session Management
13. Program based on Looping and Branching Concept
14. Working with Predefine Function
15. Creating on own Controls and Toolbar

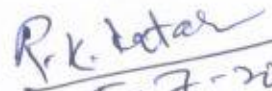
Any other as per teacher concern

Learning Outcomes: After completion of this course student will be able to write programs on various problems along with their implementation (execution) in Visual Basic setup.

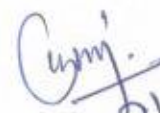
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BCA (Sem. – IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-416	Software Laboratory- B	-	-	04	02	20	20	60	100

Objectives : (2) To learn working with SQL with specific features available.

Based on SQL programming Lab

1. Commands For DDL and DML
2. Working With different type of Keys
3. Working with different type of Constraints
4. Apply various operation in table
5. Working with pre define function
6. Program based on PL/SQL
7. Working with Triggers
8. Working with Procedures
9. Working with functions and packages
10. Working with Exception handling
11. Working with Backup & Recovery Process
12. Working with Granting
13. Commands for transaction related
14. Working with different type of Join

Use the concepts like data normalization, link between table by means of foreign keys and other relevant database concepts for the following applications. The implementation of each should have necessary input screen (forms) Menu-driven query processing and reports. Necessary validations should be made for each table

1. Library information system
2. Students mark sheet processing
3. Telephone directory maintenance
4. Gas booking and delivering
5. Electricity bill processing
6. Bank Transaction
7. Pay roll processing
8. Personal information system
9. Question database and conducting Quiz
10. Personal diary

Any other as per teacher concern

Learning Outcome: After completion of this course, student will be able to design a database for specific need and will be able to access the data using features of SQL.

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BCA (Sem. – IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-SE - 417	Seminar, workshop Participation, Poster Presentation , Group Discussion, training	--	---	--	02	20	20	60	100

- Objectives :**
- (1) To make aware to students about recent developments in computer related areas.
 - (2) To explore talent of students in poster design and content presentation.
 - (3) To motivate students for seeking additional knowledge on specific subject area in the form of minor project.
 - (4) To allow students to get specific practical training related to IT-field.

It will be decided by the department or teacher(s) concern. Students have to participate and earn the credit.

This is activity & participation based course:

Note:

- (i) Students have to participate in Seminar, Poster Presentation, Group Discussion, training program, minor project (any three) as decided by course coordinator.
- (ii) Course coordinator will arrange the activities for ME, IA, ESE.
- (iii) A summary of academic content of activity will have to be submitted by students to the course coordinator for mid-term & internal evaluation.
- (iv) There may participation by students in three different (or some similar) activities relating to Mid exam., assessment and ESE evaluation.
- (v) There will be individual (or paired) participation of students in each activity. In some cases group may be considered.

Learning outcome: After completing this course student will get additional recent knowledge on subject, other than whatever is in curriculum including practical training.

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BCA (Sem. – V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-511	Software Engineering	04	-	-	04	20	20	60	100
CSA-CC-512	Linux Programming	04	-	-	04	20	20	60	100
CSA-CC-513	Web Technology	04	-	-	04	20	20	60	100
CSA-CC-514	Computer Graphics & Multimedia	04	-	-	04	20	20	60	100
Elective Course (Opt Any One of Following)									
CSA-EC-511	Introduction to Microprocessors	03	-	-	03	20	20	60	100
CSA-EC-512	Advanced Java	03	-	-	03	20	20	60	100
CSA-EC-513	Discrete Mathematical Structures	03	-	-	03	20	20	60	100
CSA-EC-514	Programming using PHP	03	-	-	03	20	20	60	100
Software Laboratory (Practical)									
CSA-CC-515	Software Laboratory - A	-	-	04	02	20	20	60	100
CSA-CC-516	Software Laboratory - B	-	-	04	02	20	20	60	100
	TOTAL	-	-	-	23	-	-	-	700

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BCA (Sem. – V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-511	Software Engineering	04	-	-	04	20	20	60	100

- Objectives :**
- (1) To learn the characteristics and models used for software engineering.
 - (2) To be aware of steps require for design, development and implementation of a software.
 - (3) To ~~be~~ learn the testing, quality and reliability estimation ^{procedure} ~~precedes~~ for software.

