SYLLABUS FOR BACHELOR OF SCIENCE (HONOURS) IN COMPUTER APPLICATION (SESSION 2016-2019)

DEPARTMENT OF COMPUTER SCIENCE
ST. XAVIER'S COLLEGE, RANCHI
(AN AUTONOMOUS COLLEGE UNDER RANCHI UNIVERSITY)
PURULIA ROAD, RANCHI
EMAIL: dept_computersc@sxcran.org
PHONE: - 06512214934

DEPARTMENT OF COMPUTER SCIENCE
ST. XAVIER'S COLLEGE
(An Autonomous College of Ranchi University)
RANCHI, JHARKHAND 834 001

NAAC 'A'

Tel: 0651-2214 301, 2214 935
Fax: 0651-2207 672
E-Mail:dept_computersc@sxcran.org
Website: www.sxcran.org

Syllabus and Scheme of Examination

for

B.Sc. (Honours) Computer Application

Under

Choice Based Credit System

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CHOICE BASED CREDIT

SYSTEM

B.Sc. HONOURS WITH

Computer Application

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MISSION

The Department of Computer Science is committed to excel in the education of its both undergraduate and post graduate students in core as well as related areas that encompass understanding of computational concepts, the generation and dissemination of new scientific knowledge involving computational principles and their applications. Its objective is to have a beneficial impact on the community and nation at large, while enhancing the quality of teaching and research.

This department is committed to maintain an active and congenial atmosphere for teaching and learning in which faculty members set a high priority in teaching and subscribe to build a caring learning environment for its students.

The faculty and students in the department cooperatively contribute to the advancement of computer science at the frontiers of human understanding in everyday life. This process essentially intertwines the initial development of computational methodology and programme development skills in classroom and laboratory instruction activities within the centre. The ultimate objective is the preparation of IT professionals/software engineers to cater the needs of the industries in India and abroad.

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Structure

The programme is divided into six semesters. The following courses are offered

- 14 Core Courses (CC)

  The Core Course is of six credits

  - ➤ Theory with practical (Theory of 4 Credits and Practical of 2 Credits)
  - ➤ Theory with tutorial (Theory of 5 Credits and Tutorial of 1 Credit)

- 4 Discipline Specific Elective (DSE)

  The Discipline Specific Elective is of six credits.

- 2 Skill Enhancement Courses (SEC)

  The Skill Enhancement Course is of 2 credits.

- 4 Generic Elective Courses (GEC)

  The Generic Elective Course is of six credits

  - ➤ Theory with practical (Theory of 4 Credits and Practical of 2 Credits)
  - ➤ Theory with tutorial (Theory of 5 Credits and Tutorial of 1 Credit)

- 2 Ability Enhancement Compulsory Courses (AECC)

  The Ability Enhancement Compulsory Course is of 2 credits.

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Semester wise distribution of courses is as follows:-

Semester	Core	AECC	GEC	SEC	DSE	Total Papers
First	2	1	1	0	0	4
Second	2	1	1	0	0	4
Third	3	0	1	1	0	5
Fourth	3	0	1	1	0	5
Fifth	2	0	0	0	2	4
Sixth	2	0	0	0	2	4

The programme is of 140 credits divided in six semesters. The division of credits semester wise is as follows:-

Semester	Credits
First	20
Second	20
Third	26
Fourth	26
Fifth	24
Sixth	24

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Proposed Scheme for Choice Based Credit System in Bachelor of Science (Honours) in Computer Application

Semester	Core Course	Ability Enhancement Compulsory Course (AECC)	Skill Enhancement Course (SEC)	Elective: Discipline Specific (DSE)	Elective: Generic (GE)
First	Programming Fundamentals using C/C++	English Communication			GE-I
	Discrete Structure				
Second	Programming in Java	Environment Science			GE-II
	Data Structures				
Third	Computer System Architecture		SEC-I (HTML)		GE-III
	Operating System				
	Computer Networks				
Fourth	Design and analysis of Algorithms		SEC-II (PL/SQL)		GE-IV
	Software Engineering				
	Database Management System				

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Fifth	Internet Technologies			DSE-I (Windows Programming using Visual Basic.Net)	
	Artificial Intelligence			DSE-II (Operation Research)	
Sixth	Theory of Computation			DSE-III (E-Commerce and PHP Programming)	
	Computer Graphics			DSE-IV (Dissertation / Project)	

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Semester Wise Distribution of Credits and Marks

Semester – I

Paper Code	Paper Name	Credits	Lectures Hours Per Semester	Marks			ESE	Full Marks	
				CIA					
				Mid Sem.	Assign.	Attend.			
C-I(A)	Programming using C/C++	04	45	10	10	05	50	75	100
C-I(B)	Programming using C/C++ Lab	02	30	00	00	00	25	25	
C-II	Discrete Structure	06	45	10	10	05	75		100
AECC-I	English Communication	02	30	00	00	00	100		100
GE-I	Generic Elective I (Mathematics)	06	45	00	00	00	100		100
Total (Semester Wise)		20	195	20	20	10	350		400

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Semester Wise Distribution of Credits and Marks

Semester – II

Paper Code	Paper Name	Credits	Lectures Hours Per Semester	Marks				Full Marks	
				CIA			ESE		
				Mid Sem.	Assign.	Attend.			
C-III(A)	Programming using Java	04	45	10	10	05	50	75	100
C-III(B)	Programming using Java Lab	02	30	00	00	00	25	25	
C-IV(A)	Data Structure	04	45	10	10	05	50	75	100
C-IV(B)	Data Structure Lab	02	30	00	00	00	25	25	
AECC-II	Environmental Science	02	30	00	00	00	100		100
GE-II	Generic Elective II (Mathematics)	06	45	00	00	00	100		100
Total (Semester Wise)		20	225	20	20	10	350		400

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Semester Wise Distribution of Credits and Marks

Semester – III

Paper Code	Paper Name	Credits	Lectures Hours Per Semester	Marks				Full Marks	
				CIA			ESE		
				Mid Sem.	Assign.	Attend.			
C-V(A)	Computer System Architecture	04	45	10	10	05	50	75	100
C-V(B)	Computer System Architecture Lab	02	30	00	00	00	25	25	
C-V(A)	Operating System	04	45	10	10	05	50	75	100
C-V(B)	Operating System Lab	02	30	00	00	00	25	25	
C-VI(A)	Computer Networks	04	45	10	10	05	50	75	100
C-VI(B)	Computer Networks Lab	02	30	00	00	00	25	25	
SEC-I(A)	SEC I (HTML)	01	15	10	10	05	50	75	100
SEC-I(B)	SEC I (HTML)Lab	01	30	00	00	00	25	25	
GE-III	Generic Elective (Mathematics) III	06	45	00	00	00	100		100
Total (Semester Wise)		26	315	40	40	20	350		400

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Semester Wise Distribution of Credits and Marks

Semester – IV

Paper Code	Paper Name	Credits	Lectures Hours Per Semester	Marks				Full Marks	
				CIA			ESE		
				Mid Sem.	Assign.	Attend.			
C-VIII(A)	Design and Analysis of Algorithm	04	45	10	10	05	50	75	100
C-VIII(B)	Design and Analysis of Algorithm Lab	02	30	00	00	00	25	25	
C-IX(A)	Software Engineering	04	45	10	10	05	50	75	100
C-IX(B)	Software Engineering Lab	02	30	00	00	00	25	25	
C-X(A)	Database Management System	04	45	10	10	05	50	75	100
C-X(B)	Database Management System Lab	02	30	00	00	00	25	25	
SEC-II(A)	SEC II (PL/SQL)	01	15	10	10	05	50	75	100
SEC-II(B)	SEC II (PL/SQL) Lab	01	30	00	00	00	25	25	
GE-IV	Generic Elective IV (Mathematics)	06	45	00	00	00	100		100
Total (Semester Wise)		26	315	40	40	20	400		500

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Semester Wise Distribution of Credits and Marks

Semester – V

Paper Code	Paper Name	Credits	Lectures Hours Per Semester	Marks			ESE	Full Marks	
				CIA					
				Mid Sem.	Assign.	Attend.			
C-XI(A)	Internet Technologies	04	45	10	10	05	50	75	100
C-XI(B)	Internet Technologies Lab	02	30	00	00	00	25	25	
C-XII(A)	Artificial Intelligence	04	45	10	10	05	50	75	100
C-XII(B)	Artificial Intelligence Lab	02	30	00	00	00	25	25	
DSE-I(A)	DSE I	04	45	10	10	05	50	75	100
DSE-I(B)	DSE I Lab	02	30	00	00	00	25	25	
DSE-II(A)	DSE II	04	45	10	10	05	50	75	100
DSE-II(B)	DSE II Lab	02	30	00	00	00	25	25	
Total (Semester Wise)		24	300	40	40	20	300		400

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Semester Wise Distribution of Credits and Marks

Semester – VI

Paper Code	Paper Name	Credits	Lectures Hours Per Semester	Marks				Full Marks	
				CIA			ESE		
				Mid Sem.	Assign.	Attend.			
C-XIII(A)	Theory of Computation	06	45	10	10	05	75		100
C-XIII(A)	Computer Graphics	04	45	10	10	05	50	75	100
C-XIII(B)	Computer Graphics Lab	02	30	00	00	00	25	25	
DSE-III(A)	DSE III	04	45	10	10	05	50	75	100
DSE-III(B)	DSE III Lab	02	30	00	00	00	25	25	
DSE-III(A)	Project / Dissertation	04	00	00	00	00	75	75	100
DSE-III(B)	Industrial Tour and Reporting	02	00	00	00	00	25	25	
Total (Semester Wise)		24	195	30	30	15	325		400

Legends:-
C   Core Course Paper
SEC   Skill Enhancement Course Paper
DSE   Discipline Specific Elective Paper
CIA   Continuous Inter Assessment
ESA   End Semester Assessment
ESE   End Semester Examination
Mid Sem.   Mid Semester Examination
Assign.   Assignment Test
Attend.   Attendance

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Marking scheme (Attendance)

5 marks shall be awarded in each theory paper for the attendance based on the following scheme:-

Attendance (%)	Marks
75 – 80	1
81-85	2
86-90	3
91-95	4
96-100	5

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Core Papers(C): (Credit: 06 each)(1 period / week for tutorials or 6 periods / week of practical)

SL. No.	Core Course
1.	Programming Fundamentals using C/C++ (4 + 4 Lab)
2.	Discrete Structures (5 + 1 Tutorial)
3.	Programming in JAVA (4 + 4 Lab)
4.	Data Structures (4 + 4 Lab)
5.	Computer System Architecture (4 + 4 Lab)
6.	Operating Systems (4 + 4 Lab)
7.	Computer Networks (4 + 4 Lab)
8.	Design and Analysis of Algorithms (4 + 4 Lab)
9.	Software Engineering (4 + 4 Lab)
10.	Database Management Systems(4 + 4 Lab)
11.	Internet Technologies (4 + 4 Lab)
12.	Artificial Intelligence (4 + 4 Lab)
13.	Theory of Computation (5 + 1 Tutorial)
14.	Computer Graphics (4 + 4 Lab)

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Discipline Specific Elective Papers: (Credit: 06 each) (4 papers to be selected) – DSE I to DSE IV

SL. No.	Discipline Specific Elective Course
1.	Information Security (4) + Lab (4)
2.	Network Programming (4) + Lab (4)
3.	Microprocessor (4) + Lab (4)
4.	Computational Linguistics (4) + Lab (4)
5.	Numerical Methods (4) + Lab (4)
6.	Machine Learning (4) + Lab (4)
7.	Introduction to Data Sciences (4) + Lab (4)
8.	Cloud Computing (4) + Lab (4)
9.	Digital Image Processing (4) + Lab (4)
10.	System Programming (4) + Lab (4)
11.	Operational Research (4) + Lab (4)
12.	Data Mining (4) + Lab(4)
13.	Project Work / Dissertation (4) + Lab (4)

Note: Universities may include more options or delete some from this list.

