

Department of Computer Science & Applications

A New Syllabus of MCA - (I to VI Semester)



Session 2019 - 2020 and onwards

(Effective from July 2019)

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

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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 : **Master of Computer Applications (MCA)**
2. Duration of the program : 3 Years
 - (a) Minimum duration : 3 Years
 - (b) Maximum duration : As per University Ordinance
3. Structure of the program:

MCA Credit Distribution

Semester	Core Course (CC) Credits	Elective Course (EC) Credits	Open Elective (OE) Credits	Skill Based Course (SE) Credits	Total Credits
I	20	--	--	03	23
II	20	--	02	03	25
III	24	--	02	02	28
IV	20	06	--	02	28
V	12	09	02	-	23
VI	-	06	--	02	08
TOTAL	96	21	06	12	135

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. : 15 marks.
 - Presentation, group discussion etc. : 05 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

The marks for attendance shall be 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

(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), the 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:

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, visit or any similar academic event is a part of a course then its score allocation, evaluation shall be decided by the course coordinator.

MCA - I Semester

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-121	Information Technology	03	01	-	04	20	20	60	100
CSA-CC-122	Digital System Design	03	01	-	04	20	20	60	100
CSA-CC-123	Programming and Problem Solving using C	03	01	-	04	20	20	60	100
CSA-SE-124	Professional Communication	03	-	-	03	20	20	60	100
CSA-CC-125	Discrete Mathematics	03	01	-	04	20	20	60	100
Software laboratory (Practicals)									
CSA-CC-126	Software Laboratory - A	-	-	04	02	20	20	60	100
CSA-CC-127	Software Laboratory - B	-	-	04	02	20	20	60	100
Total Credits		15	04	08	23	-	-	-	700

MCA -II Semester

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-221	Computer Architecture	03	01	-	04	20	20	60	100
CSA-CC-222	Data Structure	03	01	-	04	20	20	60	100
CSA-CC-223	Object Oriented Programming using C++	03	01	-	04	20	20	60	100
CSA-CC-224	Operating System	03	01	-	04	20	20	60	100
CSA-SE- 225	Organization Behaviour	03	-	-	03	20	20	60	100
Software laboratory (Practicals)									
CSA-CC-226	Software Laboratory - A	-	-	04	02	20	20	60	100
CSA-CC-227	Software Laboratory - B	-	-	04	02	20	20	60	100
Out Department Paper									
Out Department	Out Department	-	-	-	02	20	20	60	100
Total Credits		15	04	08	25	-	-	-	800
Paper offered for other Department									
CSA-OE-221	Computer Education – I	02	-	-	02	20	20	60	100

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

MCA -III Semester

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total	
						ME	IA			
CSA-CC-321	Data Communication and Networking	03	01	-	04	20	20	60	100	
CSA-CC-322	Database Management System	03	01	-	04	20	20	60	100	
CSA-CC-323	Java Programming	03	01	-	04	20	20	60	100	
CSA-CC-324	Design and Analysis of Algorithm	03	01	-	04	20	20	60	100	
CSA-CC-325	Probability, Statistics and Combinatorics	03	01	-	04	20	20	60	100	
Software laboratory (Practicals)										
CSA-CC-326	Software Laboratory - A	-	-	04	02	20	20	60	100	
CSA-CC-327	Software Laboratory- B	-	-	04	02	20	20	60	100	
Participation / Presentation/ Visit										
CSA-SE-328	Seminar, workshop Participation, Poster Presentation , Group Discussion, training	-	-	-	02	20	20	60	100	
Out Department Paper										
Out Department	Out Department Paper	-	-	-	02	20	20	60	100	
		Total Credits				15	05	08	28	
Paper offered for other Departments										
CSA-OE-321	Computer Education – II	02	-	-	02	20	20	60	100	

MCA -IV Semester

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total	
						ME	IA			
CSA-CC-421	Computer Graphics	03	01	-	04	20	20	60	100	
CSA-CC-422	Software Engineering	03	01	-	04	20	20	60	100	
CSA-CC-423	Unix Programming	03	01	-	04	20	20	60	100	
CSA-CC-424	Theory of Computation	03	01	-	04	20	20	60	100	
Elective I (Opt Any One of Following)										
CSA-EC-421	Data Warehousing and Data Mining	02	01	-	03	20	20	60	100	
CSA-EC-422	Artificial Intelligence	02	01	-	03	20	20	60	100	
CSA-EC-423	Cryptography and Security	02	01	-	03	20	20	60	100	
CSA-EC-424	Decision Support System	02	01	-	03	20	20	60	100	
Elective II (Opt Any One of Following)										
CSA-EC-425	Parallel Computing	02	01	-	03	20	20	60	100	
CSA-EC-426	Simulation and Modeling	02	01	-	03	20	20	60	100	
CSA-EC-427	Microprocessor	02	01	-	03	20	20	60	100	
CSA-EC-428	Management Information System	02	01	-	03	20	20	60	100	
Software laboratory (Practicals)										
CSA-CC-425	Software Laboratory - A	-	-	04	02	20	20	60	100	
CSA-CC-426	Software Laboratory - B	-	-	04	02	20	20	60	100	
Participation / Presentation/ Visit										
CSA-SE -427	Industrial Tour, Seminar Participation, Minor project, training	-	-	-	02	20	20	60	100	
		Total Credits				16	06	08	28	

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MCA -V Semester

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-521	Compiler Design	03	01	-	04	20	20	60	100
CSA-CC-522	Distributed System	03	01	-	04	20	20	60	100
Elective I (Opt Any One of Following)									
CSA-EC-521	Bioinformatics	02	01	-	03	20	20	60	100
CSA-EC-522	Computational Linguistics	02	01	-	03	20	20	60	100
CSA-EC-523	Advance Computer Architecture	02	01	-	03	20	20	60	100
Elective II (Opt Any One of Following)									
CSA-EC-524	Cloud Computing	02	01	-	03	20	20	60	100
CSA-EC-525	Information Theory and Coding	02	01	-	03	20	20	60	100
CSA-EC-526	Soft Computing	02	01	-	03	20	20	60	100
Elective III (Opt Any One of Following)									
CSA-EC-527	ASP.NET Programming	02	01	-	03	20	20	60	100
CSA-EC-528	Programming using PHP	02	01	-	03	20	20	60	100
CSA-EC-529	Python Programming	02	01	-	03	20	20	60	100
Software laboratory (Practical)									
CSA-CC-523	Software Laboratory - A	-	-	04	02	20	20	60	100
CSA-CC-524	Software Laboratory - B	-	-	04	02	20	20	60	100

Out Department Paper									
Out Department	Out Department Paper	-	-	-	02	20	20	60	100
Total Credits		-	-	-	23	-	-	-	800

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MCA- VI Semester

Major Project

Code	Title	L	T	P	Credit	Sessional	End Sem.	Total
CSA-EC-621	Major Project (External) based on Industrial Training	-	-	-	06	40	60	100
CSA-SE-622	Seminar and Viva-Voce on project	-	-	-	02	40	60	100
TOTAL		-	-	-	08	-	-	200

For CSA-EC-621, CSA-SE-622, 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-622, 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- 621 and CSA-SE-622 shall be by the panel of Internal & External examiners.

MCA (SEM.- I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-121	Information Technology	03	01	-	4	20	20	60	100

- Objectives :**
- (1) To introduce foundation of Computer.
 - (2) To introduce students with basics of System and Applications Software.
 - (3) To make aware students about types of Operating Systems, compiler interpreter.
 - (4) To convey students fundamental concept of design, topology and applications of Computer Network.

UNIT- I	Computer Fundamentals: Block structure of a computer, characteristics of computers, problem solving with computers, generations of computers, classification of computers on the basis of capacity, purpose, generation, Introduction to Number System. (12 Hours)
UNIT -II	Computer languages: Machine language, assembly language, higher level language. Software - system software, application software. (12 Hours)
UNIT -III	Operating system: Batch, multi-programming, time sharing, network operating system, on-line and real time operating system, Distributed operating system, multi-processor, Multi-tasking. Assembler: Elements of assembly language programming, a simple assembly scheme, pass structure of assembler, design of two pass assemblers, a single pass assemblers, Macro definition & Call. (12 Hours)
UNIT- IV	Compilers & Interpreters: aspects of compilation, memory allocation, interpreters, Linker & Loaders. Software Tools: Software tools for program development, editors, debug monitors, programming environment, user interfaces. (12 Hours)
UNIT- V	Computer Network and Communication: Network types, network topologies, network communication devices, physical communication media. Internet and its Applications : E-mail, TELNET, FTP, World Wide Web, Internet chatting. Introduction to E-Commerce: Meaning, its advantages & limitations, Types of E-Commerce Applications. (12 Hours)

Learning Outcomes : After completion this course, students will be able to understand the basic fundamentals of information technology and basic awareness about functioning of system softwares like assembler, compiler, interpreter along with computer network fundamentals and internet basics.

Essential Reading:

1. Rajaraman, "Fundamentals of Computers" (2nd Edi), PHI, New Delhi, 1996.
2. Petrick Norton, Fundamentals of Computers.
3. Dhamdhare M. "System Programming & O.S." (2nd Ed), TMH.

Suggested Reading and links:

1. Jain Satish, "Information Technology", BPB 1999.
2. Ram B., "Computer Fundamentals", Wiley, 1997.
3. Norton, Introduction to Computer, TMH.
4. Katz, Excel 2010 : Made simple, AP Press.
5. <https://nptel.ac.in/courses/106105084/1>
6. http://e-school.kmutt.ac.th/elibrary/Upload/EBook/DSIL_Lib_E1312881659.pdf
7. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

e-books (at IP 14.139.234.164):

1. Dave; Dave, 'Compilers: Principles and Practice', 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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MCA (SEM.- I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-122	Digital System Design	03	01	-	04	20	20	60	100

- Objectives :**
- (1) To introduce the mathematical and numerical foundation of digital system.
 - (2) To teach Logic gates structure of digital system.
 - (3) To aware students about combinatorial and sequential theory of circuit.
 - (4) To introduce various types of memories used in computer.

UNIT- I	Introduction to Digital Computer: Number System, 1's and 2's complement. BCD, De-Morgan's Theorem, Gray code, Duality Theorem, Boolean Algebra, Simplification using K-Map. (12 Hours)
UNIT -II	Logic gates: NOT, AND, OR, NAND, NOR, XOR, XNOR. Implementation of basic gate using NAND and NOR. (12 Hours)
UNIT -III	Combinational Circuits: Half Adder, Full Adder, Binary Adder and Subtracted. Decoder / Encoder, Multiplexer / De-multiplexer. (12 Hours)
UNIT- IV	Sequential Circuits, Flip Flops - SR, D, JK, Master – Slave, Edge Triggered, Shift Registers (Any one type), Introduction to Counters: Synchronous as well as Asynchronous Counter (one example of Each). (12 Hours)
UNIT- V	Memory System: Memory Hierarchy, Primary Memory – DRAM, SDRAM, DDR, DRAM. ROM, PROM, EPROM, EEPROM, Concepts of Auxiliary, Associative, Cache and Virtual Memory. (12 Hours)

Learning Outcomes :

after completing this course students will be able to understand the uses and applications of logic gates, circuit architecture and classification of memories in a computer system.

Essential Reading:

1. Digital Computer Electronics by Morris Mano “ Pearson Publication”
2. Fundamental of Computer, V. Rajaraman : (PHI).
3. Digital Principles and Applications 8th Edition, Leach, TMH.

Suggested Reading and links :

1. Logic in computer science : modelling and reasoning about systems, Huth, Cambridge University press.
2. Subir Kumar, Foundation of Digital Electronics : (Pan Stanford) AM/ TB/882
3. HUTH, Logic in computer Science : Modelling and reasoning a bout systems (Cambridge Univ. Press)
4. Puri, Digital Electronics Circuit and Systems. TMH.
5. <https://nptel.ac.in/courses/117105080/>
6. <https://dvikan.no/ntnu-studentserver/kompendier/digital-systems-design.pdf>
7. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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MCA (SEM.- I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-123	Programming and Problem Solving using C	03	01	-	04	20	20	60	100

- Objectives :** (1) To learn the fundamentals of C language.
 (2) To learn programming skill in C language for solving problem.

UNIT- I	A Simple C program, basic data types operators like arithmetic, relational, logical, increment, decrement, conditional, bit-wise, assignment etc. Expressions type conversions, conditional expressions. (12 Hours)
UNIT -II	Input-output statements, statements and blocks, if and switch statements, loops- while, do-while and for statements, break, continue, go to statement. (12 Hours)
UNIT -III	Functions, basics, parameter passing (Call by Value, Call by Reference) storage classes-extern, auto, register, static, Recursive functions, header files, Arrays- concepts, arrays and functions, two-dimensional and multi-dimensional arrays, applications of arrays, address calculation in array. (12 Hours)
UNIT- IV	Pointers-concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers. (12 Hours)
UNIT- V	File Handling in C, command line arguments. Structure, Union, Enumeration & type def Declaration and Initializing Structure, Accessing Structure members, Structure Assignments, Arrays of Structure, Passing Structure to function C Pre-processor Directive, Macro Substitution, File inclusion directive, Conditional Compilation. (12 Hours)

Learning Outcomes : After completing this course student will be able to writ a program in C-language for solving problems.