UNIT –I	Introduction to Software Engineering: Characteristics, Emergence of Software Engineering, Software Metrics & Models, Process & Product Metrics. (12 Hours)
UNIT-II	Software Life Cycle Models: Waterfall, Prototype and Spiral Models and their Comparison. Software Project Management: Size Estimation- LOC and FP Metrics, Cost Estimation Delphi and Basic COCOMO, Introduction to Halstead's Software Science, Staffing Level Estimation- Putnam's Model. (12 Hours)
UNIT-III	Software Requirements Specification: SRS Documents, their Characteristics and Organization. Software Design: Classification, Software Design Approaches, Function Oriented Software Design, Structured. (12 Hours)
UNIT-IV	Analysis- Data flow Diagrams and Structured Design, Introduction to Object Oriented Design. Coding and Testing of Software: Unit Testing, Block Box Testing, White Box Testing, Debugging, Program Analysis Tools, System Testing. (12 Hours)
UNIT-V	Software Reliability and Quality Assurance: Reliability Metric- Musa's Basic Model. Software Quality Assurance: ISO 9000 and SEI CMM and their Comparison. Software Maintenance: Maintenance Process Models and Reverse Engineering, Estimation of Maintenance Costs. Software Development Tools: Introduction to "Rational Rose". (12 Hours)

Learning Outcomes : After completing this course, student will be able to learn the principal steps for design, development an implementation of a software, including, testing and reliability analysis.

Essential Reading:

1. Rajib Mall -Fundamentals of Software Engineering, Prentice Hall of India, New Delhi, 2005
2. Roger S. Pressman - Software Engineering a practitioner's approach, McGraw-Hill, 5th Edition

Suggested Reading and links :

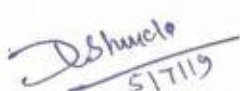
1. Pankaj Jalote- An Integrated Approach to Software Engineering, 3rd Edition, Narosa Publishing House, New Delhi, 2005
2. Richard Fairley- Software Engineering Concepts, Tata McGraw Hill, New Delhi, 2006
3. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>
4. <https://nptel.ac.in/downloads/106105087/>

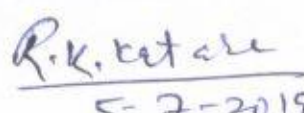
e-books (at IP 14.139.234.164):

1. Chandramouli, 'Software Engineering', Noida, Pearson (available at : <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)
2. Sommerville, 'Software Engineering', Noida, Pearson (available at : <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)

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BCA (Sem. – V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA -CC-512	Linux Programming	04	-	-	04	20	20	60	100

Objectives : (1) To learn the fundamentals of Linux operating system.
 (2) To aware about execution of Linux commands with their outcomes.
 (3) To learn the shell programming using Linux in order to get specified output.

UNIT-I	Linux Operating System- Features, flavors, Basic Architecture of Unix/Linux system, Types of shell, File system-Boot block, super block, Inode table, data blocks. Types of files, Linux directories structure, Types of Linux systems calls and their uses. (12 Hours)
UNIT-II	Files and directories related commands- mkdir, rmdir, cat, touch, rm, rmdir, mv, cp, pwd, cd, wc. Creating and editing files with vi Editors. Changing files and directories permissions, ownership and group. File Comparisons commands- cmp, comm, diff. Working with meta characters. (12 Hours)
UNIT-III	I/O redirection, Pipes and Filter concept, Filter commands- head, tail, more, less, cut, paste, tr, tee, sort, grep family, sed, Difference between grep, egrep, fgrep and sed, Filter using regular expression and meta characters. (12 Hours)
UNIT-IV	Process concept in Linux - process fundamental, life cycle, type of process, showing process details, changing priority, killing on process. Advance command in Linux- mail, split, lp. (12 Hours)
UNIT-V	Bash Shell Programming - Basic of Shell scripts, Shells for Shell scripts, Shell variables, echo and read commands, Linux operators, Conditional and looping statements, Case statements, arguments and parameters, creating on user define or new command. (12 Hours)

Learning Outcomes : After completion of this course, student will be able to work with computers having Linux operating system/^{and} students will obtain the desired result using Linux.