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Other Discipline (Four papers of anyone discipline) – GE I to GE IV

SL. No.	Other Discipline as Generic Elective
1.	Mathematics
2.	Statistics
3.	Operational Research
4.	Physics
5.	R Electronics
6.	Commerce
7.	Economics

Any one discipline of importance.

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Skill Enhancement Courses (2 papers) (Credit: 02 each) – SEC I and SEC II

SL. No.	Skill Enhancement Course
1.	Android Programming (1) + Lab (2)
2.	Programming in MATLAB (1) + Lab (2)
3.	Oracle (SQL/PL-SQL) (1) + Lab (2)
4.	Programming in Python (1) + Lab(2)
5.	PHP Programming (1) + Lab (2)
6.	UNIX/LINUX Programming (1) + Lab (2)
7.	R Programming (1) + Lab (2)
8.	Software Testing
9.	HTML (1) + Lab (2)
10.	XML (1) + Lab (2)

Note: Universities may include more options or delete some from this list

Important:

1.	Each University/Institute should provide a brief write-up about each paper outlining the salient features, utility, learning objectives and prerequisites.
2.	University/Institute can add/delete some experiments of similar nature in the Laboratory papers.
3.	The size of the practical group for practical papers is recommended to be10-15 students.
4.	The size of tutorial group for papers without practical is recommended to be 8-10 students.
5.	University/Institute can add to the list of reference books given at the end of each paper.

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Teaching and Examination Scheme

Semester I

Paper Code	Teaching Scheme(Lectures)			Examination Scheme (Marks)				Full Marks		Pass Marks
	Theory Lectures Per Week	Practical Lectures Per Week	Tutorial	Continuous Internal Assessment			ESA			
				Mid Sem.	Assign.	Attend.				
C-I(A)	4	0	0	10	10	05	50	75	100	45
C-I(B)	0	4	0	00	00	00	25	25		
C-II	4	0	1	10	10	05	75		100	45
AECC-I	3	0	0	00	00	00	100		100	45
GE-I	4	4/0	0/1	00	00	00	100		100	45
Total	15	8/4	1/2	20	20	10	350		400	
Total		23/19	1/2	20	20	10	350		400	

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Teaching and Examination Scheme

Semester II

Paper Code	Teaching Scheme(Lectures)			Examination Scheme (Marks)				Full Marks		Pass Marks
	Theory Lectures Per Week	Practical Lectures Per Week	Tutorial	Continuous Internal Assessment			ESA			
				Mid Sem.	Assign.	Attend.				
C-III(A)	4	0	0	10	10	05	50	75	100	45
C-III(B)	0	4	0	00	00	00	25	25		
C-IV(A)	4	0	0	10	10	05	50	75	100	45
C-IV(B)	0	4	0	00	00	00	25	25		
AECC-II	3	0	0	00	00	00	100		100	45
GE-II	4	4/0	0/1	00	00	00	100		100	45
Total	15	12/8	0/1	20	20	10	350		400	
Total		27/23	0/1	20	20	10	350		400	

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Teaching and Examination Scheme

Semester III

Paper Code	Teaching Scheme(Lectures)			Examination Scheme (Marks)				Full Marks		Pass Marks
	Theory Lectures Per Week	Practical Lectures Per Week	Tutorial	Continuous Internal Assessment			ESA			
				Mid Sem.	Assign.	Attend.				
C-V(A)	4	0	0	10	10	05	50	75	100	45
C-V(B)	0	4	0	00	00	00	25	25		
C-VI(A)	4	0	0	10	10	05	50	75	100	45
C-VI(B)	0	4	0	00	00	00	25	25		
C-VII(A)	4	0	0	10	10	05	50	75	100	45
C-VII(B)	0	4	0	00	00	00	25	25		
SEC-I(A)	2	0	0	10	10	05	50	75	100	45
SEC-I(B)	0	2	0	00	00	00	25	25		
GE-III	4	4/0	0/1	00	00	00	100		100	45
Total	18	18/14	0/1	40	40	20	400		500	
Total		36/32	0/1	40	40	20	400		500	

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Teaching and Examination Scheme

Semester IV

| Paper Code | Teaching Scheme(Lectures) | | | Examination Scheme (Marks) | | | | Full Marks | | Pass Marks |
| | Theory Lectures Per Week | Practical Lectures Per Week | Tutorial | Continuous Internal Assessment | | | ESA | | | |
				Mid Sem.	Assign.	Attend.				
C-VIII(A)	4	0	0	10	10	05	50	75	100	45
C-VIII(B)	0	4	0	00	00	00	25	25		
C-IX(A)	4	0	0	10	10	05	50	75	100	45
C-IX(B)	0	4	0	00	00	00	25	25		
C-X(A)	4	0	0	10	10	05	50	75	100	45
C-X(B)	0	4	0	00	00	00	25	25		
SEC-II(A)	2	0	0	10	10	05	50	75	100	45
SEC-II(B)	0	2	0	00	00	00	25	25		
GE-IV	4	4/0	0/1	00	00	00	100		100	45
Total	18	18/14	1	40	40	20	400		500	
Total		36/32	1	40	40	20	400		500	

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Teaching and Examination Scheme

Semester V

Paper Code	Teaching Scheme(Lectures)			Examination Scheme (Marks)				Full Marks		Pass Marks
	Theory Lectures Per Week	Practical Lectures Per Week	Tutorial	Continuous Internal Assessment			ESA			
				Mid Sem.	Assign.	Attend.				
C-XI(A)	4	0	0	10	10	05	50	75	100	45
C-XI(B)	0	4	0	00	00	00	25	25		
C-XII(A)	4	0	0	10	10	05	50	50	100	45
C-XII(B)	0	4	0	00	00	00	25	25		
DSE-I(A)	4	0	0	10	10	5	50	75	100	45
DSE-I(B)	0	4	0	0	0	0	25	25		
DSE-II(A)	4	0	0	10	10	5	50	75	100	45
DSE-II(B)	0	4	0	0	0	0	25	25		
Total	16	16	1	40	40	20	300		400	
Total		32	1	40	40	20	300		400	

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Teaching and Examination Scheme

Semester VI

Paper Code	Teaching Scheme(Lectures)			Examination Scheme (Marks)				Full Marks		Pass Marks
	Theory Lectures Per Week	Practical Lectures Per Week	Tutorial	Continuous Internal Assessment			ESA			
				Mid Sem.	Assign.	Attend.				
C-XIII	4	0	1	10	10	05	75		100	45
C-XIV(A)	4	0	0	10	10	05	50	75	100	45
C-XIV(B)	0	4	0	00	00	00	25	25		
DSE-III(A)	4	0	0	10	10	05	50	75	100	45
DSE-III(B)	0	4	0	00	00	00	25	25		
DSE-IV(A)	0	0	0	00	00	00	75	75	100	45
DSE-IV(B)	0	0	0	00	00	00	25	25		
Total	12	8	0	30	30	15	325		400	
Total		20	0	30	30	15	325		400	

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Load Estimation (Lecture Hours per Semester)

Odd Semester				Even Semester			
First	C-I(A)	45	225/195	Second	C-III(A)	45	255/225
	C-I(B)	30			C-III(B)	30	
	C-II	45			C-IV(A)	45	
	AECC-I	30			C-IV(B)	30	
	GE-I	45			AECC-II	30	
	GE-I (P/T)	30/0			GE-II	45	
					GE-II (P/T)	30/0	
Third	C-V(A)	45	330/300	Fourth	C-VIII(A)	45	330/300
	C-V(B)	30			C-VIII(B)	30	
	C-VI(A)	45			C-IX(A)	45	
	C-VI(B)	30			C-IX(B)	30	
	C-VII(A)	45			C-X(A)	45	
	C-VII(B)	30			C-X(B)	30	
	SEC-I(A)	15			SEC-II(A)	15	
	SEC I(B)	15			SEC II(B)	15	
	GE-III	45			GE-IV	45	
	GE-III (P/T)	30/0			GE-IV (P/T)	30/0	
Fifth	C-XI(A)	45	300	Sixth	C-XIII	45	195
	C-XI(B)	30			C-XIV(A)	45	
	C-XII(A)	45			C-XIV(B)	30	
	C-XII(B)	30			DSE-III(A)	45	
	DSE-I(A)	45			DSE-III(B)	30	
	DSE-I(B)	30			DSE-IV(A)	00	
	DSE-II(A)	45			DSE-IV(B)	00	
	DSE-II(B)	30					
Total			1335/1215	Total			1275/1155

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Load Estimation (Core Course, Skill Enhancement Course and Discipline Specific Elective)

Odd Semester				Even Semester			
First	C-I(A)	45	120	Second	C-III(A)	45	150
	C-I(B)	30			C-III(B)	30	
	C-II	45			C-IV(A)	45	
					C-IV(B)	30	
Third	C-V(A)	45	255	Fourth	C-VIII(A)	45	255
	C-V(B)	30			C-VIII(B)	30	
	C-VI(A)	45			C-IX(A)	45	
	C-VI(B)	30			C-IX(B)	30	
	C-VII(A)	45			C-X(A)	45	
	C-VII(B)	30			C-X(B)	30	
	SEC-I(A)	15			SEC-II(A)	15	
	SEC I(B)	15			SEC II(B)	15	
Fifth	C-XI(A)	45	300	Sixth	C-XIII	45	195
	C-XI(B)	30			C-XIV(A)	45	
	C-XII(A)	45			C-XIV(B)	30	
	C-XII(B)	30			DSE-III(A)	45	
	DSE-I(A)	45			DSE-III(B)	30	
	DSE-I(B)	30			DSE-IV(A)	00	
	DSE-II(A)	45			DSE-IV(B)	00	
	DSE-II(B)	30					
Total			675	Total			600

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Load Balancing

Total Load on Offer in CBCS Syllabus									
Odd Semester					Even Semester				
Semester	Paper	Theory	Practical	Total	Semester	Paper	Theory	Practical	Total
First	C/C++	45	30	120	Second	Java	45	30	150
	Discrete Structure	45	00			Data Structure	45	30	
Third	Computer System Architecture	45	30	255	Fourth	Database Management System	45	30	255
	Operating System	45	30			Software Engineering	45	30	
	Computer Networks	45	30			Design and Analysis of Algorithm	45	30	
	HTML	15	15			XML	15	15	
Fifth	Internet Technologies	45	30	300	Sixth	Theory of Computation	45	00	195
	Artificial Intelligence	45	30			Computer Graphics	45	30	
	Windows Programming using Visual Basic.Net	45	30			E-Commerce and PHP Programming	45	30	
	Operation Research	45	30			Project	00	00	
Total (Odd Semester)			675	Total (Even Semester)					600

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Fax: 0651-2207 672
E-Mail:dept_computersc@sxcran.org
Website: www.sxcran.org

Question Pattern

1. Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks in sub sections may vary).
2. A general pattern of the questions may be
   a. Objective type or very short answer type or fill in the blanks type or true-false type.
   b. Short answer/Long answer type question.

   A question setter/examiner may select both (a.) and (b.) or only (b.).