Essential Reading:

1. Yashwant Kanitkar , Let us C by BPB publication
2. E. Balaguruswami, Programming with C. TMH

Suggested Reading and links:

1. The 'C' Programming language, W. Kemighan : (Pearson Education India).
2. Programming with C, Third Edition, Gottfried, TMH.
3. Saha, Basic Computation and Programming with C, Cambridge.
4. <https://nptel.ac.in/courses/106104128/>
5. http://www.kciti.edu/wp-content/uploads/2017/07/cprogramming_tutorial.pdf
6. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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MCA (SEM.- I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-SE-124	Professional Communication	03	-	-	03	20	20	60	100

- Objectives :**
- (1) To learn effective communication skill and assessment skills useful for IT business.
 - (2) To be aware of technical points for preparing projects reports and development proposal.
 - (3) To learn effective skills of text writing time & event management manners and etiquettes.

UNIT- I	Self Development and Assessment: Self-Assessment, Self-Awareness, Perception and Attitudes, Values and Belief System, Personal Goal Setting, Career Planning, Building of Self-Confidence. (9 Hours)
UNIT -II	Components of communication, Principles of communication barriers, listening skills Verbal Communication, Includes Planning, Preparation, Delivery, Feedback and Assessment of activities like Public speaking, Group Discussion, Oral Presentation skills. (9 Hours)
UNIT –III	Written Communication: Technical Writing–Technical, Reports, Project Proposals, Brochures, Newsletters, Technical Articles, Technical Manuals, Official/Business, Correspondence: Business letters, Memos, Progress report, Minutes of meeting, Event reporting. (9 Hours)
UNIT- IV	Ethics and Etiquettes: Business Ethics, Etiquettes in social as well as Office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics and ethics as an IT professional. (9 Hours)
UNIT- V	Other Skills: Managing time, event management, Meditation, Improving Personal Memory, Study skills that include, Rapid reading, Notes taking, Complex problem solving. (9 Hours)

Learning Outcomes : After completing this course, students will be able to deal effectively the others officers, employees and customers of industries and will be capable enough technical writing.

Essential Reading:

1. You Can Win – Shiv Khera – Macmillan Books – 2003 Revised Edition
2. Habits of Highly effective people – Stephen Covey
3. Business Communication? Asha Kaul

Suggested Reading and links:

1. Business Communication - M. Balasubramanyam
2. John Collin, “Perfect Presentation”, Video Arts MARSHAL
3. Jenny Rogers “ Effective Interviews”, Video Arts MARSHAL
4. Raman Sharma, “ Technical Communications”, OXFORD
5. Sharon Gerson, Steven Gerson “Technical writing process and product”.
6. Bovee Chatterjee, Business Communication today, Pearson Education.
7. <https://nptel.ac.in/downloads/109104030/>
8. https://nptel.ac.in/syllabus/syllabus_pdf/109106065.pdf
9. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-125	Discrete Mathematics	03	01	-	04	20	20	60	100

- Objectives :**
- (1) To learn the mathematical structure used as a basic resource in computer science.
 - (2) To improve upon logic and aware of rules for decision making.
 - (3) To learn mathematical tools used in design and analysis in computer science.

UNIT- I	Set Theory : Introduction, Size of sets and cardinals, Subsets, Power sets, Complement, Union and Intersection, Demorgan’s law, Ordered pairs and Set identities. Relations & Functions: Relations - Definition, Operations on relations, Composite relations, Properties of relations, Equality of relations, Partial order relation. Functions - Definition, Classification of functions, Operations on functions, Recursively defined functions. Notion of Proof: Introduction, Mathematical Induction, Strong Induction and Induction with Nonzero base cases. <p align="right">(12 Hours)</p>
UNIT -II	Algebraic Structures: Definition, Properties, Types: Semi Groups, Monoid, Groups, Abelian Groups. Recurrence Relations: Introduction, Growth of functions, Recurrences from algorithms, Methods of solving recurrences. Combinatorics: fundamental counting principles, principle of inclusion and exclusion, pigeonhole principle, permutation and combination, Pascal’s triangles. <p align="right">(12 Hours)</p>
UNIT –III	Lattices: Introduction, Partial order sets, Combination of partial order sets, Hasse diagram, Introduction of lattices, Properties of lattices – Bounded, Complemented, Modular and Complete lattice. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Boolean functions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. <p align="right">(12 Hours)</p>
UNIT- IV	Propositional & Predicate Logic: Propositions, Truth tables, Tautology, Contradiction, Algebra of propositions, Theory of Inference and Natural Deduction. Theory of predicates, First order predicate, Predicate formulas, quantifiers, Inference theory of predicate logic. <p align="right">(12 Hours)</p>
UNIT- V	Trees & Graphs: Trees - Definition, Binary trees, Binary tree traversal, Binary search trees. Graphs - Definition and terminology, Representation of graphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Multigraphs, Euler and Hamiltonian paths, Graph coloring. <p align="right">(12 Hours)</p>

Learning Outcomes : After the completion of this course student will be capable enough to provide logical and analytical support in software development.

Essential Reading:

1. K.H. Rosen, Discrete Mathematics and Its Applications, Tata McGraw Hill
2. J.P. Trembley & R.P.Manohar, Discrete Mathematical Structure with Appl to ComputerScience.TMH

Suggested Reading and links :

1. Kenneth H. Rosen-203 Discrete Math & its Applications, 5th Ed.
2. C.L. Liu D. P. Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, TMH.
3. <https://nptel.ac.in/downloads/111104026/>
4. <https://nptel.ac.in/courses/111106086/Lecture1.pdf>
5. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-126	Software Laboratory - A	-	-	04	02	20	20	60	100

Objectives : (1) To learn the execution of C-language program on computer with special features of language.
 (2) To learn error detection and output analysis during program execution.

Programme based on C Language

(A) Basics/ Sequential program :

1. Write a C Program to Print Hello Word.
2. Write a C Program to Declaring Variable and Printing its Value.
3. Write a C Program to Calculate Area and Circumference of Circle.
4. Write a C Program to Calculate Area of Equilateral Triangle.
5. Write a C Program to Calculate Area of Right angle Triangle.
6. Write a C Program to Calculate Area of Circle.
7. Write a C Program to Calculate Area of Rectangle.
8. Write a C Program to Calculate Area of Square.
9. Write a C Program four digit number sum.
10. Write a C Program reverses of a given number.
11. Write a C Program to Find sum of two numbers
12. Write a C Program to Calculate sum of 5 subjects and find percentage
13. Write a C Program to Swap of two no's with using third variable
14. Write a C Program to Swap of two no's without using third variable.
15. Write a C Program to Swap of three no's with using third variable
16. Write a C Program to Swap of four no's with using third variable
17. Write a C Program to convert temperature from degree centigrade to Fahrenheit
18. Write a C Program to find gross salary.
19. Write a C Program to find distance in kilometre of given meter.

(B) Decision Making Statements Based on Programs

20. Write a C program to find given number is even or odd.
21. Write a C program to find given number is positive or negative.
22. Write a C program to find given number is equal or not.
23. Write a C program to find the largest of two numbers.
24. Write a C program to find the largest of three numbers.
25. Write a C program to find the smallest of two numbers.
26. Write a C program to find the smallest of three numbers.
27. Write a C program to checks whether it is a vowel or a consonant.
28. Write a C program to check whether a character is an alphabet or not.
29. Write a C program to find roots of quadratic equations with considered all cases.
30. Write a C program to find given year is leap year or not.

(C) Control Statements

31. Write a C program to find sum of first n natural number i.e.: $s=1+2+3..+n$
32. Write a C program to find $sum=1+3+5+....$
33. Write a C program to find $sum= 2+4+6..$
34. Write a C program to find $sum=1/1+1/2+1/3+...1/n$
35. Write a C program to find factorial of given number.
36. Write a C program to generate Fibonacci series of given limit.
37. Write a C program to find $sum=1/1!+1/2!+1/3!+.....1/n!$
38. Write a C program to find a reverse of a given number.

39. Write a C program to find power function a^b .

40. Write a C program to $sum=1/2!+1/4!+1/6!+1/8!$

(D) Recursion

41. Factorial

42. Reversing a string

43. Fibonacci Sequence

44. Tower of Hanoi

(E) Based on Array

45. Write a C program to create an array and display it.

46. Write a C program to find the total number of odd/even numbers in array.

47. Write a C program to find the sum of even or odd number in array.

48. Write a C program to swap a number in array.

49. Write a C program to reverse of an array.

50. Write a C program to find out maximum in array.

51. Write a C program to find out minimum in array.

52. Write a C program to search a key element in array.

53. Write a C program to arrange an array element either in increasing or decreasing.

54. Write a C program to create a matrix and display it.

55. Write a C program to find out the addition, subtraction, multiplication and division of two matrix.

56. Write a C program to find out the elements of diagonal of matrix.

57. Write a C program to find out the addition, subtraction, multiplication and division of diagonal of a matrix.

58. Write a C program to find maximum 4X3 array.

59. Write a C program to find maximum 3X4 array.

60. Write a C program to swap first element with last, second to second last and vice versa in 10X10 array.

61. Write a C program to 2D array of 7X5 which consist 0 and 1.

62. Write a C program to find total number of 0's and total number of 1's.

63. Write a C program to copy from one matrix A to another matrix B who's size 3X3.

64. Write a C program to transpose of given matrix 3X3.

(F) Based on String Manipulations

65. Counting number of vowels, consonants, words, white spaces in a string

66. Reversing a string and check for palindrome

67. Finding the number of occurrences of a sub string in a given string

68. Sub string replacing and removal

(G) Based on Pointer

69. Write a C program to swap two numbers by using call by value and call by reference.

70. Write a C program using call by reference to find area of circle and value would be display.

71. Write a C program to complete area of rectangle call by reference.

(H) Based on Structure

72. Program for Structures and Union

73. Program for Pointers

74. Program for Pointer with Structures

Any other as per teacher concern

Learning outcome: After completion of this course student will be able to write programmes in C-language of real life problems.

Essential Reading:

1. Programming with C, Third Edition, Gottfried, TMH.

Approved by BoS on dated 05-07-2019

MCA (SEM.- I)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-127	Software Laboratory - B	-	-	04	02	20	20	60	100

Objectives : (1) To learn the text typing and editing.
 (2) To be capable for data entry, sorting, data analysis.
 (3) To be competent for preparing and designing digital content presentation.

Practicals based on MS-OFFICE

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 outcome : After completing this course student will be capable enough for creating text document, and their presentation alongwith data analysis skill.

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-221	Computer Architecture	03	01	-	04	20	20	60	100

- Objectives :**
- (1) To be aware of internal architecture of central processing unit.
 - (2) To learn the functioning of exchange of information of electronic devices embedded on motherboard.
 - (3) To learn the memory classification and organization.

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	Computer Arithmetic: Introduction, addition and subtraction, multiplication algorithms, division algorithms, floating point arithmetic operation, decimal arithmetic unit, and decimal arithmetic operations. Register Transfer and Micro operation: Register transfer language, register transfer, bus and memory transfer, arithmetic micro operations, logic micro operations, shift micro operations. (12 Hours)
UNIT –III	Basic Computer Organization and Design: Instruction codes, computer registers, computer instructions, timing & control, instruction cycle, memory reference instructions, input- output and interrupts, design of basic computer, design of accumulator logic. Micro programmed Control Unit: Control memory, address sequencing. Central Processing Unit: Introduction, general registers organization, stack organization, instruction formats, and addressing modes. (12 Hours)
UNIT- IV	Input-Output Organization: Peripheral devices, input – Output interface, asynchronous data transfer, modes of data transfer, priority interrupt, direct memory access, input -output processor. (12 Hours)
UNIT- V	Memory Organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware. (12 Hours)

Learning Outcomes : After completing this course student will be capable enough to understand the roles, functions and duties of components of internal architecture of control processing unit.

Essential Reading:

1. Mano ,M “Computer System and Architecture”, Pearson Education
2. Hayes.J.P, ”Computer Architecture and Organization”, McGraw Hill

Suggested Reading and links :

1. Linda Null, Essential of Computer Organization and Architecture, J&B.
2. Essential of Computer Organization and Architecture, J&B.
3. <https://nptel.ac.in/courses/106103068/pdf/coa.pdf>
4. <https://nptel.ac.in/courses/106102062/>
5. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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>)

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-222	Data Structure	03	01	-	04	20	20	60	100

Objectives : (1) To learn the basic tools and techniques of storage of data in computer system.
 (2) To learn about access of data through various.

UNIT- I	Abstract Data Types (ADT), Asymptotic Notations, Time and space complexity of algorithms, Elementary data structures and their applications, Array Definition, Single and Multidimensional Arrays, application of arrays, String Operation. Sparse Matrices, Lower and Upper Triangular matrices. (12 Hours)
UNIT -II	Singly Linked Lists – Circular Linked Lists – Doubly Linked Lists – linked List in Array, Polynomial representation and addition. Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Linked Representation of Stack, Operations Associated with Stacks. (12 Hours)
UNIT –III	Applications of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queue, Deque and Priority Queue. (12 Hours)
UNIT- IV	Trees – Binary Trees – Binary Tree Traversals – Binary Tree Representations – Binary Search Trees – Threaded binary Trees – Application of Trees– Binary Search Tree (BST), Insertion and Deletion in BST, AVL Trees. (12 Hours)
UNIT- V	Graph: Introduction, Graph Representation, Adjacency Matrix, Adjacency List, Graph Traversals, Depth First Search, Breadth First Search, Applications of Graph. Linear & Binary search, Hash table and Hashing. Sorting: Bubble sort, Insertion sort, Selection sort, Quick sort, Shell sort, Merge sort. (12 Hours)

Learning Outcomes :

After completion of this course, student will be able to learn the various patterns of data storage, data access along with analysis of their comparative performances.