Essential Reading:

1. J.Goerzen- Linux Programming Bible, IDG Books, New Delhi
2. N.Mathew & R.Stones- Beginning Linux Programming Wiley Publishing India.
3. R. Morgan & McGilton, "Introduction Unix System - V", McGraw Hill International.

Suggested Reading and links :

1. G. Venkateshmurthy, "Unix and shell programming", Pearson Education.
2. Y. Kanitker, "Unix Shell Programming", BPB.
3. <https://nptel.ac.in/courses/117106113/>
4. https://nptel.ac.in/courses/106108101/pdf/PPTs/Mod_13.pdf

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BCA (Sem. – V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-513	Web Technology	4	0	0	4	20	20	60	100

- Objectives :**
- (1) To learn the internet basics and its functioning details.
 - (2) To be aware of designing a web-site using scripting language.
 - (3) To learn the creation of dynamic web-site.

UNIT –I	Internet Basics: Basic concepts, Communication on the Internet, Internet Domains, Internet Server Identities, Establishing Connectivity on the Internet, Client IP Address, A Brief Overview of TCP/IP and its Services, Transmission Control Protocol, Web Server, Web Client, Domain Registration. (12 Hours)
UNIT – II	Introduction to HTML: HTML, HTML Tags, Commonly Used HTML Commands, Title and Footers, Text Formatting, Text Style, Lists, Adding Graphics to HTML Documents, Tables, Linking Documents, Frames. (12 Hours)
UNIT – III	Java Script : Java Script in Web Pages, Advantages of Java Script, Advantages of Java Script, Data Types and Literals, Type Casting , Java Script Array, Operators and Expression, Conditional Checking , Function, User Defined Function. (12 Hours)
UNIT – IV	Understanding XML: SGML, XML, XML and HTML, Modeling XML Data, Styling XML with XSL, XHTML. (12 Hours)
UNIT- V	Creation of Dynamic Web pages using JSP: Dynamic Web Page, Introduction of JSP, Pages Overview, JSP Scripting, Standard Action, Page Directive, Include Directive. (12 Hours)

Learning Outcomes : After completing this course, student will be able to design static and dynamic web-pages using scripting language.

Essential Reading:

1. Ivan Bay Ross- Web Enable Commercial Application Using HTML, DHTML, BPB Publication
2. Michel Morrison -HTML and XML for Beginners, PHI, New Delhi.
3. H.M Dietal and P.J Dietal -Java How to Program, PHI, New Delhi.

Suggested Reading and links :

1. Java Server Side Programming -WROX Publication
2. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>
3. <http://textofvideo.nptel.ac.in/106105084/lec40.pdf>

e-books (at IP 14.139.234.164):

1. GODBOLE, 'Web Technology' Noida, McGraw Hill, (available at <http://mcgrawhilleducation.pdn.ipublishcentral.com/bookshelf>)
2. Srinivasan, ' Web Technology ',Noida, Pearson, (available at : <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)

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BCA (Sem. – V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA -CC-514	Computer Graphics & Multimedia	4	0	0	4	20	20	60	100

- Objectives :** (1) To learn basic concepts of computer graphics including mathematical logic for graphical display.
(2) To aware students about multimedia systems with their roles, function and operations.
(3) To convey the ~~format~~ knowledge of picture data storage.