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Theory with Practical
Theory (Core Course and Discipline Specific Elective)

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
4	6	25	50	75	8 / 5

Practical (Core Course and Discipline Specific Elective)

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
2	6	0	25	25

Theory (Skill Enhancement Course)

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
1	2	25	50	75	8 / 5

Practical (Skill Enhancement Course)

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
1	4	0	25	25

Theory with Tutorial
Theory

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
6	6	25	50	75	8 / 5

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Summary

Semester	Core Course	SEC	DSE	GE	AECC	Credits	Lectures Hours Per Semester	Lectures per Week	Full Marks
First	2	0	0	1	1	20	225	23	400
Second	2	0	0	1	1	20	255	27	400
Third	3	1	0	1	0	26	330	36	500
Fourth	3	1	0	1	0	26	330	36	500
Fifth	2	0	2	0	0	24	300	32	400
Sixth	2	0	2	0	0	24	195	20	400
Total	14	2	4	4	2	140	1635	174	2600

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Bachelor of Science (Honours) in Computer Application

Detailed Syllabus

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First Semester

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Computer Application (C-I (A)): Programming Fundamentals using C/C++

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	4	1	0

Unit	Contents	Lecture
I.	**Introduction to C** Introduction to computer programming. Basic structure of a C program. Writing a C program. The compilation and execution process of C program. Building Blocks of C Programs (Keywords, Identifiers, Constants, String, Special Symbols, and Operators).	2
II.	**Data Types, Variables, Constants, Operators and Basic I/O** Data Types in C. Variables, Modifiers, Escape Sequences, Expressions and Operators (Arithmetic, Logical, Assignment, Relational, Bitwise, Special Operators) Un Formatted Input(Reading of single character using the functions getc() and getchar()) and Output(Writing of single character using the functions putc()and putchar()). Formatted Input(Reading of different data type values using the function scanf()) and Output(Writing of different data type values using the function printf()).	4
III.	**Expressions, Conditional Statements and Iterative Statements** Expressions, conditional statements and iterative statements. Decision Making and Branching using (Unconditional Branching using goto and Conditional: Two Way Branching using if, if-else, nested if, it-else if ladder and Multi Way Branching using Switch Case). Decision Making and Looping using while(), do-while() and for() Looping construct.	4
IV.	**Functions and Arrays** Function and its need. Implementation of function. Type of functions. Return type of functions. Type of parameters (to be passed) to a function. Function with variable arguments. Array and its utility. Creating and using one / multi dimensional array of primitive data types (character, integer and floating point). Initialization of array elements (static and dynamic initialization)	7
V.	**Derived Data Types (Structures and Unions)** Limitation of array. Need of derived data types (structure and union). Basic difference between implementation of structure and union. Declaration of structure and union. Accessing data members of structure and union. Initialization of data members of structure and union. Passing and returning structure to / from the function. Nesting of structure. Structure with union as a member. Union with structure as a member.	3
VI.	**Using Classes in C++** Introduction of Object oriented Programming Concept. Benefits of Object oriented Programming. Features of Object Oriented Programming (Data Hiding, Classes and Objects, Encapsulation and Abstraction, Polymorphism and Inheritances). Class and Object. Access Specification (Private, Protected and Public). Default Visibility Mode. Member Method Definition (Inside Class Definition and Outside Class Definition). Declaration of Object as an instance of class. An array of type class. Objects as an argument to a function (pass by value and pass by reference). Function having return type as class type. Friend Function. Constructors and its type.	5
VII.	**Pointers and References in C** Pointer and its utility. Declaration of pointer and dereferencing pointer to primitive type	7

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	variables. Pointer to pointer. Pointer and structure. Pointer and union. Passing pointer as argument to a function. Returning pointer from function. Passing array as argument to a function.	
VIII.	**Memory Allocation in C++** Differentiating between static and dynamic memory allocation, use of malloc(), calloc() and free() functions, use of new and delete operators, storage of variables in static and dynamic memory allocation.	3
IX.	**Overloading of Function Overloading and Operator Overloading** Polymorphism (Compile time (operator overloading and function overloading) and run time). Overloading of constructor / member method of class. Overloading of operators (unary and binary).	5
X.	**Inheritance, Polymorphism and File Handling** Inheritance (single, multiple, multilevel, hierarchical and hybrid). Defining derived class. Visibility modes (private, protected, public). Ambiguity in multiple inheritance. Inheritance and access control. Nested class (containership). Virtual base class. Virtual function. Calling a virtual function through a base class reference. Pure virtual function. Abstract and concrete class. Input and Output in C++. Streams in C++. Predefined Streams. Unformatted Input Functions with cin Object. Unformatted Output Functions with cout Object. IOS class functions (width(),precision(),fill(), setf() and unsetf()) and flags (left, right, internal, scientific, fixed, dec, oct, hex) and bitfields(adjustfield, floatfield, basefield).	10

Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
4	4	25	50	75	8 / 5

Question Pattern

1. **Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks in sub sections may vary).**
2. **A general pattern of the questions may be**
   a. **Objective type or very short answer type or fill in the blanks type or true-false type.**
   b. **Short answer and Long answer type question.**
   A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Books:

SL. No.	Book Name
1.	Herbtz Schildt, "C++ : The Complete Reference", Fourth Edition, McGraw Hill.
2.	Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley, 2013.
3.	Bjarne Stroustrup, "Programming—Principles and Practices using C++", 2nd Edition, Addison-Wesley 2014.
4.	E. Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Education,

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	2008.
5.	Paul Deitel,Harvey Deitel, "C++ How to Program", 8th Edition, Prentice Hall, 2011.
6.	John R. Hubbard, "Programming with C++", Schaum's Series, 2nd Edition, 2000.
7.	Andrew Koeni, Barbara E. Moo, "Accelerated C++", Published by Addison-Wesley, 2000.
8.	Scott Meyers, "Effective C++", 3rd Edition, Published by Addison-Wesley, 2005.
9.	Harry H. Chaudhary, "Head First C++ Programming: The Definitive Beginner's Guide", First Create Space Inc, O-O Publishing, LLC USA.
10.	Walter Savitch, "Problem Sovling with C++", Pearson Education, 2007.
11.	Stanley B. Lippman, Joseel Lajojie, Barbara E. Moo, "C++ Premier", Published by Addison-Wesley, 5th Edition, 2012.

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Computer Application (C-I (B)): Programming Fundamentals using C/C++ Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	30	4

SL. No.	Program
1.	WAP to print the sum and product of digits of an integer.
2.	WAP to reverse a number.
3.	WAP to compute the sum of the first n terms of the following series S = 1+1/2+1/3+1/4+…
4.	WAP to compute the sum of the first n terms of the following series S =1-2+3-4+5…………….
5.	Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
6.	Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
7.	WAP to compute the factors of a given number.
8.	Write a macro that swaps two numbers. WAP to use it.
9.	WAP to print a triangle of stars as follows (take number of lines from user): * *** ***** ******* *********
10.	WAP to perform following actions on an array entered by the user: i) Print the even-valued elements ii) Print the odd-valued elements iii) Calculate and print the sum and average of the elements of array iv) Print the maximum and minimum element of array v) Remove the duplicates from the array vi) Print the array in reverse order The program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.
11.	WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
12.	Write a program that swaps two numbers using pointers.
13.	Write a program in which a function is passed address of two variables and then alter its contents.
14.	Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.
15.	Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions or new operator.
16.	Write a menu driven program to perform following operations on strings: a) Show address of each character in string b) Concatenate two strings without using strcat function. c) Concatenate two strings using strcat function. d) Compare two strings e) Calculate length of the string (use pointers) f) Convert all lowercase characters to uppercase g) Convert all uppercase characters to lowercase h) Calculate number of vowels i) Reverse the string Given two ordered arrays of integers, write a program to merge the two-arrays to get an

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		ordered array.
17.		WAP to display Fibonacci series (i)using recursion, (ii) using iteration
18.		WAP to calculate Factorial of a number (i)using recursion, (ii) using iteration
19.		WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.
20.		Create Matrix class using templates. Write a menu-driven program to perform following Matrix operations (2-D array implementation): a) Sum b) Difference c) Product d) Transpose
21.		Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
22.		Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.
23.		Create a class Box containing length, breath and height. Include following methods in it: a) Calculate surface Area b) Calculate Volume c) Increment, Overload ++ operator (both prefix & postfix) d) Decrement, Overload -- operator (both prefix & postfix) e) Overload operator == (to check equality of two boxes), as a friend function f) Overload Assignment operator g) Check if it is a Cube or cuboid Write a program which takes input from the user for length, breath and height to test the above class.
24.		Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks.
25.		Create 10 students and store them in a file.
26.		Write a program to retrieve the student information from file created in previous question and print it in following format: Roll No. Name Marks.
27.		Copy the contents of one text file to another file, after removing all whitespaces.
28.		Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.
29.		Write a program that will read 10 integers from user and store them in an array. Implement array using pointers. The program will print the array elements in ascending and descending order.

Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
2	4	0	25	25

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Computer Application (C-II)): Discrete Structures

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
6	Theory	45	4	1	1

Unit	Contents	Lectures
I.	**Introduction** Sets - finite and Infinite sets, uncountable Infinite Sets; functions, relations, Properties of Binary Relations, Closure, Partial Ordering Relations; counting - Pigeonhole Principle, Permutation and Combination; Mathematical Induction, Principle of Inclusion and Exclusion.	15
II.	**Recurrences** Recurrence Relations, Substitution Method, Recurrence Trees, Master Theorem.	6
III.	**Graph Theory** Basic Terminology, Models and Types, multigraphs and weighted graphs, Graph Representation, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees.	12
IV.	**Propositional Logic** Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory.	12
V.	**Predicate Logic** Free and Bound Variables, Rule of CP, Indirect Method of Proof.	5

Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
6	4	25	75	100	8 / 5

Question Pattern

1. Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).
2. A general pattern of the questions may be
   a. Objective type or very short answer type or fill in the blanks type or true-false type.
   b. Short answer and Long answer type question.
   A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Books:

SL. No.	Book Name
1.	C.L. Liu & Mahopatra, Elements of Discrete mathematics, 2nd Sub Edition 1985, Tata McGraw Hill.
2.	Rosen, Discrete Mathematics and Its Applications, Sixth Edition 2006.
3.	T.H. Coremen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, Prentice Hall on India (3rd edition 2009).

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4.	M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms 1988 Johnwiley Publication.
5.	J. L. Hein, Discrete Structures, Logic, and Computability, Jones and Bartlett Publishers, 3rd Edition, 2009.
6.	D.J. Hunter, Essentials of Discrete Mathematics, Jones and Bartlett Publishers, 2008.

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Second Semester

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Tel: 0651-2214 301, 2214 935
Fax: 0651-2207 672
E-Mail:dept_computersc@sxcran.org
Website: www.sxcran.org

Computer Application (C-III (A)): Programming in Java

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	4	1	0

Unit	Contents	Lectures
I.	**Introduction to Java** Features of Java, Java Program Structure, Understanding the semantic and syntax differences between C++ and Java, Java Tokens, Java Virtual Machine (Bytecodes), , Compiling and Executing a Java Program, Variables, Constants, Data Types, Scope of Variables, Type Casting, Operators, Expressions, Decision Making and Branching, Looping(While, Do, For, Jumps in Loops, Labelled Loops).	9
II.	**Arrays, Strings and I/O** Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Methods of String class, Manipulating Strings, String Buffer Classes, Methods of String Buffer class, String Tokenizer class, the Scanner class.	7
III.	**Classes, Objects and Methods** Class, Object, Constructors, Method Overloading, Inheritance, Method Overriding, This and Super, Final Variables and Methods, Final Classes, Finalize method, Abstract Methods and Classes, Visibility Control.	8
IV.	**Interfaces and Packages** Defining, Extending and Implementing Interfaces, Java API packages, Using Standard Java Packages (util, lang, io, net), Creating a package, Accessing and using a Package.	7
V.	**Multithreading and Exception Handling** Creating Threads, Extending the Thread Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Thread Priority, Thread Synchronization, Runnable Interface Types of Errors, Exceptions, Built-in exceptions, Exception handling code (Try, Catch and Finally), Throwing our own Exception.	8
VI.	**Applets and AWT Programming** **Applet :** Java Applets, Applet Life Cycle, Passing Parameters to Applets, Applet Tag, Embedding applets to HTML file, Running the applet **AWT(Abstract Window Toolkit) :** Introduction to AWT, Graphics classes and its methods, Drawing Lines, rectangles, circles, ellipses and arcs using Graphics Class, Color class, ActionListener, ItemListener, KeyListener and MouseListener Interfaces, Component Class, Container Class, Button, Label, Checkbox, Radio Buttons, List Box, Choice Box, Text Area, Border Layout and Grid Layout **Swing :** Introduction to Swing, Difference between AWT and Swing, Basics of JOptionPane, JApplet, JButton, JFrame, under javax.swing package	11

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Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
4	4	25	50	75	8 / 5

Question Pattern

1. Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).
2. A general pattern of the questions may be
   a. Objective type or very short answer type or fill in the blanks type or true-false type.
   b. Short answer and Long answer type question.