Essential Reading:

1. Data Structure using C by Tanbaum, Pearson Publication
2. Kruse, Data Structure and Programming Design in C, Pearson Education.

Suggested Reading and links :

1. Data structure and program design in C by R.L. Krus, PHI New Delhi
2. Data Structure Algorithms and applications JAVA, (Orient Blackwan) Silicon Press,
3. Main, Data Structures and other Objects using C++, 4th Edition, Pearson Education.
4. <https://nptel.ac.in/courses/106105085/4>
5. <https://nptel.ac.in/courses/106103069/>
6. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

e-books (at IP 14.139.234.164):

1. MUKHERJEE, SUDIPTA, ‘Data Structures Using C: 1000 Problems and Solutions’, Noida, McGraw, Hill, (available at <http://mcgrawhilleducation.pdn.i publishcentral.com/bookshelf>)

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- II)

Course Code	Course Title	L	T	P	C	Sessional		ES E	Total
						ME	IA		
CSA-CC-223	Object Oriented Programming using C++	03	01	-	04	20	20	60	100

Objectives : (1) To aware about fundamentals of object oriented programming tools.
 (2) To learn the program design in C++ for real life problems.

UNIT- I	Object-Oriented Programming Concepts: Introduction, comparison between procedural programming paradigm and object-oriented programming paradigm, basic concepts of object-oriented programming—Concept of streams, hierarchy of console stream classes, input/output. Function different types of function. (12 Hours)
UNIT -II	Classes & Specifying a class, creating class objects, accessing class members, access specifies and static members, use of const keyword, friends of a class, empty classes, nested classes, local classes, abstract classes, container classes, bit fields and classes. (12 Hours)
UNIT -III	Declaring and initializing pointers, accessing data through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory management using new and delete operators, pointer to an object, this pointer, pointer related problems - dangling/ wild pointers, null pointer assignment, memory leak and allocation failures Constructors and Destructors. (12 Hours)
UNIT- IV	Overloading operators, rules for overloading operators, overloading of various operators, type conversion.. Introduction inheritance, defining derived classes, forms of inheritance, ambiguity in multiple and multipath inheritance, virtual base class, object slicing, overriding member functions, order of execution of constructors and destructors, Concept of binding-early binding and late binding virtual functions, pure virtual functions, abstract classes, virtual destructors. (12 Hours)
UNIT- V	Basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, re-throwing an exception, specifying exceptions template concepts, function templates, class templates. (12 Hours)

Learning Outcomes : After completing this course student will learn writing computer program in C++ language.

Essential Reading:

1. E. Balaguruswamy, “Objected Oriented Programming with C++”, TMH.
2. D. Parsons, “Object Oriented Programming with C++”, BPB Publication.
3. R. Lafore, “Object Oriented Programming using C++”, Galgotia Publication

Suggested Reading and links:

1. Budd, “Classic Data Structure in C++” Addison Wesley
2. Khateeb, Thampi, Computer Programming in C++, Pearson Education.
3. Chip Weams, Programming and Problem Solving with C++ (Jones & Bartlett Learning).
4. Dale, C++ Plus Data Structures, 5 Editions, JBI.
5. Horowitz, Sahni , Computer Algorithms/ C++ (Orient black soil)
6. <https://nptel.ac.in/downloads/106105151/>
7. <http://textofvideo.nptel.ac.in/106105151/lec1.pdf>
8. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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>)

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-224	Operating System	03	01	-	04	20	20	60	100

- Objectives :**
- (1) To understand the basic function of operating system.
 - (2) To learn the resource manage aspect of operating system.
 - (3) To be award about problems appearing while resource management and their solutions.
 - (4) To learn the role and functions of distributed operating system.

UNIT- I	Introduction to Operating System: Operating System: Introduction, Objectives and functions. Evolution of Operating System, 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 -II	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 –III	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- IV	File Management: File system, file organization, file directories, file sharing, Record blocking, Error handling. (12 Hours)
UNIT- V	Distributed operating system: Motivation, Types of distributed system, Network structure, Network topology, and Distributed file system: Naming and transparency, Remote file access, State ful verses stateless service. (12 Hours)

Learning Outcomes : After completion of this course, student will be award about the resource management aspect of operating of computers with challenges and solutions.

Essential Reading:

1. William Stallings: “Operating System”, PHI
2. Silberschatz and Galvin: “Operating System Concept”, Addison Wesley

Suggested Reading and links :

1. Tanenbaum, A.S., “Modern Operating Systems”, Prentice Hall of India Pvt. Ltd.
2. Tanenbaum, Distributed Operating System, Pearson Education India.
3. <https://nptel.ac.in/downloads/106108101/>
4. <https://nptel.ac.in/courses/106102132/>
5. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

e-books (at IP 14.139.234.164):

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

ME – Mid – I Exam.;

IA – Internal Assessment;

ESE – End Semester Exam.

Approved by BoS on dated 05-07-2019

MCA (SEM.- II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-SE- 225	Organization Behaviour	03	-	-	03	20	20	60	100

- Objectives :**
- (1) To learn the Psychological part of human behaviour.
 - (2) To understand the Job Culture and adjustment in team.
 - (3) To understand the job nature and behaviour to uplift organization.

UNIT- I	Introduction to organizational behaviour: The challenges facing management approach to organizational behaviour. Management -functions of a management, Management Roles, Management Skills, Foundation of Individual Behaviour-Ability, Biographical characteristics and Learning. (9 Hours)
UNIT -II	Organization: Organization structure, Common organizational design, New design options, authority and responsibility, centralization and decentralization, work design and technology – requisite task attribute theory, Job characteristic model, social information process model. Conflict – source and types of conflicts in organization, conflict management. Negotiation – Bargaining policies, Negotiation process. (9 Hours)
UNIT –III	Motivation: primary and secondary motives, Maslow’s theory of motivation, Hertzberg’s two factor theory, Adam’s equality theory, McGregor’s theory X and theory Y. McClelland’s theory, leadership–it’s theories and skills, Contemporary issues in leadership, trust and leaders. (9 Hours)
UNIT- IV	Job satisfaction: Measuring job satisfaction, outcome of job satisfaction, with respect to productivity, turnover, absenteeism, etc. (9 Hours)
UNIT- V	Job Enrichment: Job rotation, MBO techniques, Human resource policies and practices – Training and development programme, Types of training & Training methods. Introduction of Communication Process and it’s benefits. (9 Hours)

Learning Outcomes : After completion of this course student will learn the psychological factors of human behaviour in an organization.

Essential Reading:

1. Robbins Stephen P., ‘Organizational Behavior’ 10th Edition, Mc Graw Hill.
2. Luthans Fred, ‘Organizational Behavior’,
3. Wehrich Koont, ‘Principal of Management’ Mc Graw Hill.

Suggested Reading and links :

1. Franklin Terry, ‘Principal of Management’, AITBS, New Delhi.
2. Obrian, Management Information System,
3. Ashok Arora, Management Information System, (Excel).
4. Chandan, Organizational Behaviour, Vikas Publication.
5. <https://nptel.ac.in/downloads/110105034/>
6. <https://nptel.ac.in/courses/110105033/>
7. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-226	Software Laboratory - A	-	-	04	02	20	20	60	100

Objectives : (1) To provide programming practice on C++ language on computer in order to generate skill of executing computer programme.

Based on C++ Language

1. C++ program to check whether a number is not a perfect number or not
2. C++ program to print all perfect numbers in given max range
3. Perfect numbers in given range by C++ program
4. C++ program to test or check an Armstrong number
5. C++ program to test or check an Armstrong number using for loop
6. Print all Armstrong numbers less than 500
7. Print all Armstrong numbers in given range by c++ program
8. Check given number is prime number or not using c++ program
9. Print all prime numbers from 1 to 100 using c++ program
10. C++ program to find all prime numbers in given max range
11. Program to find prime in given ranges number in c++
12. Code for sum of prime numbers in c++
13. C ++ code of sum of prime in given range
14. Write a c++ program to whether check given number is strong number or not
15. Find strong in given range using c++ program
16. C++ program to check given number is odd or even
17. C++ program to print all odd numbers in given range
18. C++ code to print all odd and even numbers in given range
19. C++ code to get sum of all odd numbers in given range
20. Check the given number is palindrome number or not by c++ program
21. Test palindrome number in c++ using for loop
22. How to test a number is palindrome or not in c++ using function
23. Palindrome numbers in given range by c++

Any other as per teacher concern

Learning Outcomes : After completion this course, students will be able to write execute program with compilation and output generation.

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-227	Software Laboratory - B	-	-	04	02	20	20	60	100

Objectives : (1) To learn the programming of data structure basic and fundamental procedures regarding data, storage operations.

Programme based on Data Structure using C++

1. Stack and their operation using Array
2. Queues and their operation using array
3. Circular Queue and De-Queue and their operation
4. Linked List and their operations
5. Doubly Link list and their operation
6. Liner, Binary and Hash Searching
7. Insertion, Selection, Bubble, Quick and merge Sorting
8. Heap and Bucket Sorting
9. Creating on Simple tree and Binary Search Tree
10. Binary tree Traversal [inorder, preorder, postorder]
11. Creating on Simple Graph and Multi Graph
12. Graph Traversal [breadth first, depth first]
13. Polynomial addition using linked list
14. Conversion of Infix to Prefix and Postfix Expressions and Evaluation
15. Various Program for Tree and Graph Application

Any other as per teacher concern

Learning Outcomes : After completion this course, students will learn the programming skill of tools and techniques of data storage.

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- II)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-OE-221	Computer Education – I	02	-	-	02	20	20	60	100

Objectives : (1) To learn the basics of computer system.
 (2) To understand the basics of computer structure and organization.

UNIT- I	Generations of Computer, Block Diagram of a Computer, Applications of Computers, Advantages and Disadvantage of Computer, CPU, Keyboard, mouse, joystick, track ball, light pen, Data Scanning devices image scanner, OCR, OMR, MICR, Bar code reader, card reader, Voice Recognition Device. (6 hours)
UNIT -II	Monitor, Printer laser pointer, dot matrix printer, ink jet printer, Memory hierarchy, Cache Memory, Primary Memory RAM, DRAM and SRAM, ROM, Secondary Memories. (6 hours)
UNIT –III	Application Software, System Software, Communication Software, Application Software, Programming Language Translators, Assembler, Compiler, Interpreter, Utility Programs, Computer Languages, Machine language, Assembly language, High level language. (6 hours)
UNIT- IV	Number System: Decimal Number System, Binary Number System, Octal Number System and Hexadecimal Number System and their conversions. (6 hours)
UNIT- V	First compliment & Second Compliment Logic Gates- AND, OR, NOT, Universal Logic Gates- NOR, NAND. (6 hours)

Learning Outcomes : After completing this course, student will be aware of structure, functioning and working procedure of a computer system.

Essential Reading:

1. Computer Fundamentals, Forth Edition by P.K. Sinha and Priti Sinha.
2. Computer Fundamentals Architecture and Organization, Third Edition by B. Ram.

Suggested Reading and links :

1. Digital Principle and Applications, Six Edition by Donald P Leach, Albert Paul Malvino & GoutamSaha.
2. Fundamentals of Computers, Fourth Edition by V. Raja Raman.

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-321	Data Communication and Networking	03	01	-	04	20	20	60	100

- Objectives :**
- (1) To understand the procedure of data communication and networking.
 - (2) To learn the tools, techniques, protocols of establishing communication network.
 - (3) To be aware of problems generating during communication and their contents controls.

UNIT- I	Introduction to Data Communication and Networking: Uses of Computer Networks, Network Hardware, Network Software Internet Reference Models (OSI and TCP/IP) Physical Layer: Basis for Data Communication, Guided Transmission Media , Wireless Transmission Medium, Circuit Switching and Telephone Network, High Speed Digital Access Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction, Data Link Control and Protocols, Example Data Link Protocol Medium Access Layer: Channel Allocation Problem, Multiple Access, CSMA, CSMA/CD, CSMA/CA. (12 Hours)
UNIT -II	Local Area Network: Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN, Blue tooth, Connecting devices:-Repeaters, Hub, Bridges, Switch, Router, Gateways, Virtual LAN, Example Networks: X.25, Frame Relay, ATM, ISDN. (12 Hours)
UNIT –III	Network Layer: Network Layer Design Issues, Routing Algorithms (Optimality principle, Static Routing Algorithms, Shortest Path, Flooding, Dynamic routing Algorithms, Distance Vector, Link State routing.). (12 Hours)
UNIT- IV	Congestion control Algorithms (Principles, Policies, Algorithms), Quality of Service (Requirements, Techniques, Integrated Services & Differentiated Services), Network Layer Protocols (IP Addressing, CIDR & NAT, IP layer protocols (ICMP, ARP, RARP, DHCP, BOOTP), IPv6). (12 Hours)
UNIT- V	Transport layer: Transport Layer Service, Elements of Transport protocols, Internet protocols (UDP and TCP). Application Layer: DNS- Domain Name System, Electronic Mail, World Wide Web, Multimedia (Audio Compression, Streaming Audio, Voice over IP, Video Compression, Video on Demand). (12 Hours)

Learning Outcomes : After completing of this course, student will be able to understand the classification, procedures and problems appearing in the data communication and networking.

Essential Reading:

1. Tananbaum A.S., “Computer Networks”, 3rd Ed, PHI, 1999.
2. Stallng W, “Data & Computer Communications”, 8th Edition, PHI
3. B. Forouzan, "Data Communication and Networking", First Edition, 1999, Tata McGraw Hill.