UNIT - I	Overview of Graphics Systems: Video Display Devices, Refresh Cathode Ray Tubes, Raster-Scan and Random-Scan Systems, Input Devices, Hard-Copy Devices and Graphics Software. Output Primitives: Points, Line Drawing Algorithms (DDA and Bresenham's Line Drawing Algorithm), Circle- Generating Algorithms (Bresenham's and Midpoint Circle Algorithms), Ellipse-Generating Algorithms (Midpoint Ellipse Algorithm only), Filled- Area Primitives: Scan –Line Polygon Fill Algorithm, Boundary-Fill Algorithm, Flood-Fill Algorithm. (12 Hours)
UNIT - II	Two Dimensional Geometric Transformations: Basic Transformations, Matrix Representations and Homogeneous Coordinates, Composite Transformations, Reflection and Shear, Transformations between Coordinates Systems, Raster Methods for Transformations. (12 Hours)
UNIT - III	Two-Dimensional Viewing: The Viewing Pipeline, Viewing Coordinate Reference Frame, Window-to-View Port Coordinate Transformation, Clipping- Point, Line (Cohen-Sutherland Line Clipping and Liang –Barsky Line Clipping and Nicholl-Lee-Nicholl Line Clipping) and Polygon Clipping (Sutherland- Hodgeman Polygon Clipping, Weiler-Atherton Polygon Clipping). (12 Hours)
UNIT - IV	Multimedia Systems Design: Multimedia Elements, Multimedia Applications, Multimedia System Architecture, Evolving Technologies for Multimedia Systems, Multimedia Data Interface Standards, the Need for Data Compressions, Multimedia Database. Media and Data Streams: Medium, Main Properties of a Multimedia Stream, Multimedia System Definition, Combination of Media (12 Hours)
UNIT-V	Data & File Format Standards: Rich –Text Format, TIFF File Format, RIFF, MIDI File Format, JPEG DIB File Format, MPEG Standards. (12 Hours)

Learning Outcomes : After completion of this course student will be able to design graphical structures on computer screen using algorithms alongwith their editing also.

Essential Reading:

1. D. Hearn & M. P. Baker -Computer Graphics C Version, 2nd Edn, Pearson Education, New Delhi, 2006
2. J. F. Koegel Buford -Multimedia Systems, Pearson Education, New Delhi, 2006.

Suggested Reading and links :

1. R.A. Plastrock et.al.- Computer Graphics(Schaums Outline Series), 2nd Edition, TMH, New Delhi, 2006.
2. J.D.Foley- Computer Graphics, 2nd Edn, Pearson Education, New Delhi, 2004.
2. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>
3. <http://textofvideo.nptel.ac.in/106106090/lec1.pdf>

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BCA (Sem. – V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA -EC-511	Introduction to Microprocessors	3	0	0	3	20	20	60	100

Objectives : (1) To learn the architecture of various microprocessors along with their features and applications.
(2) To learn programming aspect, multiplexing, interrupt appearance, DMA and Interface applications with microprocessors.

UNIT - I	Introduction to Microprocessors History and overview, Growth of microprocessor technology from SSI, MSI, LSI to VLSI, Intel microprocessors-8085 to Pentium II, performance and feature comparisons, Current global trends in Microprocessors. (9 Hours)
UNIT - II	8085 Microprocessor: Internal architecture, Pin-out diagram, Memory addressing schemes, System bus structure, (Data, address and control bus), Multiplexing and de-multiplexing. (9 Hours)
UNIT - III	Programming in 8085: Addressing modes, Data movement, Arithmetic and logic instructions, Control instructions. (9 Hours)
UNIT - IV	Interrupts: Introduction, purpose of interrupts, Interrupt vectors, 8259- Interrupt Controller, Internal organization, pin out, Single and cascaded operation. (9 Hours)
UNIT - V	I/O Interface: Typical I/O interface, serial communication 8251 A UART: Internal organization and functioning, 8237 DMA Controller: Block Diagram, organization and functioning. (9 Hours)

Learning Outcomes : After completion of this course student will be able to compare and analyze processing aspect of computers in view to features available.

Essential Reading:

1. R.S. Gaonkar, "Microprocessor Architecture, programming and Applications with the 8085/8080A", Wiley Eastern Ltd. 2. 1995.