   A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Books:

SL. No.	Book Name
1.	Ken Arnold, James Gosling, David Homes, "The Java Programming Language", 4th Edition, 2005.
2.	James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley"The Java Language Specification.
3.	Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.
4.	Joshua Bloch, "Effective Java" 2nd Edition,Publisher: Addison-Wesley, 2008.
5.	Cay S. Horstmann, Gary Corness, "Core Java 2 Volume 2 - Advanced Features)", 9th Edition, Printice Hall.
6.	Bruce Eckel, "Thinking in Java", 3rd Edition, PHI, 2002.
7.	E. Balaguruswamy, "Programming with Java", 4th Edition, McGraw Hill.
8.	Paul Deitel, Harvey Deitel, "Java: How to Program", 10th Edition, Prentice Hall, 2011.
9.	"Head First Java", Orielly Media Inc. 2nd Edition, 2005.
10.	David J. Eck, "Introduction to Programming Using Java", Published by CreateSpace Independent Publishing Platform, 2009.
11.	John R. Hubbard, "Programming with JAVA", Schaum's Series, 2nd Edition, 2004.

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Computer Application (C-III (B)): Programming in Java Lab

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	30	4

SL. No.	Assignment
1.	Write a program to swap two values. a. Using a third variable. b. Without using a third variable.
2.	Write a program to find the greatest and smallest among a. Three numbers b. Four numbers
3.	Write a program to read a given number & print it digit as a series of word. Ex. 523 Five Two Three.
4.	Write a program to enter a number from command line argument and find the sum of digit of a given number.
5.	Write a program to enter a number from command line argument and check whether the given number is Armstrong or not.
6.	Write a program to generate the list of prime number between 100 to 1000.
7.	Write a program to enter five strings from command line argument and print the string.
8.	WAP to check whether a given string is palindrome or not.
9.	Write a program to use methods of String and String Buffer class such as charAt(), indexOf(), setCharAt(), setLength(), append(), insert(), concat(), equals() etc.
10.	WAP to generate Matrix Multiplication.
11.	WAP to explain the difference between break and continue.
12.	Write a program to calculate the area and circumference of a circle through object and parameterized method.
13.	WAP to explain constructor overloading.
14.	WAP to explain method overriding.
15.	WAP to demonstrate the input and show dialog features of JOptionPane.
16.	WAP to demonstrate type casting.
17.	WAP to demonstrate static members.
18.	WAP to demonstrate hierarchial inheritance.
19.	WAP to demonstrate abstract classes/methods.
20.	WAP to implement multiple inheritance(use of interfaces).
21.	WAP using package to find area of the square and volume of the cube.
22.	Write a program to demonstrate priorities among multiple threads.
23.	WAP using multithreading concepts to demonstrate the yield(), sleep() and stop() methods.
24.	Write a program —DivideByZero that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
25.	Write a program to handle multiple catch statements.
26.	Write a program to create and throw our own exception.
27.	Write an applet program to draw the Rectangle, Oval, Triangle, parallelogram.
28.	WAP to demonstrate <PARAM> tags in Applet.

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29.	Write an Applet Program to draw our National Flag.
30.	Write an Applet Program to draw a human face.
31.	Write an Applet Program using AWT concept to demonstrate 'Button' Class.
32.	Write an Applet Program using AWT concept to demonstrate 'Label' Class.
33.	Write an Applet Program using AWT concept to demonstrate 'Checkbox' Class.
34.	Write an Applet Program using AWT concept to demonstrate 'Radio Button' Class.
35.	Write an Applet Program using AWT concept to demonstrate 'List Box' Class.
36.	Write an Applet Program using AWT concept to demonstrate 'Choice Box' Class.
37.	Write an Applet Program using AWT concept to demonstrate 'Text Area' Class.

Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
2	4	0	25	50

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Computer Application (C-IV (A)): Data Structures

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	4	1	0

Unit	Content	Lectures
I.	**Introduction** Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Time-Space Trade-off, Abstract Data Types (ADT).	3
II.	**Arrays** Definition, Single and Multidimensional Arrays, Memory Representation of Multi-dimensional Arrays: Row Major Order and Column Major Order, Application of arrays, Sparse Matrices and their Representations.	6
III.	**Stacks** Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Multiple Stack in an Array, Application of stack: Prefix and Postfix Expressions, Evaluation of Postfix Expression.	4
IV.	**Recursion** Principles of Recursion, Recursive Definition of Simple Problems and their Implementation, Type of Recursion, Tower of Hanoi Problem, Tail-Recursion, Limitations of Recursion, Recursion versus Iteration.	5
V.	**Queues** Operations on Queue: Create, Add, Delete, Full and Empty, Circular Queues, Array and linked implementation of Queues in C, De-queue and Priority Queue.	6
VI.	**Linked lists** Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition.	8
VII.	**Trees** Basic Terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Binary Search Tree, Algebraic Expressions, Extended Binary Trees, Tree Traversal Algorithms: In-order, Pre-order and Post-order, Threaded Binary Trees, Traversing Threaded Binary Trees.	8
VIII.	**Searching and Sorting** Sequential Search, Binary Search, Comparison of Linear Search and Binary Search, Bubble Sort, Selection Sort, Insertion Sort, Shell Sort, Hashing: Perfect Hash Function, Type of Hash Function: Remainder Method, Mid-Square Method, Folding Method, Collision Resolution Strategies: Separate Chaining and Open Addressing.	8

Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
4	5	25	50	75	8 / 5

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Question Pattern

1. **Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).**
2. **A general pattern of the questions may be**
   a. **Objective type or very short answer type or fill in the blanks type or true-false type.**
   b. **Short answer and Long answer type question.**
   A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Books:

SL. No.	Book Name
1.	Adam Drozdek, "Data Structures and algorithm in C++", Third Edition, Cengage Learning, 2012.
2.	Sartaj Sahni, Data Structures, "Algorithms and applications in C++", Second Edition, Universities Press, 2011.
3.	Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures Using C and C++:, Second edition, PHI, 2009.
4.	Robert L. Kruse, "Data Structures and Program Design in C++", Pearson.
5.	D.S Malik, Data Structure using C++,Second edition, Cengage Learning, 2010.
6.	Mark Allen Weiss, "Data Structures and Algorithms Analysis in Java", Pearson Education, 3rd edition, 2011.
7.	Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures Using Java, 2003.
8.	Robert Lafore, "Data Structures and Algorithms in Java, 2/E", Pearson/ Macmillan Computer Pub,2003.
9.	John Hubbard, "Data Structures with JAVA", McGraw Hill Education (India) Private Limited; 2 edition, 2009.
10.	Goodrich, M. and Tamassia, R. "Data Structures and Algorithms Analysis in Java", 4th Edition, Wiley.
11.	Herbert Schildt, "Java The Complete Reference (English) 9th Edition Paperback", Tata McGraw Hill, 2014.
12.	D. S. Malik, P.S. Nair, "Data Structures Using Java", Course Technology,2003.

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Computer Application (C-IV (B)): Data Structures Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	30	4

SL. No.	Program
1.	WAP to implement Diagonal Matrix using one-dimensional array.
2.	WAP to implement Lower Triangular Matrix using one-dimensional array.
3.	WAP to implement Upper Triangular Matrix using one-dimensional array.
4.	WAP to implement Symmetric Matrix using one-dimensional array.
5.	WAP to convert the Sparse Matrix into non-zero form and vice-versa.
6.	WAP to perform Stack operations using Array implementation.
7.	WAP to reverse the order of the elements in the stack using additional stack.
8.	WAP to convert infix expression to postfix expression using Stack.
9.	WAP to perform Stack operations using Linked List implementation.
10.	WAP to calculate factorial and to compute the factors of a given number. • using recursion • using iteration
11.	WAP to display Fibonacci series • using recursion, • using iteration
12.	WAP to calculate GCD of two numbers • with recursion • without recursion
13.	WAP to perform Queues operations using Circular Array implementation.
14.	WAP to reverse the order of the elements in the stack using additional Queue.
15.	WAP to create and perform different operations on Double-ended Queues using Linked List implementation.
16.	WAP to scan a polynomial using linked list and add two polynomials.
17.	WAP to search an element from a list. Give user the option to perform Linear or Binary search.
18.	WAP to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.
19.	WAP to implement Linked List and include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists.
20.	WAP to implement Doubly Linked List and include functions for insertion, deletion and search of a number, reverse the list.
21.	WAP to implement Circular Linked List and include functions for insertion, deletion and search of a number, reverse the list.
22.	WAP to create a Binary Tree and include following operations in tree: • Count the number of nodes in a binary tree • Search a number in BST • Display its pre-order, post-order and in-order traversals Recursively.
23.	WAP to create a Threaded Binary Tree as per in-order traversal, and implement an operation to

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	find the successor / predecessor of an element.
24.	WAP to implement hash function using remainder method, mid-square method and folding method.
25.	WAP to resolve collision using Linear Probing technique.

Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
2	4		25	25

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Third Semester

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Computer Application (C-V (A)): Computer System Architecture

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	4	1	0

Unit	Contents	Lectures
I.	**Introduction** **Basics of computer-** Definition, Characteristics, Classification, Parts and block diagram of a digital computer **Logic gates**- Types of logic gates, basic logic operations, truth tables, Boolean algebra, simplification of Boolean expression by applying Boolean Theorem and Karnaugh Map(K-Map up to 4 variables), Sum of products, product of sums and canonical forms.	8
II.	**Data Representation and Basic Computer Arithmetic** **Number System** – Different types of number systems(i.e. Decimal, binary, octal, hexadecimal), conversion of numbers from one Number system to the other, binary arithmetic, (r-1)'s & r's complement representation, subtraction using r's and (r-1)'s complement, , signed and unsigned numbers, Fixed and Floating point representation of numbers .**Code Conversion**- BCD(Binary Coded Decimal), Gray Code and ASCII, BCD-to-Binary Conversion, Binary-to-Gray conversion, Gray-to-Binary conversion, Error detection and Correction codes(Parity method for error detection and Hamming error detection code).	10
III.	**Basic Computer Organization and Design** **Combinational Circuit** – Half Adder, Full Adder, Multiplexer(4X1, 8X1), Demultiplexer(1X4), Encoder(Octal to Binary Encoder, Decimal to BCD Encoder), Decoder(3X8 Decoder, BCD to Decimal Decoder). **Sequential Circuits**- Flip flops(SR, D, JK, T, Master Slave), Registers (Registers with parallel load, Shift Registers), Counters(Synchronous and Asynchronous Counters), Structure of a digital machine (VON-Neumann architecture).	12
IV.	**Central Processing Unit** **Microprocessors** – Definition, Features and Architecture of 8085 microprocessor, Register organization Timing and control unit of 8085, Pin diagram of 8085,Addressing modes of 8085, , DMA (Direct Memory Access) **Instruction set** – Instruction formats, Classification of 8085 instructions(Data Transfer, Arithmetic, logical and Branch instructions), Types of instructions(Three address, two address, one address and zero address).	14
V.	**Memory Organization** **Memory Organization**- Concept of Memory Hierarchy Organization, Cache Memory, Semiconductor Memory (RAM and ROM), Magnetic Memory (Magnetic disks i.e. Hard disks and floppy disks, Magnetic tapes, Optical disks),Associative memory, Mapping Functions:- Associative Mapping, Direct Mapping, Set-Associative Mapping.	6

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Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
4	4	25	50	75	8 / 5

Question Pattern

1. Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).
2. A general pattern of the questions may be
   a. Objective type or very short answer type or fill in the blanks type or true-false type.
   b. Short answer and Long answer type question.
   A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Books:

SL. No.	Book Name
1.	M. Mano, Computer System Architecture, Pearson Education 1992.
2.	A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004.
3.	W. Stallings, Computer Organization and Architecture Designing for Performance, 8th Edition 2009, Prentice Hall of India .
4.	Digital Design, M.M. Mano, Pearson Education Asia.