Suggested Reading and links :

1. Cryptography and network Security, 3rd Edi. , Foroyzan (TMH).
2. Kurose, “Computer Networking 6 Edition, A Top down approach”, Pearson.
3. Dye, “Network Fundamental” CCNA Exploration”, Pearson.
4. Cisco, “CCNA Exploration, Wan Accessing the Wan”, Pearson
5. Jan Garba, “An Introduction to Network Programming with JAVA”, JAVA 7 Compliant.
6. <https://nptel.ac.in/downloads/106105080/>
7. <https://nptel.ac.in/courses/106105082/1>
8. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

e-books (at IP 14.139.234.164):

Forouzan, ‘Computer Networks’, Noida, McGraw Hill, (available at : <http://mcgrawhilleducation.pdn.i publishcentral.com/bookshelf>)

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

MCA (SEM.- III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-322	Database Management System	03	01	-	04	20	20	60	100

- Objectives :**
- (1) To learn the basics of creation of databases.
 - (2) To understand tools and techniques used in database creation.
 - (3) To be aware of rules, checks, problems and their remedies.
 - (4) To learn conditional data access techniques in the form of queries.

UNIT- I	Basic concepts: database & database users, characteristics of the database, database systems, concepts and architecture, data models, schemas & instances, DBMS architecture & data independence, database languages & interfaces, data modeling using the entity-relationship approach. (12 Hours)
UNIT- II	Relational data Model & Algebra: Basics of the Relational Model-From E/R Diagrams to Relational Designs. 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 Relational Algebra: Relational Operations-Extended Operators of Relational Algebra- Constraints on Relations. (12 Hours)
UNIT- III	SQL : Simple Queries in SQL-Sub queries-Full-Relation Operations - Database Modifications Defining a Relation Schema-View Definitions- Constraints and Triggers: Keys and Foreign Keys-Constraints on Attributes and Tuples Modification of Constraints-Schema-Level Constraints and Triggers. (12 Hours)
UNIT -IV	Index Structures: Indexes on Sequential Files-Secondary Indexes-B-Trees-Hash Tables-Bitmap Indexes. Query Execution: Physical-Query-Plan Operators-One-Pass, two-pass & index based Algorithms, Buffer Management, Parallel Algorithms Estimating the Cost of Operations-Cost-Based Plan Selection -Order for Joins-Physical- Query Plan. (12 Hours)
UNIT -V	Concurrency control & recovery techniques: concurrency control techniques, locking techniques, time stamp ordering, granularity of data items, Recovery techniques: recovery concepts, database backup and recovery from catastrophic failures. (12 Hours)

Learning Outcomes : After completion of this course, student will be able to learn the creation, storage, access tools and techniques used in databases.

Essential Reading:

1. Elmsari and Navathe, “Fundamentals of database systems”, Pearson Education
2. C. J. Date, An Introduction to Database System, Vol. 1, Norasa Publishing House

Suggested Reading and links :

1. Desai, B., “An introduction to database concepts”, Galgotia publications
2. https://nptel.ac.in/courses/IIT-MADRAS/Intro_to_Database_Systems_Design/pdf/1_Introduction.pdf
3. <https://nptel.ac.in/courses/106106093/>
4. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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>)

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-323	Java Programming	03	01	-	04	20	20	60	100

- Objectives :**
- (1) To learn the basic tools and techniques used in Java language.
 - (2) To be aware of special and advanced features of Java language.
 - (3) To develop skill of writing Java program for problem.

UNIT- I	Overview and characteristics of Java, Java program Compilation and Execution Process Organization of the Java Virtual Machine , JVM as an interpreter and emulator, Instruction Set, class File Format, Verification, Class Area, Java Stack, Heap, Garbage Collection, Security Promises of the JVM, Security Architecture and Security Policy, Class loaders. (12 Hours)
UNIT -II	Java Fundamentals, Data Types & Literals Variables, Wrapper Classes, Arrays, Arithmetic Operators, Logical Operators, Control of Flow, Classes and Instances, Class Member Modifiers Anonymous Inner Class Interfaces and Abstract Classes , inheritance, throw and throws clauses, user defined Exceptions, The String Buffer Class tokenizer, applets, Life cycle of applet. (12 Hours)
UNIT -III	Threads: Creating Threads, Thread Priority, Blocked States, Extending Thread Class, Runnable Interface, Starting Threads, Thread Synchronization, Synchronize Threads, Sync Code Block, Overriding Synced Methods, Thread Communication, wait, notify and notify all. (12 Hours)
UNIT -IV	AWT Components, Component Class, Container Class, Layout Manager Interface Default Layouts, Insets and Dimensions, Border Layout, Flow Layout, Grid Layout, Card Layout Grid Bag Layout AWT Events, Event Models, Listeners, Class Listener, Adapters, Action Event Methods Focus Event Key Event, Mouse Events, Window Event. (12 Hours)
UNIT- V	Input/ Output Stream, Stream Filters, Buffered Streams ,Data input and Output Stream, Print Stream Random Access File. (12 Hours)

Learning Outcomes : After completion of this course, student will be able to learn fundamentals of Java programming language and skill of writing program.

Essential Reading:

1. Bill Verrens, Inside the Java Virtual Machine, Tata McGraw Hill
2. Herbert Scheldt, The complete reference Java, Seventh Edition, Tata McGraw Hill
3. Sierra and Bates, Head First Java, O'Reilly
4. Herbert Scheldt Java 2.0 (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)
5. R Lafore "Object Oriented Programming": Pearson

Suggested Reading and links :

1. Horstmann Cay, Big Java , Wiley –India
2. Horstmann, "CORE JAVA" Pearson Education
3. Deitel, Java "How to Program (Early Objects) Pearson Education India.
4. Jan. Grave, "An Introduction to Network Programming with JAVA" JAVA 7 Compatible.
5. E. Balaguruswami "OOps using Java"-TMH
6. <http://textofvideo.nptel.ac.in/106106147/lec1.pdf>
7. <https://nptel.ac.in/courses/106106147/>
8. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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.

Approved by BoS on dated 05-07-2019

MCA (SEM.- III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-324	Design and Analysis of Algorithm	03	01	-	04	20	20	60	100

Objectives : (1) To understand the fundamentals used in the design and analysis of algorithm.
 (2) To learn the tools and techniques used in algorithm analysis.

UNIT -I	Introduction: Algorithms, Analysis of Algorithms, Design of Algorithms, Complexity of Algorithms, Asymptotic Notations, Growth of function, Recurrences and their solution methods: substitution method, iteration method and master method (including proof). Sorting Techniques: Sorting in polynomial Time (Insertion sort, Merge sort, Heap sort, and Quick sort), Sorting in Linear Time (Counting sort, Radix Sort, Bucket Sort, Medians and order statistics) (12 Hours)
UNIT –II	Advanced Data Structure: Balanced Search Tree, AVL Tree, Red Black Tree, Augmenting Data Structure, Binomial Heap, B-Tree, Fibonacci Heap, and Data Structure for Disjoint Sets, All kinds of Algorithms on these data structures, Dictionaries and priority Queues, mergeable heaps, concatenable queues (12 Hours)
UNIT –III	Graph Algorithms: Elementary Graph Algorithms, Breadth First Search, Depth First Search, Minimum Spanning Tree- Kruskal’s Algorithms, Prim’s Algorithms, Shortest Path Algorithm- Kruskal’s Algorithm, Dijkstra’s and Bellman Ford Algorithm. (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, naïve 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. NP -completeness: Informal concepts of deterministic and nondeterministic algorithms, P and NP, NP-completeness, statement of Cook’s theorem, some standard NP-complete problems. (12 Hours)

Learning Outcomes : After completion of this course, student will be able to know the ways and means of design, analysis of algorithm used in computer programming.

Essential Reading:

1. Jon Kleinberg and Eva Tardos , Algorithm Design, Pearson Edition, 2006.
2. “Algorithms” Sanjoy Dasgupta , Christos Papadimitriou Umesh Vazirani TMH

Suggested Reading and links :

1. “Introduction to Algorithms”, T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, PHI
2. Aho, Design and Analysis of Computer Algorithm, PEI.
3. Basse, Computer Algorithm, Introduction to Design and Analysis, Pearson.
4. https://nptel.ac.in/courses/pdf_link/106106131/lec12.pdf
5. <https://nptel.ac.in/courses/106101060/>
6. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

e-books (at IP 14.139.234.164):

1. Levitin, ‘Introduction to the Design and Analysis of Algorithms’, Noida, Pearson (available at : <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)

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Approved by BoS on dated 05-07-2019

MCA (SEM.- III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-325	Probability, Statistics and Combinatorics	03	01	-	04	20	20	60	100

- Objectives :** (1) To learn the statistical methodologies used in data analysis.
 (2) To be aware of probabilities theory and Combinatorics science.

UNIT –I	Sample Space, Events, probability axioms, Law of addition of Probability, Law of Multiplication of Probability. Joint probability, conditional probability, Bayes rule. (12 Hours)
UNIT- II	Random Variables: Discrete and Continuous, Probability Mass function, Probability Density Functions, Expectation. (12 Hours)
UNIT –III	Basic Statistics : _Measure of central tendencies, measures of dispersion, Theory of least square and Line fitting, correlation Coefficient, Rank Correlation and its coefficient, Linear Regression. (12 Hours)
UNIT –IV	Permutation and Combination: Distinct & non-distinct object. Generating functions for combinations. (12 Hours)
UNIT –V	Enumerators for permutations, Distribution of distinct objects. Problem solving on distribution. (12 Hours)

Learning Outcomes : After completion of this course, student will be able to analyse the data through statistical tools and would be able for decision making under probabilistic environment.

Essential Reading:

- Ross, S., “A first course in probability”, Collier Macmillan, New Your, 1976.
- Lilu, C. L., “Introduction to combinatorial Mathematics”, McGraw Hill, 1996.
- Hogg, R. V. Et., Al., “Introduction to Mathematical statistics”, American Pub., N York

Suggested Reading and links :

- Ross, S, An Introduction to Probability Models, Academic Press.
- Chapra, Numerical Methods for Engineer, TMH.
- Jones, Gareth, Elementary Number Theory, Jones, Springer.
- Conte, Elementary Numerical Analysis and Algorithmic Approach, TMH.
- Buraldi, Introductory Combinatorics, Pearsonn.
- <https://nptel.ac.in/courses/111105041/>
- <http://textofvideo.nptel.ac.in/111104079/lec1.pdf>
- <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

e-books (at IP 14.139.234.164):

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

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IA – Internal Assessment;

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MCA (SEM.- III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-326	Software Laboratory – A	-	-	04	02	20	20	60	100

Objectives : (1) To develop skill of database creation and access

Programme Based on SQL

1. SQL Command for DDL and DML
2. Working With Primary, Foreign key, Unique Key, Alternate Key and other Key
3. Working with Integrity Constraints, Data Constraints, Column and table level Constraints
4. Working with Predefine Function
5. Apply various operations on Table like Manipulation Data, Grouping Data From Tables etc.
6. Working with All Type of SQL Joining
7. Working with View
8. Working with Indexes
9. Show the Concept of Normalization
10. Working with Nested Query and Sub Query
11. Programming With PL/SQL
12. Working with Cursor
13. Working With Different type of Triggers
14. Working with Backup & Recovery Process
15. Working With Security & Authorization in SQL

Any other as per teacher concern

Learning Outcomes : After completion of this course, student will be having skill to utilize the tools and procedures of database creation & its access.

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-327	Software Laboratory - B	-	-	04	02	20	20	60	100

- Objectives :** (1) To learn the implementation and execution of Java program on computer system.
(2) To develop skill for output generations using JAVA based program.

Programme Based on Java Language

1. Write common Programs using Java like Factorial, Reversing a string, Fibonacci sequence, Prime Number, Armstrong number etc.
2. Working With Lopping and Branching Concept
3. Working with Inner and Outer Class
4. Program Based on All Type of Inheritance
5. Apply Various Access protection Method in inheritance in Difference Way
6. Handling on Exception
7. Creating on Own Exception and Package
8. Working With all Constructors and Destructor in Simple class and inheritance
9. Working With Interface, Abstract and Final Class
10. Program Based on Threads Model (life cycle, Synchronization and messaging, Inter thread communication, Priority etc.)
11. Program Based on Applets
12. Program Based on Vector and Wrapper Class
13. Working with Frames/Panel and various controls & Events
14. Working With Stream
15. Working With JDBC

Any other as per teacher concern

Learning Outcomes : After completion of this course, student will be able to design and implement JAVA program on computer system with output generation.

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-SE-328	Seminar, workshop Participation, Poster Presentation , Group Discussion, training	-	-	-	2	20	20	60	100

- Objectives :**
- (1) To encourage students for collecting knowledge on recent topics.
 - (2) To develop presentation and discussion skill among students.
 - (3) To provide opportunity to students for latest update, short training minor-project etc.

This is activity & participation based course:

Note:

- (i) Students have to participate in some of activities Seminar, Poster Presentation, Group Discussion, training program, minor project 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., internal assessment and End Sem. evaluation.
- (v) There will be individual (or paired) participation of students in activities. In some cases group may be considered.

Learning Outcomes: After completion of this course, student will improve the skill of communication and presentation through discussion, training etc.

ME – Mid – I Exam.;

IA – Internal Assessment;

ESE – End Semester Exam.

Approved by BoS on dated 05-07-2019

MCA (SEM.- III)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-OE-321	Computer Education – II	02	-	-	02	20	20	60	100

Objectives : (1) To provide the general awareness knowledge about fundamental of computers.
 (2) To provide basic idea of computer programming and database.