Suggested Reading and links :

1. "Inside the PC": Peter Norton (Sixth Edition), January 2005
2. "Microprocessor System-The 8086/8088 Family": Yu-Cheng Liu & Glen A. Gibson
3. "The Intel Microprocessor: 8086/8088, 80286, 80386, Pentium, Pentium Pro. Pentium-II & III": Barry Brey (Fourth Edition)
4. <https://nptel.ac.in/courses/108105102/16>
5. https://nptel.ac.in/courses/Webcourse-contents/IISc-BANG/Microprocessors%20and%20Microcontrollers/pdf/Lecture_Notes/LNm1.pdf

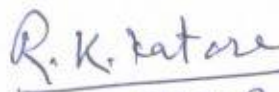
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BCA (Sem. – V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA -EC-512	Advanced Java	3	0	0	3	20	20	60	100

Objectives : ~~to~~ To learn specil tools and advanced features of JAVA programming language.

UNIT - I	GUI Programming: Designing Graphical User Interfaces in Java, Components and Containers, Basics of Components, Using Containers Layout Managers, AWT Components, Adding a Menu to Window, AWT controls, Extending GUI Features Using Swing Components. (9 Hours)
UNIT - II	Event Handling- Event-Driven Programming in Java, Event- Handling Process, Event Handling Mechanism, The Delegation Model of Event Handling, Event Classes, Event Sources, Event Listeners, Adapter Classes as Helper Classes in Event Handling. (9 Hours)
UNIT- III	Database Programming using JDBC- Basic JDBC Concept, JDBC Drivers & Architecture, Establishing the connection, Executing DML commands using JDBC applications with predefined data. (9 Hours)
UNIT - IV	Java Utilities The Collection Framework- Collections of Objects, Collection Types, Sets, Sequence, Map, Understanding Hashing, Use of Array List & Vector. (9 Hours)
UNIT - IV	Java Server Technologies Servlet- Introduction to servlet, Servlet life cycle, Developing and Deploying Servlets, Exploring Deployment, servlet container, Descriptor (web.xml), Handling Request and Response. (9 Hours)

Learning Outcomes : After the completion of this course student will be able to write and execute computer program in java language using advance features.

Essential Reading :

1. H.Schildt, "The complete Java 2 reference", TMH, 1998
2. Kathy walrath, "Black Book Java server programming J2EE" Dream Tech

Suggested Reading and links

1. James Keogh, "Complete Reference J2EE", McGraw publication.
2. http://www.nptelvideos.com/java/java_video_lectures_tutorials.php
3. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html

e-books (at IP 14.139.234.164):

1. Pandey, 'Java Programming', Noida, Pearson, (available at : <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>).

ME – Mid – I Exam.;

IA – Internal Assessment;

ESE – End Semester Exam.

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Approved by School Board Dated 31/7/19

BCA (Sem. – V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-513	Discrete Mathematical Structures	3	0	0	3	20	20	60	100

- Objectives :**
- (1) To learn mathematical logic & relations.
 - (2) To be aware of mathematical structure used in computer science.

UNIT-I	Sets, Logic, Direct Proof and Proof by Contra positive, Proof by Contradiction, Prove or Disprove, Equivalence Relations, Functions, Mathematical Induction, Cardinalities of Sets. (9 Hours)
UNIT-II	Understanding of the basic ideas of sets and functions, including Boolean combination of sets and be able to manipulate such expressions. (9 Hours)
UNIT-III	Understanding of the standard propositional logic connectives and be able to convert logical expressions into conjunctive and disjunctive normal form, understanding of the universal and existential quantifiers. (9 Hours)
UNIT-IV	Familiar with the general concept of binary relation, equivalence and order relations and methods of combining relations, standard graphical representations of relations, principle of mathematical induction, inclusion-exclusion principle in simple counting examples. (9 Hours)
UNIT-V	Basic ideas of probability. Calculation of probabilities in simple experiments. (9 Hours)

Learning Outcomes : After completing this course student will be able to implement comprehensive logic in programming language and in decision making systems.