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Computer Application (C-V (B)): Computer System Architecture Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	30	4

Following is the architecture of a machine of basic Computer instructions:

Register Set

IR	DR	AC	AR	PC	FGI	FGO	S	I	F
0 15	0 15	0 15	0 11	0 11	1 Bit	1 Bit	1 Bit	1 Bit	1 Bit

Memory 4096 Words 16 bits per word	Instruction Format

Instruction Format

0	3	4	15
Opcode		Address	

Basic Computer Instruction

Memory Reference			Register Reference		Input-Output	
Symbol	Hex		Symbol	Hex	Symbol	Hex
AND	0xxx	Direct Accessing	CLA	7800	INP	F800
ADD	1xxx	I=0	CLE	7400	OUT	F400
LDA	2xxx		CMA	7200	SKI	F200
STA	3xxx		CME	7100	SKO	F100
BUN	4xxx		CIL	7080	ION	F080
BSA	5xxx		CIR	7040	IOF	F040
ISZ	6xxx		INC	7020		
AND_I	8xxx	Indirect Accessing	SPA	7010		
ADD_I	9xxx		SNA	7008		
LDA_I	Axxx		SZA	7004		
STA_I	Bxxx	I=1	SZE	7002		
BUN_I	Cxxx		HLT	7001		
BSA_I	Dxxx					
ISZ_I	Exxx					

1. Create the machine for Memory Reference Instructions with addressing mode I=0.
2. Create the machine for Memory Reference Instructions with addressing mode I=1.

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3. Create the machine for Register Reference Instructions.
4. Create the machine for Input-Output Instructions.
5. Create a Fetch routine of the instruction cycle.

6. Simulate the machine to determine the contents of AC, E, PC, AR and IR registers in hexadecimal after the execution of each of following register reference instructions:

   a. CLA   e. CIR
   b. CLE   f. CIL
   c. CMA
   d. CME

   Initialize the contents of AC to $(A937)_{16}$, that of PC to $(022)_{16}$ and E to 1.

7. Simulate the machine to determine the contents of AC, E, PC, AR and IR registers in hexadecimal after the execution of each of following register reference instructions:

   a. INC   e. SZE
   b. SPA   f. HLT
   c. SNA
   d. SZA

   Initialize the contents of AC to $(A937)_{16}$, that of PC to $(022)_{16}$ and E to 1.

8. Simulate the machine for the following memory-reference instructions with I= 0 and address part = 082. The instruction to be stored at address 022 in RAM. Initialize the memory word at address 082 with the operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.

   a. ADD   f. BSA
   b. AND   g. ISZ
   c. LDA   d. STA
   e. BUN

9. Simulate the machine for the memory-reference instructions referred in above question with I= 1 and address part = 082. The instruction to be stored at address 026 in RAM. Initialize the memory word at address 082 with the value 298. Initialize the memory word at address 298 with operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.

Modify the above machine according to the following instruction format:

Instruction Format

0 2	0 4	15
Opcode	I	Address

The instruction format contains a 3-bit opcode, a 1-bit addressing mode and a 12-bit address. There are only two addressing modes, I = 0 (direct addressing) and I = 1 (indirect addressing). Create a new register I of 1 bit.

10. Create two new microinstructions as follows:
    i. Check the opcode of instruction to determine type of instruction (Memory Reference) and then jump accordingly.
    ii. Check the I bit to determine the addressing mode and then jump accordingly

11. Create two new microinstructions as follows:

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    i. Check the opcode of instruction to determine type of instruction (Register Reference) and then jump accordingly.

    ii. Check the I bit to determine the addressing mode and then jump accordingly

12. Create two new microinstructions as follows:

    i. Check the opcode of instruction to determine type of instruction (Input-Output) and then jump accordingly.

    ii. Check the I bit to determine the addressing mode and then jump accordingly

Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
2	4	0	25	25

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Computer Application (C-VI (A)): Operating Systems

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	4	1	0

Unit	Contents	Lectures
I.	**Introduction to Operating System** Introduction to operating System. Basic Functions of Operating System. Simple Batch Systems, Multi Programmed Batch Systems, Time-Sharing Systems, Parallel System, Distributed systems, Real-Time Systems. Computer System structure- Computer System Operation, I/O Structure (I/O Interrupts and DMA Structure) Storage Structure, Storage Hierarchy and Hardware Protection (Dual Mode Operation, I/O Protection, Memory Protection and CPU protection).	5
II.	**Operating System Structure** System Components (Process Management, Main Memory Management, File Management, I/O System Management, Secondary Storage Management, Networking, Protection System and Command Interpreter System), Operating System Services (Program Execution, I/O Operations, File System Manipulation, Communication and Error detection).	5
III.	**Process** Process Concept (Process, Process State, Process Control Blocks), Process Scheduling (Scheduling Queues, Schedulers and Context Switching) Operations of Processes (Process Creation and Process Termination), Inter Process Communication (Information Sharing, Computation Speedups, Modularity and Convenience), Thread (Thread Structure) and difference between Thread and Process.	5
IV.	**CPU Scheduling** CPU scheduling (CPU-I/O Burst Cycle, CPU Scheduler, Types of Scheduling (Pre-emptive and Non-Pre-Emptive Scheduling and Dispatcher), Scheduling Criteria (CPU Utilization, Throughput, Turnaround Time, Waiting Time and Response Time), Scheduling Algorithms (First Come First Served Scheduling, Shortest Job First Scheduling, Priority Scheduling, Round Robin Scheduling, Multi Level Queue Scheduling, Multi Level Feedback Queue Scheduling.	8
V.	**Memory** Memory Management (Address Binding (Compile Time, Load Time and Execution Time), Dynamic Loading, Dynamic Linking and Overlays). Comparison between Logical and Physical Address Space. Swapping. Contiguous Allocation (Single Partition Allocation, Multiple Partition Allocation and External and Internal Fragmentation), Paging (Idea of Paging, Page Table Structure, Multi Level Paging, Inverted Page Table and Shared Pages), Segmentation (idea of Segmentation, Hardware Support, Implementation of Segment Tables, Protection and Sharing and Fragmentation). Virtual memory (Idea of Virtual Memory, Demand Paging, Page Replacement, Page Replacement Algorithms (**F**irst **I**n **F**irst **O**ut Algorithm and **L**east **R**ecently **U**sed Algorithm). Thrashing.	12
VI.	**File**	5

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Fax: 0651-2207 672
E-Mail:dept_computersc@sxcran.org
Website: www.sxcran.org

	File (Idea of File, File Attributes, File Operations, File Types and File Structure), File System Structure (File System Organization, File Allocation Methods (Contiguous Allocation, Liked Allocation, Indexed Allocation)), Free Space Management (Bit Vector, Linked List, Grouping and Counting).	
VII.	**Introduction to Linux / Unix** • What is Linux / Unix Operating systems • Difference between Linux / Unix and other operating systems • Features and Architecture • Various Distributions available in the market • Installation, Booting and shutdown process • System processes (an overview) • External and internal commands • Creation of partitions in OS • Processes and its creation phases – Fork, Exec, wait	**5**
VIII.	**Shell introduction and Shell Scripting** • What is shell and various type of shell, Various editors present in Linux • Different modes of operation in vi editor • What is shell script, Writing and executing the shell script • Shell variable (user defined and system variables) • System calls, Using system calls • Pipes and Filters • Decision making in Shell Scripts (If else, switch), Loops in shell • Functions • Utility programs (cut, paste, join, tr , uniq utilities) • Pattern matching utility (grep)	**5**

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Fax: 0651-2207 672
E-Mail:dept_computersc@sxcran.org
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Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
4	4	25	50	75	8 / 5

Question Pattern

1. Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).
2. A general pattern of the questions may be
   a. Objective type or very short answer type or fill in the blanks type or true-false type.
   b. Short answer and Long answer type question.
   A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Books:

SL. No.	Book Name
1.	A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2.	A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3.	G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4.	W. Stallings, Operating Systems, Internals & Design Principles 2008 5th Edition, Prentice Hall of India.
5.	M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.
6.	

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Computer Application (C-IV (B)): Operating System Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	30	4

Sl. No.	Program
1.	DOS Commands.
2.	Batch Files Creation and Execution.
3.	Write a C/ C++ program to copy files using system calls.
4.	Write a C/ C++ program to implement FCFS scheduling algorithm.
5.	Write a C/ C++ program to implement Round Robin scheduling algorithm.
6.	Write a C/ C++ program to implement SJF scheduling algorithm.
7.	Write a C/ C++ program to implement non-preemptive priority based scheduling algorithm.
8.	Write a C/ C++ program to implement preemptive priority based scheduling algorithm.
9.	Write a C/ C++ program to implement SRJF scheduling algorithm.
10.	Write a C/ C++ program to calculate sum of n numbers using thread library.
11.	Write a C/ C++ program to implement first-fit, best-fit and worst-fit allocation strategies.
12.	Linux Commands.

Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		MSE	ESE	
2	4		25	25

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Computer Application (C-V (A)): Computer Network

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	4	0	0

Unit	Contents	Lectures
I.	**Introduction to Computer Networks** Network definition; Advantages and Disadvantages of Computer Networks, network topologies; BUS, RING, STAR,MESH, TREE and HYBRID Topologies, Distributed Processing, Network Criteria, Network Models, Purpose of Layered Network Architecture, Overview of OSI and TCP/IP Reference Models, Network addressing: Physical, Logical and Port Address.	8
II.	**Data Communication Fundamentals and Techniques** Analog and digital signal, Sine Waves, Wavelength, Composite Signals, Digital to Digital Line Coding Schemes, Unipolar NRZ, Polar NRZ, RZ, Biphase Manchester and Differential Manchester Encoding, Synchronous and Asynchronous Transmission, Digital to Analog Conversion: Amplitude Shift Keying, Frequency Shift Keying and Phase Shift Keying, Analog to Analog Conversion: Amplitude Modulation, Frequency Modulation and Phase Modulation, Bandwidth and its utilization, Multiplexing and its types, TDM, FDM and WDM. Guided and Unguided transmission media.	11
III.	**Networks Switching Techniques and Access mechanisms** Circuit Switching, Structure of Circuit Switches, Datagram Switching, Routing Tables, Addressing in virtual Circuit Network, Comparison between Connection Oriented and Connection less transmission.	4
IV.	**Data Link Layer Functions and Protocol** Errors in communication, Types of Errors, Error detection and correction, Parity Check, Hamming distance, CRC, Checksum, Flow and Error Control, Noiseless Channels: Simplest Protocol, Stop and Wait Protocol, Noisy Channels: Stop and Wait ARQ, GO BACK N ARQ, HDLC, Configuration and Transfer modes in HDLC.	12
V.	**Multiple Access Protocol and Networks** ALOHA Network, CSMA, CSMA with Collision Detection and with Collision Avoidance (CSMA/CD, CSMA/CA), Channelization and Framing Concepts, Code Division Multiple Access(CDMA), Introduction to networking security.	7
VI.	**Networks Layer Functions and Protocols** Routing Concepts, Types of Routing, Flood based and Flow based Routing Techniques, Dijkstra's Shortest Path Algorithm, Introduction to IP Addressing, Classful and Classless Addressing structures, Network Congestion and Associated Concepts, Open and Closed loop congestion control, Traffic Shaping, Leaky Bucket Algorithm, Overview of DNS.	8

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Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
4	4	25	50	75	8 / 5

Question Pattern

1. **Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).**
2. **A general pattern of the questions may be**
   a. **Objective type or very short answer type or fill in the blanks type or true-false type.**
   b. **Short answer and Long answer type question.**
   A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Books:

SL. No.	Book Name
1.	B. A. Forouzan: Data Communications and Networking, Fourth edition, THM Publishing Company Ltd 2007.
2.	A. S. Tanenbaum: Computer Networks, Fourth edition, PHI Pvt. Ltd 2002.
3.	Data and Computer Communications, Stallings, PHI.
4.	Communication Networks, Walrand, TMH.
5.	Computer Communication Networks, Shanmugam &Rajeev, ISTET/EXCEL.
6.	Data Communication, Prakash C .Gupta, PHI.
7.	Computer Networking, Tattle, Shamus Outline Series, TMH.
8.	Data and Network Communications, Miller, VIKAS.
9.	Data Communication and Network, Dr. Prasad, Wiley, Dreamtech.
10.	Computer Network Theory, Prasad, Scitech.
11.	TCP/IP network administration, Hunt, SPD/O'REILLY.