UNIT – I	Introduction of Computer Networks: Characteristics of a Computer Network, Benefits of Networks, Types of Computer Networks, Network Cables, Network Topologies. (6 hours)
UNIT- II	Operating System: Introduction, Functions of Operating System, Type of OS, basic scheduling FIFO, Round Robin. (6 hours)
UNIT - III	Programming Language: Introduction of C, data types, operators, statements Input & Output statements, control statements, simple programming using C. (6 hours)
UNIT - IV	Cyber Crime: Types of Cyber Crime, Hackers, Intrusion, Virus, Denial of Service (DOS Attack), Network Security, crime detection and control. (6 hours)
UNIT - V	DBMS: Introduction keys and creation tables, File System, Database security, Database architecture and updation, Basic SQL Query, DDL, DML, DCL. (6 hours)

Learning Outcomes : After completion of this course, student will be able to know basic part about computer networking operating system, Database management and cyber crime.

Essential Reading:

1. Computer Fundamentals, Forth Edition by P.K. Sinha and Priti Sinha
2. Digital Principle and Applications, Six Editions by Donald P Leach, Albert Paul Malvino and Goutam Saha.
3. Fundamentals of Computers, Fourth Edition by V. Raja Raman.
4. DataBase System Concept, Fifth Edition, by Abraham Silberschatz and S. Sudarshan, Mc Graw Hill.

Suggested Reading and links :

1. Computer Fundamentals Architecture and Organization, Third Edition by B. Ram.
2. Fundamentals of Database Systems, Fifth Edition by Ramez Elmasri and Shamkant B. Navathe.

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-421	Computer Graphics	03	01	-	04	20	20	60	100

Objectives : (1) To make aware of students about basic tools and techniques regarding design and development of computer graphics.

UNIT -I	Introduction to Computer Graphics, Types of refresh graphics displays, Interactive devices, CRT. Raster scan graphics : Video basics, Scan conversion. (12 Hours)
UNIT -II	Line drawing algorithms: Digital Differential Analyzer, Bresenham’s algorithm. Polygon filling, edge fill algorithm, seed fill algorithm. (12 Hours)
UNIT-III	Polygon Meshes in 3D, curves, cubic & surfaces, Solid modeling Geometric Transformation: 2D, 3D transformations, window to view port transformations, acromatic and color models. Graphics Hardware: Hardcopy & display techniques, Input devices, image scanners. (12 Hours)
UNIT -IV	Shading Tech: Transparency, Shadows, Object reflection, Gouraud & Phong shading techniques. Visible surface determination techniques for visible line determination. (12 Hours)
UNIT -V	Z-buffer algorithm, scan line algorithm, algorithm for oct-tres, algorithm for curve surfaces, visible surfaces ray-tracing, recursive ray tracing. (12 Hours)

Learning Outcomes : After completion of this course, student will learn the ways and means of computer graphic generation.

Essential Reading:

1. Foley et. al., “Computer Graphics Principles & practice”, AWL
2. Rogers, D. F. “Procedural Elements for computer graphics” . McGraw Hill, 2008

Suggested Reading and links :

1. Hearon, D. and Baker,M. “Computer Graphics” PHI, 2008
2. <http://textofvideo.nptel.ac.in/106106090/lec1.pdf>
3. <https://nptel.ac.in/courses/106106090/>
4. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-422	Software Engineering	03	01	-	04	20	20	60	100

Objectives : (1) To provide knowledge about tools and techniques used in designing a software.
 (2) To aware about failure of software with classification analysis testing and maintenance.

UNIT -I	Software Crisis, Software Processes, Software life cycle models: Waterfall, Prototype, Evolutionary and Spiral models, Overview of Quality Standards like ISO 9001, SEI - CMM Size Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics, Information Flow Metrics. Cost estimation, static, Single and multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk management. (12 Hours)
UNIT -II	Software Requirement Analysis and Specifications: Problem Analysis, Data Flow Diagrams, Data Dictionaries, Entity-Relationship diagrams, Software Requirement and Specifications, Behavioral and non-behavioral requirements, Software Prototyping. (12 Hours)
UNIT -III	Cohesion & Coupling, Classification of Cohesiveness& Coupling, Function Oriented Design, Object Oriented Design, User Interface Design. (12 Hours)
UNIT -IV	Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Calendar time Component, Reliability Allocation. Software process, Functional testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, (12 Hours)
UNIT -V	Structural testing: Path testing, Data flow and mutation testing, unit testing, integration and system testing, Debugging, Testing Tools & Standards, Management of Maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation. (12 Hours)

Learning Outcomes : After computation of this course student will be able to know the procedure of designing and developing softwares alongwith fault, failure and analysis.

Essential Reading:

1. R. S. Pressman, “Software Engineering – A practitioner’s approach”, 3rd ed., McGraw Hill Int. Ed., 1992.
2. K.K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International, 2001.
3. Pankaj Jalote, Software Engineering a prices Engineering, Veiled India.

Suggested Reading and links :

1. Leach, Introduction to software Engineering.
2. Pendrycz, software Engineering An Engineering Approach, Wiley India.
3. Yogesh Singh, Software Testing, (Cambridge University Press).
4. <https://nptel.ac.in/downloads/106105087/>
5. https://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Soft%20Engg/New_index1.html
6. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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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MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-423	Unix Programming	03	01	-	04	20	20	60	100

Objectives : (1) To provide knowledge about fundamentals of UNIX operating system.
 (2) To understand the technique of shell programming in UNIX.

UNIT -I	Unix Operating System – Features of Unix, kernel structure: kernel, shell and file system, Files and directories structure, shell, directories and file names, file permissions, basic commands of Unix, Introduction of Unix Editors. (12 Hours)
UNIT -II	Advance command handling : mail , lp ur, tr, crypt, cut, split, paste, cmp, comm, diff, head, tail, chmod, chown, sort, kill, etc., command line structures, creating new commands. (12 Hours)
UNIT -III	I/O redirection Pipes and Filters, grep family, stream editor(sed), pattern scanning and processing language awk. (12 Hours)
UNIT -IV	Shell Programming- Shell scripts, The Bourne, Korn and C shell, Shell variables and shell scripts, meta characters and environment variables, arguments and parameters, Conditional statements and loops of both shells. (12 Hours)
UNIT -V	Introduction of UNIX system calls: Types of systems calls, Input output, processes, signals and interrupts. Device management etc. related system calls and their uses. (12 Hours)

Learning Outcomes : After completion of this course, student will be able to work with UNIX operating system.

Essential Reading:

1. R Morgan & McGilton, “Introducing Unix systems-v”, McGraw Hill International.
2. M. G. Venkateshmurthy, “Unix and Shell programming”, Pearson Education.

Suggested Reading and links :

1. Y. Kanitker, “Unix Shell Programming”, BPB.
2. Maurice Bach, “The design of the Unix Operating System”, PHI
3. https://nptel.ac.in/courses/106108101/pdf/PPTs/Mod_13.pdf2.
4. https://nptel.ac.in/courses/106108101/pdf/Lecture_Notes/Mod%2012_LN.pdf
5. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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Approved by BoS on dated 05-07-2019

MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-424	Theory of Computation	03	01	-	04	20	20	60	100

Objectives : (1) To provide students with theoretical aspect of design, development and functioning of computer system.
 (2) To make aware of students about theoretical comparisons of languages.

UNIT- I	Alphabets, Strings and Languages; Automata and Grammars, Finite Automata (FA), Deterministic finite Automata (DFA)-Formal Definition, State transition diagram, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), Equivalence between two FSM's , Limitations of FSM, Application of finite automata. (12 Hours)
UNIT -II	Finite Automata with output- Moore & Melay Machine. Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions. (12 Hours)
UNIT -III	Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages. Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF. (12 Hours)
UNIT -IV	Push Down Automata (PDA): Description and definition, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG. (12 Hours)
UNIT- V	Basic model, definition and representation, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions. (12 Hours)

Learning Outcomes : After completion of this course, student will be able analyse the computer languages and other design aspects related to computation.

Essential Reading:

1. "Introduction to Automata Theory Language and Computation", Hopcroft H.E. and Ullman J. D., Pearson Education.
2. "Theory of Computer Science ", Automata Languages and computation", K.L.P.Mishra and Chandrashekar, 2nd edition, PHI.
3. System Software (Che adap), Beck (Pearson Education India).

Suggested Reading and links :

1. Compiler Design, Chattopadhyaya Santanu (PHI Learning Pvt. Ltd.).
2. Compiler Design in C, Alleh Holub : (Pearson Education India).
3. An Introduction to formal languages and automata, 6 Edition, Peter Linz.
4. <https://nptel.ac.in/downloads/106106049/>
5. <https://nptel.ac.in/courses/106104028/3>
6. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

e-books (at IP 14.139.234.164):

1. Kandar, 'Automata Theory and Formal Languages', Noida, Pearson, (available at : <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)

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MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-421	Data Warehousing and Data Mining	02	01	-	03	20	20	60	100

- Objectives :** (1) To provide the knowledge about basic procedure of data mining.
 (2) .To introduce tools and techniques used in data mining and data warehousing.

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, information packages – a new concept, requirements gathering methods, requirements definition: scope and content. (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 Dimensional Modeling: Updates to the Dimension tables, miscellaneous dimensions, the snowflake schema, aggregate fact tables, families of STARS. (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, OLAP characteristics, major features and functions, general features, dimensional analysis. (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, genetic algorithms, moving into data mining, Data Mining Applications, Benefits of data mining. (9 Hours)

Learning Outcomes : After completion of this course, student will be able to learn concept and applications of methods and procedure used in data mining & warehousing.

Essential Reading:

1. Paul Raj Poonia, “Fundamentals of Data Warehousing”, John Wiley & Sons, 2003.
2. Sam Anahony, “Data Warehousing in the real world: A practical guide for building decision support systems”, John Wiley, 2004

Suggested Reading and links :

1. Kamber and Han, “Data Mining Concepts and Techniques”, Hartcourt India P. Ltd., 2001
2. Principles of Data Mining, Handa : (Pearson Education India).
3. <https://nptel.ac.in/courses/106105174/>
4. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

e-books (at IP 14.139.234.164):

1. ITL ESL, ‘Data Warehousing and Mining’, Noida, Pearson, (available at: <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-422	Artificial Intelligence	02	01	-	03	20	20	60	100

Objectives : (1) To be aware of concept and methodologies of artificial intelligence used in computer system.
 (2) To understand the model and design of expert system.

UNIT -I	Scope of AI-Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems, AI techniques- search knowledge, abstraction. Problem solving-State space search; Production systems. (9 Hours)
UNIT- II	Search space control: depth-first, breadth-first search, heuristic search - Hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis. (9 Hours)
UNIT -III	Knowledge Representation Predicate Logic: Unification, modus ponens, resolution, dependency directed backtracking. Rule based Systems: Forward reasoning: conflict resolution, backward reasoning: use of no backtrack. Structured Knowledge Representation: Semantic Nets: slots, exceptions and default frames, conceptual dependency, scripts. (9 Hours)
UNIT -IV	Handling uncertainty-Non-Monotonic Reasoning, Probabilistic reasoning, use of certainty factors, fuzzy logic. Learning-Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets. (9 Hours)
UNIT -V	Expert Systems-Need and justification for expert systems, knowledge acquisition, Case studies: MYCIN, RI. (9 Hours)

Learning Outcomes : After completion of this course, student will be able to learn the design and applications of artificial intelligences with special reference to Expert System.

Essential Reading:

1. E. Rich and K. Knight, "Artificial intelligence", TMH, 2nd ed., 1992.
2. N.J. Nilsson, "Principles of AI", Narosa Publ. House, 1990
3. Introduction of Artificial Intelligence and Expert Systems. D. W. Patterson.

Suggested Reading and links :

1. D.W. Patterson, "Introduction to AI and Expert Systems", PHI, 1992.
2. Nils J. Nilsson, Artificial Intelligence a new synthesis, Elsevier
3. Norvig, Artificial Intelligence, Pearson Education.
4. https://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Artificial%20intelligence/New_index1.html
5. <https://nptel.ac.in/courses/106105078/pdf/Lesson%2001.pdf>
7. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

ME – Mid – I Exam.;

IA – Internal Assessment;

ESE – End Semester Exam.

Approved by BoS on dated 05-07-2019

MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-423	Cryptography and Security	02	01	-	03	20	20	60	100

Objectives : (1) To introduce the concept of data security any cryptography.
 (2) To learn various mythologies used in secures of computer system and data.

UNIT- I	Introduction to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques substitution ciphers and transposition ciphers, cryptanalysis, stenography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon’s theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear cryptanalysis of DES, block cipher modes of operations, triple DES. (9 Hours)
UNIT -II	Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat’s and Euler’s theorem, primality testing, Euclid’s Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffie-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elgamel encryption. (9 Hours)
UNIT -III	Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm. (9 Hours)
UNIT -IV	Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME. (9 Hours)
UNIT- V	IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems. (9 Hours)

Learning Outcomes : After completion of this course, student will be able to learn the security features used in computer system.

Essential Reading:

1. William Stallings, “Cryptography and Network Security: Principals and Practice”, Prentice Hall, New Jersey.
2. Johannes A. Buchmann, “Introduction to Cryptography”, Springer-Verlag.