Essential Reading :

1. Truss, J.K. Discrete Mathematics for Computer Scientists. 2nd Edition, Addison Wesley 1998.

Suggested Reading and links :

1. <https://nptel.ac.in/courses/111106086/Lecture1.pdf>
2. <https://nptel.ac.in/downloads/111104026/>

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

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Computer Science & Applications

Approved by School Board Dated 21/7/19

BCA (Sem. – V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-514	Programming using PHP	03	-	-	03	20	20	60	100

Objectives : (1) To learn the basics and fundamental tools of PHP Language.
 (2) To learn functions, databases error handling in PHP.
 (3) To be capable enough to write program for web page design.

UNIT- I	Introduction to PHP: Language Features, Object-Oriented Model, Object-Oriented Features, Other Language Features, General PHP Changes, XML and Web Services & Memory Manager. PHP Basic Language: Introduction, HTML Embedding, Comments, Variables, Indirect References to Variables, Managing Variables, Super globals, Basic Data Types, Integers, Floating-Point Numbers, Strings, Booleans, Null, Resources, Arrays, Constants. (9 Hours)
UNIT -II	Operators in PHP: Binary Operators, Assignment Operators, Comparison Operators, Logical Operators, Bitwise Operators, Unary Operators, Negation Operators, Increment/Decrement Operators, The Cast Operators, The Silence Operator, The One and Only Ternary Operator. Control Structures: Conditional Control Structures, Loop Control Structures, Code Inclusion Control Structures. (9 Hours)
UNIT -III	Functions in PHP: User-Defined Functions, Function Scope, Returning Values by Value, Returning Values by Reference, Declaring Function Parameters, Static Variables. Writing Web Application with PHP, Embedding into HTML, User Input, Safe-Handling User Input, Techniques to Make Scripts "Safe" Input Validation, HMAC Verification, PEAR: Crypt HMAC, Input Filter Working with Passwords. (9 Hours)
UNIT - IV	Databases with PHP: MySQL, MySQL Strengths and Weaknesses, PHP Interface, Connections, Buffered Versus Unbuffered Queries, Queries Multi Statements, Fetching Modes, BLOB Handling, SQLite, SQLite Strengths and Weaknesses, PHP Interface, Obtaining PEAR DB, Pros and Cons of Database Abstraction, Database Connections, Executing, Queries, Fetching, Sequences. (9 hours)
UNIT - V	Error Handling: Introduction, Types of Errors, Programming Errors, Undefined Symbols, Portability Errors, Runtime Errors, PHP Errors. The PEAR_Error Class, Handling PEAR Errors, PEAR Error Modes, Exceptions: introduction to Exception. (9 Hours)

Learning Outcomes : After completing this course student will be able to create a website using PHP.

Essential Reading:

1. **PHP 5 Power Programming**, Bruce Perens' Open Source Series.
2. **PHP Bible**, (Author) Tim Converse, Joyce Park.

Suggested Reading and links :

1. **Beginning PHP5** David Mercer, Allan Kent, Steven Nowicki, Clark Morgan, Wankyu Choi.
2. https://nptel.ac.in/courses/nptel_download.php?subjectid=106105171
3. <https://www.guru99.com/php-tutorials.html>

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BCA (Sem. – V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-515	Software Laboratory - A	0	0	4	2	20	20	60	100

Objectives : To draw some graphical structures on computer screen using a programming language.

List of practicals based on Computer Graphics and Multimedia:

1. Write a program to draw a line or circle.
2. Write a program to display a rainbow.
3. Write a program to draw table and chair.
4. Write a program to draw railway track.
5. Write a program to draw shooting arrow.

Any other as per teacher suggestion.

Learning Outcomes : After completion of this course student will be able to design a graphical structure, through a programming.

ME – Mid – I Exam.;

IA – Internal Assessment;

ESE – End Semester Exam.

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BCA (Sem. – V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-516	Software Laboratory - B	0	0	4	2	20	20	60	100

Objectives : (1) To learn the execution of commands in ~~UNIX~~ Linux environment.
(2) To learn the implementation of bash shell programming.