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Computer Application (C-VII (B)): Computer Networks Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	30	4

SL. No.	Programs
1.	Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2.	Simulate and implement stop and wait protocol for noisy channel.
3.	Simulate and implement go back n sliding window protocol.
4.	Simulate and implement selective repeat sliding window protocol.
5.	Simulate and implement distance vector routing algorithm
6.	Simulate and implement Dijkstra algorithm for shortest path routing.

Examination Scheme

Credits	Lab Hours per Week	Marks		Full Marks
		CIA	ESE	
2	4	0	25	25

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Computer Application (SEC-I (A)): HTML

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
1	Theory	15	2	0	0

Unit	Contents	Lecture
I.	**Introduction**	1
II.	**The Basics** • The Head • The Body • Colors, Attributes • Lists, ordered and unordered	2
III.	**Links** • Introduction • Relative Links, Absolute Links • Link Attributes • Using the ID Attribute to Link Within a Document	3
IV.	**Images** • Putting an Image on a Page • Using Images as Links • Putting an Image in the Background	2
V.	**Tables** • Creating a Table • Table Headers • Captions • Spanning Multiple Columns • Styling Table	4
VI.	**Forms** • Basic Input and Attributes • Other Kinds of Inputs • Styling forms with CSS • Where To Go From Here	3

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Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		MSE	ESE		
1	2	25	50	75	8 / 5

Question Pattern

1. **Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).**
2. **A general pattern of the questions may be**
   a. **Objective type or very short answer type or fill in the blanks type or true-false type.**
   b. **Short answer and Long answer type question.**
   A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Book:

SL. No.	Book Name
1.	Introduction to HTML and CSS - O'Reilly.

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Computer Application (SEC-I (B)): HTML Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
1	Practical	15	2

SL. No.	Assignments
1.	Create an HTML document with the following formatting options: I. Bold II. Italics III. Underline IV. Headings (Using H1 to H6 heading styles) V. Font (Type, Size and Color) VI. Background (Colored background/Image in background) VII. Paragraph VIII. Line Break IX. Horizontal Rule X. Pre tag
2.	Create an HTML document which consists of: I. Ordered List II. Unordered List III. Nested List IV. Image

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	A. Saftey Considerations
	   1. Body substance isolation
	   2. Sense safty
	   3. Initial size-up
	B. Intitial Patient Assessment
	   1. General Impression
	   2. Unresponsiveness
	      i. Alert to person, place and time
	      ii. Verbal response to audible stimuli
	      iii. Pain evokes verbal or physical response
	      iv. Unresponsive to all stimuli
	C. Patient Critical Needs
	   1. Airway
	   2. Breathing
	      i. Use oxygen if indicated
	      ii. Consider use of assisting with bag value mask
	   3. Circulation
	   4. Bleeding

3.	Create an HTML document which implements Internal linking as well as External linking.
4.	Create a table using HTML which consists of columns for Roll No., Student's name and grade. Result Roll No. Name Grade <table><tr><td colspan="3" align="center">Result</td></tr><tr><td>Roll No.</td><td>Name</td><td>Grade</td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table>
5.	Create a Table with the following view: <table><tr><td></td><td></td><td></td><td rowspan="4">Place an image here</td></tr><tr><td colspan="3"></td></tr><tr><td colspan="3"></td></tr><tr><td colspan="3"></td></tr></table>
6.	Create a form using HTML which has the following types of controls: I. Text Box II. Option/radio buttons III. Check boxes IV. Reset and Submit buttons

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7.	Create HTML documents (having multiple frames) in the following three formats:

Frame 1
Frame 2

Frame 1	
Frame 2	Frame 3

Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
1	2	0	25	25

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Fourth Semester

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Computer Application (C-VIII (A)): Design and Analysis of Algorithms

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	4	1	0

Unit	Content	Lecture
I.	**Introduction** Notion of an Algorithm, Fundamentals of the Analysis of Algorithm Efficiency, Analysis Framework, Time and Space Complexity, Growth of Functions, Asymptotic Notations and its Properties, Performance Measurements, Comparison and Analysis of Insertion-Sort, Bubble-Sort, Selection-Sort.	3
II.	**Algorithm Design Techniques:** **Divide and Conquer Principle:** Basic Method, Use, Examples: Merge-Sort, Quick-Sort, Binary Search, Recurrences, Solution of Recurrences by Substitution Method, Recursion Tree Method, Master Method , Analysis of Merge-Sort, Quick-Sort, Binary-Search.	9
III.	**Dynamic Programming:** Basic Method, Use, Examples: Matrix-Chain Multiplication, All Pair Shortest Path Problem-Floyd- Warshall Algorithm, Single Source Shortest Path Problem- Dijkstra's Algorithm, Traveling Salesman Problem.	10
IV.	**Greedy Technique:** Basic Method, Use, Examples: Knapsack Problem, Minimum Spanning Tree- Prim's and Kruskal's Algorithms, Huffman Algorithm.	8
V.	**Graph Algorithm:** Properties of Graphs and Graph Traversal Algorithms: Breadth First Search, Depth First Search and its Applications.	4
VI.	**Advanced Data Structures:** Heaps and Heap-Sort, Count-Sort, Radix-Sort, Bucket-Sort, Complexity Analysis, Binary Search Tree- Insertion and Deletion in Binary Search Tree, Height of a Binary Tree, Complexity of Search Algorithm, Balanced Tree- AVL Tree - Rotation, Insertion, Deletion, Height of an AVL Tree, Red-Black Tree, Introduction to m-way Search Trees, B Trees & B+ Trees.	12
VII.	**String Processing:** Naïve String-Matching Algorithm, Knuth-Morris-Pratt (KMP) Algorithm.	4

Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		MSE	ESE		
4	4	25	50	75	8 / 5

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Question Pattern

1. **Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).**
2. **A general pattern of the questions may be**
   a. **Objective type or very short answer type or fill in the blanks type or true-false type.**
   b. **Short answer and Long answer type question.**
   A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Books:

SL. No.	Book Name
1.	T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein Introduction to Algorithms, PHI, 3rd Edition 2009.
2.	Sarabasse& A.V. Gelder Computer Algorithm – Introduction to Design and Analysis, Publisher – Pearson 3rd Edition 1999.

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Computer Application (C-VIII (B)): Design and Analysis of Algorithms Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	30	4

SL. No.	Programs
1.	WAP to implement Insertion Sort. (The program should report the number of comparisons).
2.	WAP to implement Merge Sort (The program should report the number of comparisons).
3.	WAP to Implement Heap Sort(The program should report the number of comparisons).
4.	WAP to Implement Quick sort (The program should report the number of comparisons).
5.	WAP to Implement Radix Sort, Bucket Sort and Count Sort.
6.	WAP to create a Binary Search Tree and perform following operations on it: • Insert a node • Delete a node • Search for a number • Successor of a node • Predecessor of a node.
7.	WAP to implement various operations on AVL Tree.
8.	WAP to create a Red-Black Tree and perform following operations on it: • Insert a node • Delete a node • Search for a number & also report the color of the node containing this number.
9.	WAP to implement Breadth-First Search in a graph.
10.	WAP to implement Depth-First Search in a graph.

Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
2	4	0	25	25

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Computer Application (C-IX (A)): Software Engineering

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	4	1	0

Unit	Contents	Lectures
I.	**Introduction to Software Engineering** Introduction to software. Qualities of good software. Introduction to software engineering. Components of software engineering. Software development models. Comparative analysis of process models. Software Development Life Cycle.	5
II.	**Software Estimation (Size, effort and cost)** Software metrics. Metrics Database (process metrics, documentation, line of code, reviews, quality metrics). Software size estimation (Function Point Analysis and Marks II Function Point Analysis). Estimation of effort and schedule Impact of risk estimation on effort and time. Impact of schedule and manpower constraints. Delphi Cost Estimation Technique, expert judgement ,COCOMO model, Application Suite Model. COCOMO II model. Software cost estimation (personal cost, hardware cost, software cost, training cost, marketing cost, outsourcing cost etc).	10
III.	**Software Risk Management** Introduction to software risk. Types of risk. Nature of risk. Software risk management. Risk mitigation management. **Software Reliability**	5
IV.	**Software Engineering Tools** Modeling, Analysis, Requirement Engineering, Work Breakdown Structure, Work Breakdown Structure Scheduling, Prototyping, CASE, I-CASE.	5
V.	**System Analysis** Introduction and types of System. Principles of System Development. Organization as a System. Measurement of System Performance. System control. System Modeling. Structured System Analysis. Understanding the system environment (organization, business, management and system). Software Requirement Specification. Information Systems (input, process, output, store and control).	5
VI.	**System Design** Introduction to system design. The modeling of user requirement using System Decomposition and Modeling, Work Flow Diagram, Data Flow Diagram, Entity Relationship Diagram and System Flow Chart. Converting E-R Diagram to Relational Tables.	10
VII.	**User Interface Design** Introduction to user interface. Dimensions of User Interface Design. Types of User Interface. Reports. User Interface Analysis and Design.	5
VIII.	**Software Project Management**	7

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		Introduction to Software Product Management. Project Management Cycle (inception, elaboration, construction and transition). Factors affecting Project Management like people, product (software), process and project. Project Management Keys (scope, time, cost, risk, quality, human resource, communication, procurement and integration).	
IX.		**Software testing** Introduction to software testing. Software testing needs and goals. Testing paths (non-execution based testing and execution based testing. White Box Testing and Black Box Testing, Non execution based testing like walkthrough and review. Execution Based Testing. Tree Structure of Testing. Functional Testing (Unit testing and Integration testing), System testing (Alpha and Beta testing and runtime operations testing) and User Satisfaction Testing. Testing based on Matrix Testing.	8

Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	**ESE**		
4	4	25	50	75	8 / 5

Question Pattern

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   a. **Objective type or very short answer type or fill in the blanks type or true-false type.**
   b. **Short answer and Long answer type question.**

   A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Books:

SL. No.	Book Name
1.	R.S. Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill, 2009.
2.	P. Jalote, An Integrated Approach to Software Engineering (2nd Edition), Narosa Publishing House, 2003.
3.	K.K. Aggarwal and Y. Singh, Software Engineering (revised 2nd Edition), New Age International Publishers, 2008.
4.	I. Sommerville, Software Engineering (8th edition), Addison Wesle, 2006.
5.	D. Bell, Software Engineering for Students (4th Edition), Addison-Wesley, 2005.
6.	R. Mall, Fundamentals of Software Engineering (2nd Edition), Prentice-Hall of India, 2004.