Suggested Reading and links :

1. Bruce Schneier, “Applied Cryptography”.
2. Behrouz A. Forouzan, “Cryptography and Network Security”,
3. <https://nptel.ac.in/courses/106105080/pdf/M8L1.pdf>
4. <http://textofvideo.nptel.ac.in/106105031/lec2.pdf>
5. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-424	Decision Support System	02	01	-	03	20	20	60	100

Objectives : (1) To understand the concept and procedure used in developing decision support system.

UNIT - I	Introduction to the concept of Decision Support System: Definition Need for Computerized DSS and support technology characteristics and capabilities of DSS. Components of DSS: Data management subsystem, Model Management Sub system knowledge management subsystem, User interface subsystem classification of DSS. (9 Hours)
UNIT- II	DSS development Strategies: Development process, DSS technology levels & tools Algeria's. & Hemistich: Tube search, genetic Algeria's simulation. (9 Hours)
UNIT -III	Introduction to artificial neural network, (NLP) Natural Language Processing and its applications. (9 Hours)
UNIT -IV	Introduction to data warehousing & Data mining; Data visualization & multi dimensionality. An overview of GDSS (Group Decision Support System) and Decision Conferencing. (9 Hours)
UNIT - V	Introduction to Expert System and its Applications in Management. Introduction to GIS & Concept of virtual reality. Executive Information System (EIS), Expert System: Basic Concept structure and working. (9 Hours)

Learning Outcomes : After completion of this course, student will be able to learn concept, design and development of a decision support system useful for common man.

Essential Reading:

1. Bennis, J.L.: "Building Decision Support System" Addison Wesley Pub., Comp, 1983.
2. Sprague, R.H, & Watson, HJ (Edu.): "Decision Support System, Putting Theory and Practices" Prentice Hall, New Jersey, 1986.

Suggested Reading and links :

1. Keen, PGW & Morton, MSS "Decision Support System: An organizational Perspective, Add. Wesley Pub.
2. David: "Applied Decision Support System", PHI, 1989.
3. <https://nptel.ac.in/courses/105108081/module9/lecture39/lecture.pdf>
4. https://nptel.ac.in/courses/122106031/Pdfs/6_1.pdf
5. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-425	Parallel Computing	02	01	-	03	20	20	60	100

Objectives : (1) To provide knowledge of methods and procedures used in parallel computing.

UNIT- I	Concept, need and requirement, generalized structure of parallel computer, classification of parallel computer, various concepts in pipelining, Need of Parallel Computation, Levels of parallel processing, Parallel processing Vs. Parallel computing, Dataflow Computing concept, Applications of parallel processing (9 Hours)
UNIT- II	Classification of Parallel Computers: Types of Classification Flynn's/ Handler classification UMA / NUMA /COMA, Loosely coupled/ tightly coupled, Classification based grain size and Instruction level parallelism, PRAM Model. (9 hours)
UNIT III	Types of parallelism: data, temporal. Conditions of parallelism, Data and Resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Program flow mechanisms, Sorting and Searching on PRAM. (9 hours)
UNIT- IV	Need of Interconnection Network, Static and Dynamic Interconnection network, Introduction of permutation, group of mapping, elementary permutation used in interconnection network such as transposition, perfect shuffle, flying and exchange, bit reversal, shift permutation. Fast Fourier transforms and Inverse Fast Fourier Transformation. (9 Hours)
UNIT- V	Task Scheduling: DAG, Priority of task, Homogenous and heterogeneous scheduling different scheduling algorithms, Performance metrics of scheduling. (9 Hours)

Learning Outcomes : After completion of this course, student will learn the concept, tools, techniques, optimization used in the area of parallel computing.

Essential Reading:

1. Ratan Ghosh, Rajat Moona, Phalguni Gupta, "Foundation of Parallel Processing" NAROSA.
2. V. Rajaraman "Elements of Parallel Computing" PHI.

Suggested Reading and links :

1. Selim Akl, "The Design and Analysis of Parallel Algorithms", PHI.
2. M.R.Bhujade, "Parallel Computing", New Age International Publications.
3. Kai Hwang, "Advanced computer architecture"; TMH
4. https://nptel.ac.in/courses/106106112/Module1/Lecture%201/mod1_1.pdf
5. <https://nptel.ac.in/courses/106102114/>
6. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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Approved by BoS on dated 05-07-2019

MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-426	Simulation and Modeling	02	01	-	03	20	20	60	100

Objectives : (1) To study the concept and procedure of modelling of system.
 (2) To provide knowledge of various simulation procedures.

UNIT -I	System Models - Continuous and discrete models - Static and Dynamic Models - Principles used in modelling - system studies - system analysis - design and postulation (9 Hours)
UNIT -II	System simulation: Types of Models, Techniques of simulation - Monte Carlo Method - Comparison of analysis and simulation – Types of system - Simulation Numerical (9 Hours)
UNIT -III	Computation for simulation - Applications of digital analogue and hybrid computers in continuous system simulation - Real time simulation. (9 Hours)
UNIT -IV	Exponential growth models, exponential decay models – Logistic curves -Generation of growth models - system models- system dynamic diagrams (9 Hours)
UNIT- V	Discrete system Simulation : Discrete events - Generation of arrival patterns - Simulation of telephone systems - Simulation languages - GPSS programming General description - simscript programs, simscript system concept. (9 Hours)

Learning Outcomes : After completion of this course, student will learn the method of designing a system and its analysis using appropriate simulation produce.

Essential Reading:

1. Banks, J, Carson S and Nilson B L, “Discrete Event System Simulation “PHI
2. Deo N “System simulation with digital computers" PHI
- 3 Law A M and Kelton W D “Simulation Modeling and analysis" Mc Graw Hill

Suggested Reading and links :

1. Geoffrey Gordon., System simulation –, Prentice Hall of India Pvt. Ltd.1999.
2. Maryanski F., Digital Computer Simulation , CBS Distributors.
3. Simulation Modeling and Analysis (Averillm Law) : TMH.
4. <https://nptel.ac.in/courses/103107096/module1/lecture1/lecture1.pdf>
5. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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Approved by BoS on dated 05-07-2019

MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-427	Microprocessor	02	01	-	03	20	20	60	100

Objectives : (1) To provide knowledge of structure, architecture, classification related to the microprocessor.

UNIT -I	History of Microprocessor, 8085 Microprocessor architecture, buses, register, flags. 8085 pin configuration & function of each pin. Fetch, Decode and execute operations. Op-code Fetch, execute cycle, T state, Machine cycle. Memory and I/O read and write cycles WAIT state, interrupt timing diagram. Addressing modes of 8085. Data transfer, Arithmetic, Logical, Rotate, Branch and machine control instructions. (9 Hours)
UNIT -II	Development of 8085 assembly language programs, time delays. Concept of stack and Instruction related to stack. 8085 interrupts, RST, RIM, SIM instructions. Subroutines and conditional call instruction. (9 Hours)
UNIT- III	Memory mapped I/o and I/O mapped I/O. Address decoding, interfacing of memory chips with 8085. Interfacing of input/output chips with 8085. Block diagram, Pin description and Interfacing of 8255(PPI) with 8085 Microprocessor. Interfacing of keyboard, display. (9 Hours)
UNIT -IV	ADC and DAC to 8255. Block diagram, Pin description and Interfacing of 8253(PIT) with 8085 Microprocessor. (9 Hours)
UNIT -V	8086 Microprocessor architecture, Addressing Modes, 8086 pin configuration & function of each pin. 8086 maximum mode/minimum mode, Introduction and advance features of 8088, 80186, 80286, 80386 and 80486 microprocessor. (9 Hours)

Learning Outcomes : After completing this course, student will learn the construction, design, functionality, operation of microprocessor.

Essential Reading:

1. Microprocessor 8085 and its Interfacing, By Sunil Mathur, Second Edition, PHI Learning Pvt. Ltd.
2. Microprocessor Architecture, Programming, and Applications with the 8085 –Ramesh S. Gaonkar Pub: Penram International.

Suggested Reading and links :

1. 8085 Microprocessor And its Applications, By A. Nagoor Kani, Third Edition, TMH Education Pvt. Ltd.
2. <https://nptel.ac.in/downloads/106108100/>
3. <https://nptel.ac.in/courses/Webcourse-contents/IISc->
4. [BANG/Microprocessors%20and%20Microcontrollers/pdf/Lecture_Notes/LNm1.pdf](#)
5. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

e-books (at IP 14.139.234.164):

1. Triebel;Singh, ‘8088 and 8086 Microprocessors
The : Programming, I’, Noida, Pearson, (available at: <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-428	Management Information System	02	01	-	03	20	20	60	100

Objectives : (1) To make aware to students about fundamentals of Management Information System.
 (2) To teach about features, tools and controls used in Management Information System.

UNIT- I	Management Information System : The General Management System, Control systems, MIS Planning, MIS Design and Development, Components of MIS, Open Systems v/s Closed Systems. (9 Hours)
UNIT -II	Open Loop Control System v/s Closed Loop Control System, Information and Decision, MIS v/s EDP Systems, Role and Importance of MIS, MIS Organization, Stages of Growth of MIS, Management Control Systems. (9 Hours)
UNIT -III	Definition of Office Automation, Need for Office Automation, Office Functions Needed to be Automated Office Automation Systems, Document Management Systems, Advantage of Office Automation, Disadvantages of Office Automation. (9 Hours)
UNIT- IV	Information Resource Management, Business Processes v/s Information Systems, Information Systems for Management, Transaction Processing System, Management Report System, Office Information System, Operational Control and Research Systems, Decision Support Systems, Knowledge Based Systems. (9 Hours)
UNIT-V	Information System as a System, software Development Life Cycle (SDLC) Systems Analyst, Case Scenario, Feasibility Study, Systems Analysis (Requirement Analysis), Data Flow Diagram, Data Dictionary, Process Description, Software Requirement Specifications (SRS). (9 Hours)

Learning Outcomes : After completing this course, student will learn the concept, design and development of management Information System.

Essential Reading:

1. Ashok Arora, Akshaya Bhatia, "Information Systems for Managers", 1st Edi. Excel Books.
2. Kenneth C. Handan, Java P Landan, "Management Information System", 8th Edi. Prentice Hall.
3. Murdick R. G., Ross J. E. & Claggiest J. R., "Information System for Modern Management" PHI, 1997.

Suggested Reading and links :

1. James A. O. Brien, "Management Information System" Golgotha, Publication, 1999.
2. Locus, "Analysis, Design and Implementation of information System", 3rd Edi. McGraw Hill.
3. Anderson Lavid, "Management Information System", Tata McGraw Hill, 1999.
4. <http://textofvideo.nptel.ac.in/122105022/lec1.pdf>
5. <https://nptel.ac.in/courses/106108103/pdf/PPTs/mod1.pdf>
6. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

ME – Mid – I Exam.;

IA – Internal Assessment;

ESE – End Semester Exam.

Approved by BoS on dated 05-07-2019

MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-425	Software Laboratory - A	-	-	04	02	20	20	60	100

Objectives : (1) To develop the programming skill about the computer program implementation on generating computer graphics.

Practical based on Computer Graphics

1. Drawing on a Line using DDA and Bresenham's Algorithm
2. Drawing on a Circle using Bresenham's Midpoint Algorithm
3. Drawing on an Ellipse using midpoint ellipse drawing Algorithm
4. Drawing on a Rectangle and Polygon in simple way
5. Implementation on edge fill algorithm.
6. Implementation on seed fill algorithm
7. Implementation on Scan-line Polygon Fill Algorithm
8. Implementation on 2D Transformation
9. Implementation on 3D Transformation
10. Working with Colour Model
11. Drawing on a Bezier curves
12. Drawing on B-Spline curves
13. Implementation on Cohen-Sutherland-Hodgeman Polygon clipping Algorithm
14. Implementation on Z-buffer algorithm
15. Implementation on Morphing

Any other as per teacher concern

Learning Outcomes : After completing this course, student will be able to draw graphics in computer system.

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-426	Software Laboratory - B	-	-	04	02	20	20	60	100

Objectives : (1) To provide practical training to students for executing UNIX commands.

Practical based on Unix Programming

1. Commands for Files and Directories related
2. Command for Disk related
3. Command for Mathematical related
4. Command for Background and Foreground Process Management
5. Working with vi & vim Editor
6. Commands for I/O redirection Pipes and Filters
7. Commands for Printing
8. Commands for Networking
9. Commands for User Management
10. Commands for Group Management
11. Creating on Shell and Environment Variable
12. Programming with conditional and looping statements
13. Commands for Backup and restore process
14. Working with KDE & Gnome graphical interfaces.
15. Commands for Device Related

Any other as per teacher concern

Learning Outcomes : After completing this course, student will learn the implementation of UNIX commands.

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- IV)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-SE -427	Industrial Tour, Seminar Participation, Minor project, training	-	-	-	02	20	20	60	100

Objectives : (1) To provide practical training to students regarding industrial experience, communication, presentation and specialized and recent knowledge.

This is activity & participation based course:

Note:

- (i) Students have to participate in Industrial Visit, Seminar, Poster Presentation, Group Discussion, Training program, Minor project.
- (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 exam., assessment and evaluation.
- (v) There will be individual (or paired) participation of students in activity in some cases group may also be considered.
- (vi) The tour incharge teacher will valuate the tour activity.

Learning Outcomes : After completing this course, student will learn about the Industrial environment and specific, recent developments.

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-521	Compiler Design	03	01	-	4	20	20	60	100

- Objectives :** (1) To provide basic knowledge of designing a compiler.
 (2) To make aware to students about mathematical foundation of a compiler.