Practical based on Linux Programming

1. Create, delete, update, change location and copy operation for one or more files and Directories.
2. Working with vi editor.
3. Changing file permission, ownership and group for one or more files and Directories .
4. Comparing with two files or more then files using cmp, comm, diff command.
5. Any ten application of meta characters.
6. Any ten application of I/O redirection and Pipes operators.
7. Perform page filter, sorting filter, translate filter for one or more files
8. Any ten Uses of grep filter with and without regular expression
9. Any ten Uses of sed command with and without regular expression.
10. Command for Background and Foreground Process Management .
11. Using and set on Shell and Environment Variable.
12. Bash shell Program for using conditional statements.
13. Bash shell Program for using looping statements.
14. Bash shell Program for using case statements.
15. Bash shell Program for using Unix Operator.
16. Bash shell Program for creating new commands.
17. Bash shell Program for automate system task.
18. Bash shell program for argument and parameter passing

Any other as per teacher concern

Learning outcome : After completion of this course student will be able to handling Linux operating efficiently.

ME – Mid – I Exam.;

IA – Internal Assessment;

ESE – End Semester Exam.

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BCA (Sem. – VI)

Course Code	Course Title	L	T	P	C	Sessional	ESE	Total
CSA-EC-611	Major Project (External) based on Industrial Training	-	-	-	06	40	60	100

Objectives : (1) To learn Industrial need and prepare accordingly.
(2) To provide IT Industry related training to students.

Guidelines

1. Every student shall be spending more than 2 months for Industrial Training preferably on a live project.
2. The report in hard bound copy (with attached CD and attached coding) should contain the system design, analysis, feasibility, methodology, screen shots, output etc.
3. The report should contain the original certificate obtained from the Industry / Company about the originality of the work done there. The certificate must indicate the work has been done by the candidate himself/ herself in the industrial environment. The coding may be attached at the end of project report.
4. Every report should attach a declaration certificate of the candidate that his/ her contribution in project report is original and performed by himself / herself. Each student will submit a project separately on a distinct topic.
5. There will be project monitoring by the teacher concern (course coordinator) of department. Groups of students may be notified by the HoD assigning to teachers concern, if required.
6. Concern teacher (course coordinator) have to conduct two mid-term periodic evaluations of the project work each of 20 marks as per mode of evaluation decided by him/her, equivalent to Mid-I and IA .
7. Before submission of the project, the concern teacher (course coordinator) has to sign on the project and there shall be the signature of HoD also.
8. At the end, the signed copy of project will be evaluated by the panel of internal and external examiners. The score of mid-term periodic evaluation will be added to the End term evaluation.
9. The HoD (or departmental council) will resolve the conflicts raised (if any) whose decision shall be final.
10. Few Lectures by the concerned teacher may be conducted (if required) on topics-Proposal preparation, Methodology, Software and Hardware requirements, Coding, technology, Design, Testing, Validation, Report Writing, Project Presentation.

Learning outcome : After completing this course students will be aware of industrial need for their employment and career prospects in IT sectors in the county/abroad.

ME – Mid – I Exam.;

IA – Internal Assessment;

ESE – End Semester Exam.

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BCA (Sem. – VI)

Course Code	Course Title	L	T	P	C	Sessional	ESE	Total
CSA-SE-612	Seminar and Viva-Voce on Project	-	-	-	02	40	60	100

- Objectives :**
- (1) To make students capable enough to present their project outcomes.
 - (2) To be trained for facing queries question raised by experts / others.

Guidelines

1. It will be based on the live demonstration of the project completed by student through power point presentation and to defend viva-voce.
2. There shall be two periodic evaluation each of 20 marks, equivalent to ME and IA.
3. The course coordinator for above course, will conduct periodic assessment in mode as decided by him /her.
4. The conflict raised, if any, shall be resolved by HOD or by Departmental council, whose decision shall be final.
5. The evaluation of ESE in MM 60, will be done by a panel of one internal and one external examiner.

Learning outcome: After completion of this course student will be trained for presentation & exploration and discussion over a topic of change.

ME – Mid – I Exam.;

IA – Internal Assessment;

ESE – End Semester Exam.

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