UNIT - I	Compilers and Translators, Syntactic and lexical structure of a language Classification of grammars, Context free grammars, Deterministic finite state automata (DFA) Non-DFA. Finite Automata and design of lexical analyzer, Context free grammars and derivation of parse trees, basic parsing techniques: shift-reduce, operator-precedence, top-down, predictive. (12 Hours)
UNIT - II	Scanners, Top down parsing, LL grammars, Bottom up parsing, Polish expression Operator Precedence grammar, IR grammars, Comparison of parsing methods, Error handling. Symbol table handling techniques, Organization for non-block and block structured languages. (12 Hours)
UNIT - III	Syntax Directed Translation. Run time storage administration, Static and dynamic allocation, Intermediate forms of source program, syntax trees, Semantic analysis and code generation. (12 Hours)
UNIT - IV	Code optimization, Folding, redundant sub-expression evaluation, Optimization within iterative loops. (12 Hours)
UNIT - V	Symbol table organization, Run time storage management, Error detection and recovery (12 Hours)

Learning Outcomes : After completion of this course student will be aware about design, and structure of the compiler.

Essential Reading:

- (1) Aho, Ullman and Sethi, Principles of Compiler Design, Addison Wesley.

Suggested Reading and links :

1. J. P. Trembley and P. G. Sorensen, The Theory and Practice of Compiler Writing, McGraw Hill.
2. Holub, Compiler Design in C, PHI.
3. <https://nptel.ac.in/downloads/106108113/>
4. <https://nptel.ac.in/courses/106108113/module1/Lecture1.pdf>
5. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

e-books (at IP 14.139.234.164):

1. RAGHAVAN, 'PRINCIPLES OF COMPLIER DESIGN' Noida, McGraw, Hill (available at <http://mcgrawhilleducation.pdn.i. publishcentral.com/bookshelf>)
2. ITL ESL, 'Principles of Compiler Design', Noida, Pearson (available at : <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-522	Distributed System	03	01	-	4	20	20	60	100

Objectives : (1) To provide, knowledge of features, fundamentals of distributed.
 (2) To be aware about specific properties of distributed system.

UNIT-I	Introduction to Distributed Systems : Goals of Distributed Systems, Hardware and Software concepts, the client server model, Remote procedure call, remote object invocation, message and stream oriented communications. (12 Hours)
UNIT-II	Process and synchronization in Distributed Systems : Threads, clients, servers, code migration, clock synchronization, mutual exclusion, Bully and Ring Algorithm, Distributed transactions. (12 Hours)
UNIT-III	Consistency, Replication, fault tolerance and security : Object replication, Data centric consistency model, client-centric consistency models, Introduction to fault tolerance, process resilience, recovery, distributed security architecture, security management, KERBEROS, secure socket layer, cryptography. (12 Hours)
UNIT-IV	Distributed Object Based and File Systems : CORBA, Distributed COM, Goals and Design Issues of Distributed file system, types of distributed file system, sun network file system,. (12 Hours)
UNIT-V	Distributed shared memory, DSM servers, shared memory consistency model, distributed document based systems: the world wide web, distributed co-ordination based systems. (12 Hours)

Learning Outcomes : After completion of this course student will be able to learn concept and applications of distributed system.

Essential Reading:

1. Andrew S. Tanenbaum, Maarten Van Steen “Distributed Systems Principles and Paradigms” Pearson Education Inc. 2002.
2. Harry Singh “Progressing to Distributed Multiprocessing” Prentice-Hall Inc.
3. B.W. Lampson “Distributed Systems Architecture Design & Implementation”, 1985 Springer Verlag.

Suggested Reading and links :

1. Parker Y. Verjies J. P. “Distributed computing Systems, Synchronization, control & Communications” PHI.
2. Robert J. & Thieranf “Distributed Processing Systems” 1978, Prentice Hall.
3. George Coulios, “Distribute System: Design and Concepts”, Pearson Education.
4. <https://nptel.ac.in/courses/106106168/>
5. <http://textofvideo.nptel.ac.in/106106168/lec1.pdf>
6. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

e-books (at IP 14.139.234.164):

1. Coulouris;Doll, imore;Kind, ‘Distributed Systems’, Noida, Pearson (available at : <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)
2. Tanenbaum, ‘Distributed Systems: Principles and Paradigms’, Noida, Pearson, (available at: <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)

ME – Mid – I Exam.;

IA – Internal Assessment;

ESE – End Semester Exam.

Approved by BoS on dated 05-07-2019

MCA (SEM.- V) Elective - I

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-521	Bioinformatics	02	01	-	3	20	20	60	100

Objectives : (1) To provide knowledge about basic, fundamentals and storage aspect of bio-informatic information.

UNIT - I	Biological Algorithms versus Computer Algorithms, Algorithmic Notations, Algorithm Design Techniques: Exhaustive Search, Greedy Algorithm. (9 Hours)
UNIT - II	Dynamic Programming, Branch-and-Bound Algorithms, Randomized Algorithms, Machine Learning, Tractable versus Intractable Problems, Introductory Molecular Biology, DNA Analysis, Regulatory Motifs in DNA Sequences, Finding Motifs. (9 Hours)
UNIT - III	Greedy Approach to Motif finding, Longest Common Subsequence's, Global and Local Sequence Alignments, Multiple Alignment, Gene Prediction, Constructing Algorithms in sub quadratic time, (9 Hours)
UNIT - IV	Shortest Superstring Problem, Sequencing by Hybridization, Protein Sequencing and Hybridization, Spectrum Graphs, Spectral Convolution, Repeat Finding, Hash Tables, (9 Hours)
UNIT - V	Keyword Trees, Suffix Trees and its Applications, Approximate Pattern Matching, Hierarchical Clustering Evolutionary Trees, Parsimony Problem, Hidden Markov Models, Applications of HMM. (9 Hours)

Learning Outcomes : After completion of this course student will be able to learn the specific features of Bioinformatics with special reference to biological databases.

Essential Reading:

1. N. C. Jones, P. A. Pevzner, An Introduction to Bioinformatics Algorithms, MPI Press 2004.

Suggested Reading and links :

1. D. W. Mont, Bioinformatics: Sequence and Genome Analysis, CSHL Press.
2. D. Gusfield, Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology, Cambridge University Press, 1997.
3. <https://nptel.ac.in/downloads/102103044/>
4. <https://nptel.ac.in/courses/102103044/pdf/mod6.pdf>
5. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- V) Elective - I

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-522	Computational Linguistics	02	01	-	3	20	20	60	100

Objectives : (1) To provide knowledge about natural language processing and computation aspect of if useful for deciding making.

UNIT - I	Man-Machine Interface: Concept of Artificial Intelligence (AI), information system and information processing, concept of formal language. (9 Hours)
UNIT - II	Natural Language (NL) and real language, natural language as man-machine interface. Natural Language Processing: Basic characteristic of NL, knowledge representation, level of representation in NL, function of natural language. (9 Hours)
UNIT - III	Computational Linguistics: Relationship between linguistics and NLP, computational models for phonology, unphology, lexicography, syntax, semantics and discourse. (9 Hours)
UNIT - IV	Processes and Methods: Pursuing applications – machine translation, information retrieval, information extraction, natural language in multimodal and multimedia systems. (9 Hours)
UNIT - V	computer assisted language learning, multilingual on-line natural language processing. (9 Hours)

Learning Outcomes : After completion of this course student will be able to implement the natural language processing art useful to common man.

Essential Reading:

1. A.M. Andrew, Artificial Intelligence. Kent: Abacus Press, 1983.
2. R., Grishman, Computational Linguistics, Cambridge: Cambridge University Press, 1986.
3. G. Keith, and M. Glover, Primary Language Learning with Microcomputers. London: Croom Helm, 1987. 23

Suggested Reading and links :

1. S. Nirenburg, (ed) Machine Translation: I Theoretical and Methodological Issues. Cambridge, Cambridge University Press, 1987.
2. W.A. Sedlow, and S.Y. Sedlow, (eds.) Computer in Language Research, Hillsdale: N.S. Lawrence Erlbawn, 1979.
3. <http://textofvideo.nptel.ac.in/109106114/lec1.pdf>
4. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- V) Elective I

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-523	Advance Computer Architecture	02	01	-	3	20	20	60	100

Objectives : (1) To introduce the advanced configuration of modern computing.
 (2) To make aware students about VLSI architecture.

UNIT - I	Evolution of Computer architecture, system attributes to performance, Multi processors and multi computers, Multi-vector and SIMD computers, PRAM and VLSI models-Parallelism in Programming, conditions for Parallelism-Program Partitioning and Scheduling-program flow Mechanisms-Speed up performance laws-Amdahl's law, Gustafson's law-Memory bounded speedup Model. (9 Hours)
UNIT - II	Memory hierarchy-cache and shared memory concepts-Cache memory organization-cache addressing models, Aliasing problem in cache, cache memory mapping techniques-Shared memory organization-Interleaved memory organization, Lower order interleaving, Higher order interleaving. Back plane bus systems-Bus addressing, arbitration and transaction. (9 Hours)
UNIT - III	Instruction set architectures-CISC and RISC scalar processors-Super scalar processors-VLIW architecture- Multivector and SIMD computers-Vector processing principles-Cray Y-MP 816 system-Inter processor communication. (9 Hours)
UNIT - IV	Multiprocessor system interconnects- Cross bar switch, Multiport memory-Hot spot problem, Message passing mechanisms-Pipelined processors-Linear pipeline, on linear pipeline Instruction pipeline design-Arithmetic pipeline design. (9 Hours)
UNIT - V	Data flow computer architectures-Static, Dynamic-VLSI Computing Structures-Systolic array architecture, mapping algorithms into systolic arrays, Reconfigurable processor array-VLSI matrix arithmetic processors-VLSI arithmetic models, partitioned matrix algorithms, matrix arithmetic pipelines. (9 Hours)

Learning outcome : After completing this course, students will learn the design, working and comparative performance of modern computer architecture.

Essential Reading:

1. Kai Hwang, Advanced Computer architecture Parallelism, Scalability, Programmability I, Mc Graw Hill, N.Y, 2003
2. Kai Hwang and F.A. Briggs, Computer architecture and parallel processor I, Mc Graw Hill, N.Y, 1999

Suggested Reading and links :

1. David A. Pearson and John L. Hennessey-Computer organization and design I Elsevier, Fifth edition, 2014.
2. www.sci.tamucc.edu/~sking/Courses/COSC5351/syllabus.php
3. <https://nptel.ac.in/courses/106105033/>
4. <https://nptel.ac.in/downloads/106104073/>
5. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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Approved by BoS on dated 05-07-2019

MCA (SEM.- V) Elective II

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-524	Cloud Computing	02	01	-	3	20	20	60	100

Objectives : (1) To introduce the basic fundamentals of cloud computing along with functions and operations.
 (2) To teach security features to be adopted in the environment of cloud computing.

UNIT - I	Cloud Computing Fundamentals: Cloud Computing definition, Types of cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing , Applications cloud computing, Business models around Cloud – Major Players in Cloud Computing - Issues in Cloud - Eucalyptus - Nimbus - Open Nebula, Cloud Sim. (9 Hours)
UNIT - II	Cluster Computing, Grid Computing, Grid Computing Versus Cloud Computing, Key Characteristics of Cloud Computing. Cloud Models: Benefits of Cloud Models, Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud, Shared Private Cloud, Dedicated Private Cloud, and Dynamic Private Cloud. (9 Hours)
UNIT- III	Cloud Services and File System: Types of Cloud services: Software as a Service-Platform as a Service-Infrastructure as a Service-Database as a Service-Monitoring as a Service-Communication as services. Service providers- Google App Engine, Amazon EC2, Microsoft Azure, Sales force. (9 Hours)
UNIT -IV	Virtualization: Basics of Virtualization-Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms-Virtualization of CPU, Memory, I/O Devices-Virtual Clusters and Resource management – Virtualization for Data-centre Automation. Introduction to MapReduce, GFS, HDFS, Hadoop Framework. (9 Hours)
UNIT -V	Security in the Cloud: Security Overview – Cloud Security Challenges and Risks- Software-as-a-Service Security – Security Monitoring – Security Architecture Design - Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security. (9 Hours)

Learning outcome : After completing this course, student will be capable enough to understand the cloud computing environment alongwith implementation and security.

Essential Reading

1. Cloud Computing "A Practical Approach" Anthony T. Velte, Toby J. Velte, Robert
2. Elsenpeter. McGraw-Hill. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
3. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.

Suggested Reading and links :

- 1 Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.
- 2 Kumar Saurabh, " Cloud Computing – insights into New -Era Infrastructure", Wiley India,2011.
- 3 Ronald L. Krutz, Russell Dean Vines, "Cloud Security – A comprehensive Guide to Secure Cloud Computing", Wiley – India, 2010.
- 4 <http://textofvideo.nptel.ac.in/106105167/lec1.pdf>, <https://nptel.ac.in/courses/106106129/28>, <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

e-books (at IP 14.139.234.164):

1. ARAVIND DOSS & RAJEEV NANDA, 'CLOUD COMPUTING: A PRACTITIONER'S GUIDE' Noida, McGraw Hill, (available at : <http://mcgrawhilleducation.pdn.i>, publishcentral.com/bookshelf)
2. Srinivasan, 'Cloud Computing', Noida, Pearson, (available at : <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)

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Approved by BoS on dated 05-07-2019

MCA (SEM.- V) Elective - II

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-525	Information Theory and Coding	02	01	-	3	20	20	60	100

Objectives : (1) To teach tools, techniques, procedures used in the processing of information through digital channels including error detection and error control.

UNIT-I	Information Theory: Introduction, Measure of information, Information content of message, Average Information content of symbols in Long Independent sequences, Average Information content of symbols in Long dependent sequences, Markov Statistical Model of Information Sources, Entropy and Information rate of Markoff Sources. (9 Hours)
UNIT -II	Source Coding: Source coding theorem, Prefix Codes, Kraft McMillan Inequality property – KMI, Encoding of the Source Output, Shannon’s Encoding Algorithm, Shannon Fano Encoding Algorithm, Huffman codes, Extended Huffman coding, Arithmetic Coding, Lempel – Ziv Algorithm. (9 Hours)
UNIT -III	Information Channels: Communication Channels ,Channel Models, Channel Matrix, Joint probability Matrix, Binary Symmetric Channel, System Entropies, Mutual Information, Channel Capacity, Channel Capacity of : Binary Symmetric Channel, Binary Erasure Channel, Muroga,s Theorem, Contineuos Channels. (9 Hours)
UNIT -IV	Error Control Coding:Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Single Error Correcting hamming Codes, Table lookup Decoding using Standard Array. (9 Hours)
UNIT -V	Binary Cyclic Codes: Algebraic Structure of Cyclic Codes, Encoding using an (n-k) Bit Shift register, Syndrome Calculation, Error Detection and Correction. (9 Hours)

Learning outcome : After completing this course, student will learn the concept and procedure of information processing in digital environment.

Essential Reading:

1. Information Theory and Coding, Muralidhar Kulkarni , K.S. Shivaprakasha, Wiley India Pvt. Ltd, 2015, ISBN:978-81-265-5305-1.

Suggested Reading and links :

1. Information Theory and Coding and Cryptography, Ranjan Bose, TMH, II edition, 2007
2. <https://nptel.ac.in/courses/117101053/23>
3. <https://nptel.ac.in/courses/117108097/>
4. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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Approved by BoS on dated 05-07-2019

MCA (SEM.- V) : Elective II

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-526	Soft Computing	02	01	-	3	20	20	60	100

Objectives : (1) To introduce basic tools and techniques of soft computing along with neural network modelling and computational intelligence.

UNIT- I	Fuzzy Set Theory: Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Setheoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling. (9 Hours)
UNIT- II	Optimization: Derivative-based Optimization–Descent Methods–The Method of Steepest Descent–Classical Newton’s Method–Step Size Determination–Derivative-free Optimization – Genetic Algorithms – Simulated Annealing–Random Search – Downhill Simplex Search. (9 Hours)
UNIT- III	Neural Networks: Supervised Learning Neural Networks - Perceptrons - Adaline - Back propagation Mutilayer Perceptrons - Radial Basis Function Networks Unsupervised Learning Neural Networks–Competitive Learning Networks - Kohonen Self-Organizing Networks – Learning Vector Quantization– Hebbian Learning. (9 Hours)
UNIT- IV	Neuro Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum. (9 Hours)
UNIT- V	Applications Of Computational Intelligence : Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction. (9 Hours)

Learning outcome : After completing of this course student will be able to know the applications of neural network, neuro modelling with comparative advantages and applications.

Essential Reading:

1. J.S.R.Jang, C.T.Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI, 2004, Pearson Education 2004.
2. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”, McGraw-Hill, 1997.
3. Davis E.Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y.,1989.

Suggested Reading and links :

1. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003.
2. R.Eberhart, P.Simpson and R.Dobbins, “Computational Intelligence - PC Tools”, AP Professional, Boston,1996.
3. <https://nptel.ac.in/courses/106105173/>
4. <http://textofvideo.nptel.ac.in/106105173/lec1.pdf>
5. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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Approved by BoS on dated 05-07-2019

MCA (SEM.- V) : Elective III

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-527	ASP.NET Programming	02	01	-	3	20	20	60	100

Objectives : (1) To teach the basic fundamentals of ASP.NET web design language.
 (2) To aware students about web-page creation and its designing in ASP.NET environment.

UNIT- I	Introduction to .NET Framework: Introduction, Advantages & Components, CLR, CTS, CLS, MSIL, JIT, GC, BCL(Base Class Library), Compilation of .NET Applications, Features of .NET Framework, C#/VB .Net Basics, Creating Applications using Visual studio IDE and Command Line compiler, About .NET Assemblies- Creating an Assembly, Namespaces. (9 Hours)
UNIT- II	Conceptual Overview of ASP.NET Framework: Client And Server Architecture, Page Life Cycle, All Standard Controls, Validation Controls, Navigation Controls, Rich Web Controls. Creating and Implementing User and Custom Controls, Design website with Master Pages. (9 Hours)
UNIT -III	ASP.NET Configuration: Session and Application Management, Caching, Security Authentication and Authorization, Localization and Globalization, Exception Handling, Using AJAX Control toolkit. (9 Hours)
UNIT- IV	Working with Data Controls: Basics of ADO.NET, OLEDB and SQL Managed Data Providers-Data adapters, Dataset, Data Reader, Execute Reader, Execute Scalar, Execute Non Query, Data Table, Data Row, Data Column, Crystal Reports (9 Hours)
UNIT -V	Introduction to Web Services: need of Web Services, role of XML, UDDI, WSDL, HTTP and SOAP Protocol, Web Service Vs WCF (Windows Communication Foundation). Text Books: 1. Jeffery Ritcher “Applied Microsoft .Net framework programming”, MS Press 2002. (9 Hours)

Learning outcome : After completing of this course student will be capable enough to design a web-site of an organization in ASP.NET environment .

Essential Reading:

1. ImarSpaanjaars,” Beginning ASP. NET 4: in C# and VB”, Wrox Publication 2010.
2. Thuan L. Thai, Hoang Q. Lam “.Net framework essentials”, O’Reilly 2003

Suggested Reading and links :

1. Juval Lowy “Programming .Net components” O’Reilly.2003
2. http://www.nptelvideos.com/visualbasic_net/visualbasicnet_video_tutorials.php
3. <https://nptel.ac.in/courses/106105084/1>
4. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- V) : Elective III

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-528	Programming using PHP	02	01	-	3	20	20	60	100

- Objectives :** (1) To understand the basic fundamentals of PHP programming language.
 (2) To develop skill for writing program using PHP web development environment.

UNIT - I	Works with the web server, Hardware and software requirements, Benefits of PHP as a server side language. Basic PHP syntax, PHP Delimiters, Creating User Defined Variable, Assigning values to scalar variable, Data type with PHP, Displaying type information, Testing for specific data type, Operators. Use of HTML for web design purpose, HTML scripts and Form's element, Embedding PHP code into HTML pages, Retrieving form data with \$_POST, \$_GET and \$_REQUEST arrays, Validating retrieved data, Strategies for handling invalid input, Adding dynamic content. (9 Hours)
UNIT -II	Introduction to Arrays in PHP, Numerically and Non-Numerically Indexed arrays, Array operators, Multidimensional arrays, Array sorting, Array Functions. Creating and Deleting a file, Reading and Writing text files, Working with directories in PHP. Checking for existence of file, Determining file size, Opening a file for writing, reading or appending, Using other useful file functions. File Upload/Download. (9 Hours)
UNIT -III	Comparing Strings, Matching and replacing substrings, Introduction to Regular Expressions, Matching and replacing substring with Regular Expressions, Splitting string with Regular expressions. Functions, Using parameters and Returning Values, Call by value and call by reference. Function: require (), include(), header(), date(), math library, string formatting functions. (9 Hours)
UNIT -IV	Object Oriented Programming in PHP, Object oriented concepts, Classes, objects and operations. Constructor and Destructor, Abstract class, Inheritance, Function Overriding, Interface, Final keyword, Exception Handling, User defined exception. Session Control, Session Functionality, Setting Cookies with PHP, Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Session Variables, Destroying the variables and Session. (9 Hours)
UNIT - V	MySQL Architecture, Defining a Database, Creating Tables and Fields in MySQL, Working with PHP-MySQL Environment, Using PHP my admin. Connecting to MySQL Server, Selecting Databases, Insert Update and Delete records, Checking for Errors, Closing the MySQL Server Connection. My Sql Database connectivity in Object Oriented manner. PHP configuration file, Error tracking and debugging. (9 Hours)

Learning outcome : After completion of this course student will be able to design a website of an organization in PHP environment.

Essential Reading:

1. PHP Bible, (Author) Tim Converse , Joyce Park.

Suggested Reading and links :

1. Beginning PHP5(Author) David Mercer, Allan Kent , Steven Nowicki, Clark Morgan,Wankyu Choi
2. http://www.nptelvideos.com/php/php_video_tutorials.php
3. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

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MCA (SEM.- V) : Elective III

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-529	Python Programming	02	01	-	3	20	20	60	100

Objectives : To develop skill of programming using Python language for real life problems.

UNIT -I	Introduction of Python, Simple program using Python, Expressions and Values, Variables and Computer Memory, error detection, Multiple line statements, Designing and using functions, functions provided by Python, Tracing function calls in memory model, omitting return statement. Working with Text: Creating Strings of Characters, Using Special Characters in Strings, Creating a Multiline String, Printing Information, Getting Information from the Keyboard. (9 Hours)
UNIT- II	A Boolean Type , Choosing Statements to Execute, Nested If Statements , Remembering the Results of a Boolean Expression Evaluation , A Modular Approach to Program Organization, Importing Modules , Defining Your Own Modules, Testing Code Semi automatically Grouping Functions Using Methods: Modules, Classes, and Methods , Calling Methods the Object Oriented Way, Exploring String Methods, Underscores. (9 Hours)
UNIT- III	Storing Collections of Data Using Lists: Storing and Accessing Data in Lists, Modifying Lists, Operations on Lists , Slicing Lists , Aliasing, List Methods , Working with a List of Lists. Repeating Code Using Loops: Processing Items in a List, Processing Characters in Strings, Looping Over a Range of Numbers, Processing Lists Using Indices , Nesting Loops in Loops, Looping Until a Condition Is Reached, Repetition Based on User Input, Controlling Loops Using Break and Continue. (9 Hours)
UNIT -IV	Reading and Writing Files: Kinds of files, Opening a File, Techniques for Reading Files, Files over the Internet, Writing Files, Writing Algorithms That use the File Reading Techniques, Multiline Records. Storing Data Using Other Collection Types: Storing Data Using Sets, Storing Data Using Tuples, Storing Data Using Dictionaries, Inverting a Dictionary, Using the In Operator on Tuples, Sets, and Dictionaries, Comparing Collections. (9 Hours)
UNIT -V	A Collection of New Information Object-Oriented Programming : Understanding a Problem Domain , Function “Isinstance,” Class Object, and Class Book, Writing a Method in Class Book, Plugging into Python Syntax: More Special Methods, Creating Graphical User interface: Building a Basic GUI, Models, Views, and Controllers, Customizing the Visual Style Introducing few more Widgets, Object-Oriented GUIs, Keeping the Concepts from Being a GUI Mess. (9 Hours)

Learning outcome : After completing this course student will be able to write computer programs for the assigned problems.

Essential Reading:

1. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.
2. Python for Informatics: Exploring Information, Charles Severance

Suggested Reading and links :

1. Learning Python, Fourth Edition, Mark Lutz, O’Reilly publication
2. Introduction to Python for Computational Science and Engineering (A beginner's guide), Hans Fangohr.
3. <https://nptel.ac.in/courses/117106113/34>,
4. <https://nptel.ac.in/courses/106105166/26> , 5. <https://epgp.inflibnet.ac.in/ahl.php?csrno=7>

e-books (at IP 14.139.234.164):

1. KAMTHANE, ‘Programming & Problem Solving with Python’, Noida, McGraw Hill (available at : <http://mcgrawhilleducation.pdn.i.publishcentral.com/bookshelf>)
2. Budd, Timothy, ‘Exploring Python’, Noida, McGraw Hill, (available at : <http://mcgrawhilleducation.pdn.ipublishcentral.com/bookshelf>)
3. Gaddis, ‘Starting Out with Python, Global Edition’ , Noida, Pearson (available at : <https://ebookcentral.proquest.com/lib/hsgu-ebooks/home.action>)
4. Balagurus Amy, ‘Introduction To Computing And Problem Solving Using Python’ , Noida, McGraw Hill (available at : <http://mcgrawhilleducation.pdn.i.publishcentral.com/bookshelf>)

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MCA (SEM.- V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-523	Software Laboratory - A	-	-	04	02	20	20	60	100

Objectives : To provide practical training to students about execution of written programmes for problem solving.

The List of Practicals for this course will be decided the course coordinator based on Core and (or) Elective Courses.

Learning outcome : After completing this course student will be skilled enough to execute computer programmes of relevant courses.

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- V)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-CC-524	Software Laboratory - B	-	-	04	02	20	20	60	100

Objectives : (1) To provide practical training to students about execution of written programmes for solving the given problems .

The List of Practicals for this course will be decided the course coordinator based on Core and (or) Elective Courses.

Learning outcome : After completing this course student will be skilled enough to execute computer programmes of relevant courses.

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- VI)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-EC-621	Major Project (External) based on Industrial Training	-	-	-	06	-	40	60	100

- Objectives :** (1) To learn Industrial need and be trained according.
 (2) To provide It Industry barred training to s students regarding software development.
-

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 for 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 dispose students will be aware of industrial need for employment and carrier prospect in IT sectors.

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

Approved by BoS on dated 05-07-2019

MCA (SEM.- VI)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-SE-622	Seminar and Viva-Voce on Project	-	-	-	06	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 for 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 interest.

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

Approved by BoS on dated 05-07-2019