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Computer Application (C-IX (B)): Software Engineering Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	30	4

SL. No.	Practical Title
1.	• Problem Statement • Process Model
2.	Requirement Analysis • Creating a Data Flow • Data Dictionary, Use Case
3.	Project Management • Computing FP • Effort • Schedule, Risk Table, Time Line chart
4.	Design Engineering • Architectural Design • Data Design, Component Level Design
5.	Testing • Basis Path Testing

SL. No.	Project
1.	Criminal Record Management: Implement a criminal record management system for jailers, police officers and CBI officers
2.	DTC Route Information: Online information about the bus routes and their frequency and fares.
3.	Car Pooling: To maintain a web based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively.
4.	Patient Appointment and Prescription Management System
5.	Organized Retail Shopping Management Software
6.	Online Hotel Reservation Service System
7.	Examination and Result computation system
8.	Automatic Internal Assessment System
9.	Parking Allocation System
10.	Wholesale Management System

Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
2	4	00	25	25

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ST. XAVIER'S COLLEGE
(An Autonomous College of Ranchi University)
RANCHI, JHARKHAND 834 001

NAAC 'A'

Tel: 0651-2214 301, 2214 935
Fax: 0651-2207 672
E-Mail:dept_computersc@sxcran.org
Website: www.sxcran.org

Computer Application (C-X (A)): Database Management Systems

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	4	1	0

Unit	Contents	Lectures
I.	Introduction to DBMS, Purpose, difference with respect to conventional file processing system, data abstraction, data independence, data models (object-based, record based, physical data models), database manager, database administrator , overall system structure.	5
II.	Entity- Relationship model, Relationship sets, Mapping, Keys and entity sets. Entity-Relationship diagram, specialization, generalization and aggregation, database schema under relational model.	5
III.	Relational algebra –Project, select, Cartesian product, joins, natural join, union, intersection, minus, division operations.	6
IV.	Normalization – Functional dependency, INF, 2NF, 3NF, BCNF, Multi valued dependency & 4NF. Lossless joins, dependency preservation, redundancy control and integrity preservation during decomposition.	6
V.	Transaction- concepts, transaction state, concurrent executions, serializability, conflict serializability, view serializability.	8
VI.	Concurrency control-locks, granting of locks, timestamps based protocols, deadlock prevention, detection & recovery. Security & integrity violation. Authorization, views.	10
VII.	Oracle functions, SQL (DDL, DML), simple queries, nested sub- queries, self join, equijoin, non-equijoin.	10

Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
4	4	25	50	75	8 / 5

Question Pattern

1. **Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).**
2. **A general pattern of the questions may be**
   a. **Objective type or very short answer type or fill in the blanks type or true-false type.**
   b. **Short answer and Long answer type question.**
   A question setter/examiner may select both (a.) and (b.) or only (b.).

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ST. XAVIER'S COLLEGE   Fax: 0651-2207 672
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RANCHI, JHARKHAND 834 001   Website: www.sxcran.org

Recommended Books:

SL. No.	Book Name
1.	R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010.
2.	R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
3.	A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.
4.	R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education, 2013.

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NAAC 'A'

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Computer Application (C-X (B)): Database Management Systems Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	30	4

SL. NO.	Contents
	Create and use the following database schema to answer the given queries.

EMPLOYEE Schema

Field	Type	Null	Key	Default
Eno	Char(3)	No	PK	NULL
Ename	Varchar(50)	No		NULL
Job_Type	Varchar(50)	No		NULL
Manager	Char(3)	Yes	FK	NULL
Hire_Date	Date	No		NULL
Dno	Integer	Yes	FK	NULL
Commission	Decimal(10,2)	Yes		NULL
Salary	Decimal(7,2)	No		NULL

DEPARTMENT Schema

Field	Type	Null	Key	Default
Dno	Integer	No	PK	NULL
Dname	Varchar(50)	Yes		NULL
Location	Varchar(50)	Yes		New Delhi

Query List

1.	Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2.	Query to display unique Jobs from the Employee Table.
3.	Query to display the Employee Name concatenated by a Job separated by a comma.
4.	Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5.	Query to display the Employee Name and Salary of all the employees earning more than $2850.
6.	Query to display Employee Name and Department Number for the Employee No= 7900.
7.	Query to display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.
8.	Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.
9.	Query to display Name and Hire Date of every Employee who was hired in 1981.
10.	Query to display Name and Job of all employees who don't have a current Manager.

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11.	Query to display the Name, Salary and Commission for all the employees who earn commission.
12.	Sort the data in descending order of Salary and Commission.
13.	Query to display Name of all the employees where the third letter of their name is =A'.
14.	Query to display Name of all employees either have two =R's or have two =A's in their name and are either in Dept No = 30 or their Manger's Employee No = 7788.
15.	Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
16.	Query to display the Current Date.
17.	Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.
18.	Query to display Name and calculate the number of months between today and the date each employee was hired.
19.	Query to display the following for each employee <E-Name> earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.
20.	Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with =J', 'A' and =M'.
21.	Query to display Name, Hire Date and Day of the week on which the employee started.
22.	Query to display Name, Department Name and Department No for all the employees.
23.	Query to display Unique Listing of all Jobs that are in Department # 30.
24.	Query to display Name, Dept Name of all employees who have an =A' in their name.
25.	Query to display Name, Job, Department No. And Department Name for all the employees working at the Dallas location.
26.	Query to display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Employees' Name who do not have a Manager.
27.	Query to display Name, Dept No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.
28.	Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies $100.
29.	Query to display the Highest, Lowest, Sum and Average Salaries of all the employees
30.	Query to display the number of employees performing the same Job type functions.
31.	Query to display the no. of managers without listing their names.
32.	Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
33.	Query to display Name and Hire Date for all employees in the same dept. as Blake.
34.	Query to display the Employee No. And Name for all employees who earn more than the average salary.
35.	Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a = 'T'.
36.	Query to display the names and salaries of all employees who report to King.
37.	Query to display the department no, name and job for all employees in the Sales department.

Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
2	4	0	25	25

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Computer Application (SEC-II (A)): PL/SQL

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
1	Theory	15	2	0	0

Unit	Contents	Lecture
I.	Introduction to Oracle as RDBMS SQL Vs. SQL * Plus: SQL Commands and Data types, Operators and Expressions, Introduction to SQL * Plus.	2
II.	Managing Tables and Data: • Creating and Altering Tables (Including constraints) • Data Manipulation Command like Insert, update, delete ▯ • SELECT statement with WHERE, GROUP BY and HAVING, ORDER BY, DISTINCT, Special operator like IN, ANY, ALL BETWEEN, EXISTS, LIKE • Join, Built in functions.	4
III.	Other Database Objects • View • Synonyms • Index	2
IV.	Transaction Control Statements • Commit • Rollback • Savepoint	2
V.	Introduction to PL/SQL • SQL v/s PL/SQL • PL/SQL Block Structure • Language construct of PL/SQL (Variables, Basic and Composite Data type, Conditions looping etc.) • % TYPE and % ROWTYPE • Using Cursor (Implicit, Explicit)	5

Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks
		CIA	ESE	
1	2	25	50	75

Question Pattern

1. Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).
2. A general pattern of the questions may be
   a. Objective type or very short answer type or fill in the blanks type or true-false type.

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b. Short answer and Long answer type question.
A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Books:

SL. No.	Book Name
1.	SQL, PL/SQL The programming Lang. of Oracle Ivan Bayross
2.	Oracle9i the Complete Reference George Koch

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Computer Application (SEC-II (B)): PL/SQL Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
1	Practical	15	2

SL. No.	Exercise
1.	**SQL Commands** • **SQL* formatting commands** • **To create a table, alter and drop table.** • **To perform select, update, insert and delete operation in a table.** • **To make use of different clauses viz where, group by, having, order by, union and intersection,** • **To study different constraints.**
2.	**SQL Functions** • **To use oracle function viz aggregate, numeric, conversion, string function.** • **To understand use and working with joins.** • **To make use of transaction control statement viz rollback, commit and save point.** • **To make views of a table.** • **To make indexes of a table.**
3.	**PL/SQL** • **To understand working with PL/SQL** • **To implement Cursor on a table.** • **To implement trigger on a table**

Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
1	2	0	25	25

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Fifth Semester

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NAAC 'A'

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Computer Application (C-XI (A)): Internet Technologies

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	4	1	0

Unit	Contents	Lecture
I.	**Internet** What is Internet? Evolution and history of internet, Internet Services and resources, Internet Service Provider, Internet Addressing(Domain names and IP addresses), Resource Addressing(URL), Advantages of Internet, TCP/IP, Types of Internet Connections(Dial-up connection, ISDN,ADSL, Leased Line connections, Satellite connections) Services on Internet- E-mail, WWW, Telnet, FTP, IRC and Search Engine Web Browser, Web Server, HTTP(Hypertext Transfer Protocol),MIME(Multipurpose Internet Mail Extension). Internet Security Management- Overview of Internet Security, Firewalls, Internet Security, Management Concepts and Information Privacy and Copyright issues.	11
II.	**JavaScript** Overview of Javascript, Advantages of Javascript, Basic Programming Techniques, Operators and Expressions, Simple programs on Javascript(for ex. Finding factorial, Fibonacci, power etc), String properties and methods, Date objects, Screen output and Keyboard input(confirm, prompt, alert), Simple concept of arrays, Functions in Javascript (writing programs using functions), Javascript document object model(DOM), Javascript object hierarchy model, History objects, Events Handling.	14
III.	**JDBC** What is JDBC? JDBC Architecture, JDBC Components, JDBC Environment Setup, Types of JDBC drivers, JDBC Establishing Connectivity and working with connection interface, JDBC Database Connections, JDBC-Statements, Prepared Statement and Calllable Statement, JDBC Result Sets, JDBC Transactions(Commit, Rollback and Savepoints).	11
IV.	**JSP** What are Java Server Pages(JSP), HTTP and Servlet Basics, The Problem with Servlets, JSP-Environment Setup, JSP-Architecture, JSP Processing, JSP Life Cycle, JSP Scriptlet, JSP Declarations, JSP Expression, JSP Comments, JSP Directives, JSP Actions, JSP Implicit Objects, JSP Control-Flow statements(Decision Making and Loop), JSP Operators, JSP Directives, Placing JSP in the web server, JSP- Client request.	14

Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
4	4	25	50	75	8 / 5

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Question Pattern

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   a. **Objective type or very short answer type or fill in the blanks type or true-false type.**
   b. **Short answer and Long answer type question.**
   A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Books:

SL. No.	Book Name
1.	Web Enabled Commercial Application Development Using Html, Dhtml, Javascript, Perl CGI By Ivan Bayross, BPB Publications, 2009.
2.	BIG Java Cay Horstmann, Wiley Publication , 3rd Edition., 2009.
3.	Java 7, The Complete Reference, Herbert Schildt, 8th Edition, 2009.
4.	The Complete Reference J2EE, TMH, Jim Keogh, 2002.
5.	Java Server Pages, Hans Bergsten, Third Edition, O'Reilly Media December 2003.

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Computer Application (C-XI (B)): Internet Technologies Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	30	4

SL. No.	Program
1.	Write a javascript to find the largest of three numbers.
2.	Write a javascript to find the factorial of a number.
3.	Write a javascript to check whether the number is prime or not.
4.	Write a javascript to check whether the number is armstrong or not.
5.	Write a javascript to input a number and then display in words. For ex. 123 should be displayed as one two three.
6.	Write a javascript to demonstrate Math objects.
7.	Write a javascript to find factorial of a number using function.
8.	Write a javascript to generate the fibonacci series.
9.	Write a javascript to find largest number in an array using function.
10.	Write a javascript to demonstrate String properties and methods.
11.	Write a javascript to demonstrate events and event handling.
12.	Write a javascript to demonstrate history object.
	Execute the following JSP programs. Make the use of Tomcat Server wherever needed.
13.	Write a JSP program to display "Hello World".
14.	Write a JSP program to find the sum of two numbers.
15.	Write a JSP program to print even numbers
16.	Write a JSP program to find factorial of a given number.
17.	Write a JSP program to generate Fibonacci series.
18.	Write a JSP program to enter value between 0 and 6. Now display the weekday according to the value ie. Sunday for "0", Monday for "1" and so on. Make the use of Switch-Case.
19.	Write a JSP program to create a string using the JSP. Save it in a folder inside the Tomcat directory. Finally run it using the Tomcat server.
20.	Write a JSP program for printing "Hello World" for a specified number of times "say n" on the web browser. The value of n should be entered through the browser and then submitted to the server. Now the web server should execute JSP code and should respond with an HTML page displaying "Hello World" n number of times on the Web Browser.
21.	Write a JSP program to accept the value of n and print numbers from 1 to n. The values of n should be entered in a jsp and the program should be saved under the Tomcat directory. Finally the Tomcat server is executed to display the output.
22.	Write a JSP program for displaying the text "JSP Programming" in font-size ranging from 1 to 10 and with font-color "green".
23.	Write a JSP program using <jsp:include> directive of Action to display today's date and time. Include two jsp files for ex. "main.jsp" and "date.jsp". Embed date.jsp inside the main.jsp using the <jsp:include> directive.
24.	Write a JSP program using <jsp:forward> directive of Action to display today's date and time. Include two jsp files for ex. "main.jsp" and "date.jsp". Embed date.jsp inside the main.jsp using the <jsp:forward> directive. Notice and write the difference between the output of prog no. 11

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	and prog no. 12.
	Execute the following JDBC programs. Make use of JDBC driver.
25.	Write a JDBC program to retrieve the data fro a table using the "Select" command.
26.	Write a JDBC program to insert data into a specified table.
27.	Write a JDBC program to insert data into a specified table using "Prepared Statement"
28.	Write a JDBC program to demonstrate the use of "ResultSet" interface.
29.	Write a JDBC program to create a table.
30.	Write a JDBC program to drop a table.

Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
2	4	0	25	25

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ST. XAVIER'S COLLEGE
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RANCHI, JHARKHAND 834 001

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E-Mail:dept_computersc@sxcran.org
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Computer Application (C-XII (A)): Artificial Intelligence

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	4	1	0

Unit	Contents	Lecture
I.	**Introduction** Introduction to Artificial Intelligence, Background and Applications, Turing Test and Rational Agent approaches to AI, Introduction to Intelligent Agents, their structure, behavior and environment.	6
II.	**Problem Solving and Searching Techniques** Problem Characteristics, Production Systems, Control Strategies, Breadth First Search, Depth First Search, Hill climbing and its Variations, Heuristics Search Techniques: Best First Search, A* algorithm, Constraint Satisfaction Problem, Means-End Analysis, Introduction to Game Playing, Min-Max and Alpha-Beta pruning algorithms.	16
III.	**Knowledge Representation (20 Lectures)** Introduction to First Order Predicate Logic, Resolution Principle, Unification, Semantic Nets, Conceptual Dependencies, Frames, and Scripts, Production Rules, Conceptual Graphs. Programming in Logic (PROLOG).	14
IV.	**Dealing with Uncertainty and Inconsistencies** Truth Maintenance System, Default Reasoning, Probabilistic Reasoning, Bayesian Probabilistic Inference, Possible World Representations.	8
V.	**Understanding Natural Languages** Parsing Techniques, Context-Free and Transformational Grammars, Recursive and Augmented Transition Nets.	6

Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
4	4	25	50	75	8 / 5

Question Pattern

1. **Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).**
2. **A general pattern of the questions may be**
   a. **Objective type or very short answer type or fill in the blanks type or true-false type.**
   b. **Short answer and Long answer type question.**
   A question setter/examiner may select both (a.) and (b.) or only (b.).

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Recommended Books:

SL. No.	Book Name
1.	DAN.W. Patterson, Introduction to A.I and Expert Systems – PHI, 2007.
2.	Russell &Norvig, Artificial Intelligence-A Modern Approach, LPE, Pearson Prentice Hall, 2nd edition, 2005.
3.	Rich & Knight, Artificial Intelligence – Tata McGraw Hill, 2nd edition, 1991.
4.	W.F. Clocksin and Mellish, Programming in PROLOG, Narosa Publishing House, 3rd edition, 2001.
5.	Ivan Bratko, Prolog Programming for Artificial Intelligence, Addison-Wesley, Pearson Education, 3rd edition, 2000.

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Computer Application (C-XIII (B)): Artificial Intelligence Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	30	4

SL. No.	Programs
1.	Write a prolog program to calculate the sum of two numbers.
2.	Write a prolog program to find the maximum of two numbers.
3.	Write a prolog program to calculate the factorial of a given number.
4.	Write a prolog program to calculate the nth Fibonacci number.
5.	Write a prolog program, insert_nth(item, n, into_list, result) that asserts that result is the list into_list with item inserted as the n'th element into every list at all levels.
6.	Write a Prolog program to remove the Nth item from a list.
7.	Write a Prolog program, remove-nth(Before, After) that asserts the After list is the Before list with the removal of every n'th item from every list at all levels.
8.	Write a Prolog program to implement append for two lists.
9.	Write a Prolog program to implement pallindrome(List).
10.	Write a Prolog program to implement max(X,Y,Max) so that Max is the greater of two numbers X and Y.
11.	Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List.
12.	Write a Prolog program to implement sumlist(List,Sum) so that Sum is the sum of a given list of numbers List.
13.	Write a Prolog program to implement two predicates evenlength(List) and oddlength(List) so that they are true if their argument is a list of even or odd length respectively.
14.	Write a Prolog program to implement reverse(List,ReversedList) that reverses lists.
15.	Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List using cut predicate.
16.	Write a Prolog program to implement GCD of two numbers.
17.	Write a prolog program that implements Semantic Networks/Frame Structures.

Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
2	4	0	25	25

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Computer Application (DSE-I (A)): Windows Programming using Visual Basic .Net

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	5	1	0

Unit	Contents	Lecture
I.	**.NET Introduction** .NET Framework, Common Language Runtime, Application types	5
II.	**Language** Datatype,Constants,Variables,Keywords,Literals,Operators,Programming Constructs,Procedure,Functions,Event Procedures.Parameter Passing,Byval,ByRef	10
III.	**OOPS** Class, Interface, Objects, Modules, Constuctors, Access Modifiers,Polymorphism,Abstraction.	15
IV.	**Thread and Exception Handling** Thread Class,Multithreading Structured Exception,Unstructured Exception,Custom/Application Exception	10
V.	**File Handling** File Stream, Stream Reader,Stream Writer,File,Directory.	5
VI.	**ADO.net** Database, Simple Binding, Complex Binding,Data Adapter, Connection Class, Command Class, Dataset, Data reader.	10
VII.	Creating Setup	2
VIII.	Web Services Introduction to smart device application	3

Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
4	4	25	50	75	8 / 5

Question pattern

1. **Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).**
2. **A general pattern of the questions may be**
   a. **Objective type or very short answer type or fill in the blanks type or true-false type.**
   b. **Short answer and Long answer type question.**
   A question setter/examiner may select both (a.) and (b.) or only (b.).

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ST. XAVIER'S COLLEGE
(An Autonomous College of Ranchi University)
RANCHI, JHARKHAND 834 001

NAAC 'A'

Tel: 0651-2214 301, 2214 935
Fax: 0651-2207 672
E-Mail:dept_computersc@sxcran.org
Website: www.sxcran.org

Computer Application (DSE-I (B)): Windows Programming using Visual Basic. Net Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	30	4

Sl. No.	Program
1.	Accept ten (10) names in a variable and find out the one which is of the minimum length.
2.	Accept a name of four characters and print all the possibly string after jumbling up the characters.
3.	Use a sub procedures to accept the month and year in number and then print the calendar of it.
4.	In a function accept two names as parameters by value then concatenate them and return the concatenated string back to the calling sub procedure "print" which will print it on the screen.
5.	Accept the details of 10 employees, their name,age,salary and city and then print the total of salary grouped by city.
6.	Make a class Industry which extends its member function "RegulatoryBoard" in all of its subclasses "Films","Real State","Medicine","Insurance" .this function when called by any object of any particular subclass should print the name of the head of the department.
7.	A class "insurance" displays the product details using its function "productdet".productdet displays just the name and company of the products if the customer name as a string variable is passed to it as the only argument.but if the argument passed to the same function includes age as number it should displays the name of the product ,its company and the insurance premium.
8.	An organization having several wings, has introduced some named rule which are must to be used by all of its wings. These rules are open to be implemented in different ways according to the wing using it. Write a program which represent rules in the form of functions and the wings as classes.
9.	Accept the details of ten students which includes their name, age and department. If in case any name accepted is less than 3 and greater than 12 (including space)in length an exception "checklenght" should get fired.
10.	Use the exception classes such as Arithmetic Exception, Overflow Exception and Exception in such a way that it shows how exceptions are tracked from specific to general.
11.	Design a form visually by adding three labels,three text boxes, two comboboxes and two buttons, in which after clicking the save button it should be checked that none of the textboxes are blank and a choice has been made from each of the comboboxes. Labe1 is for Name,Label2 is for age and Label3 is for salary. Textbox1 is for name,textbox2 is for age and textbox3 is for salary. Combobox1 is for designation and combobox2 is for department. Button1 is for Save and button2 is for reset.
12.	Make a form on which a label with a font size of 24 should display the integer value starting from 0 and getting changed on each tick of the timer based on the value of the

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	label a progressbar should continue its value from 1 to 100.
13.	Make a form that should display all the pictures(at least 10)of the imagelist one by one in the picturebox keeping a gap of 1 second each.
14.	Visually design a form having two panels. The first to accept the basic details of the candidate and another to accept the educational details of the candidate. Place the controls to capture these details in both the panels.if the data entry related validations are done properly save the details of the form on to a file.Repeat this for 10 candiadtes.
15.	A picture box in not of such a size which can give the complte view of an image use the required control which can help to see the complete image after dragging it left ,right,up and down.
16.	Design a form visually which should be as a text editor and it uses color dialog box and font dialog box to select the color, font, style and size of the text written into it. These should be a menu on the top in which a menuitem "save" should save the content(text written inside)as a file on the hard disk.
17.	Make a window form in which the entire form should be colored to red, green, yellow or blue in response to the toolbar option button click. The form having a toolbar should have button for red, green, yellow and blue.
18.	Make a calculator form where the designing should be done using code. The same form should have a status bar with three panels first for having date, second for having time and the third for having a good morning wish as string written.
19.	Make a form in code which should be used as a drawing board in which one can make sketches by moving the cursor on the form while the left mouse button is pressed.
20.	Use ADO.Net to store the details of the books in the library into a database in Ms-Access.
21.	Make different forms in order to accept,update,delete records from a product table. Use SQLDataAdapter,SQLConnction,SQLCommand and Dataset to handle the database.
22.	Create a setup file for the standard calculator developed as per the specification mentioned in the question no. 18.

Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		MSE	ESE	
2	4	00	25	25

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Website: www.sxcran.org

Computer Application (DSE-II (B)): Operational Research

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	4	1	0

Unit	Contents	Lecture
I.	**Introduction to Operational Research (OR)** Introduction, Historical Background, Scope of Operation Research, Features of Operation Research, Phases of Operation Research, Operation Research Methodology, Operations Research Techniques and Tools, Structure of the Mathematical Model, Limitations of Operations Research, Applications of OR.	3
II.	**Linear Programming** Meaning of Linear Programming, Linear Programming Problem, General \Mathematical Formulation of LPP, Slack and Surplus Variables, Standard Form of LPP, Matrix Form of Linear Programming Problem, Advantages of Linear Programming Problem, Limitations of Linear Programming, Basic Solution, Solution of a Linear Programming Problem, Convex Sets and Their Properties.	6
III.	**Graphical Method** Graphical Procedure, Graphical Solution of Two Variable Problem, Graphical Solution in some exceptional cases such as Problems Having Unbounded Solutions, Problems Having Infinite Number of Solutions, Problems No Optimal Solution or Feasible Regions, Problems Having Redundant Constraints, Geometric Properties of LPP.	4
IV.	**Simplex Method** Introduction, Fundamental Properties of Simplex Method, Fundamental Theorem of LPP (Algebraic Method), Computational Procedure of Simplex Method, Initial Basic Feasible Solution, Simplex Tableau.	4
V.	**Artificial Variable Techniques** Two-phase Method, Penalty Cost Method or Big M-Method, Disadvantages of Big-M Method over Two-Phase Method, LPP with unrestricted variables, Solution of simultaneous linear equations by simplex method, Inverse of a matrix by Simplex Method.	6
VI.	**Special Cases in LPP** Degeneracy, Unbounded Solution, Alternate Optima, Infeasible Solution	4
VII.	**Duality** Concept of Duality, Definition of the Primal-Dual Problems, General Rules for Converting any Primal into its Dual, Principle of Duality, Primal-Dual Relationships, Comparison of solutions to the primal and its dual, Rules for obtaining dual optimal solution from that of primal and vice versa, Economic Interpretation of Duality.	4
VIII.	**Dual Simplex Method** Computational Procedure of Dual Simplex Method, Advantage of Dual Simplex Method over Simplex Method, Difference between Simplex and Dual Simplex Methods.	3
IX.	**Integer Programming Problem** Introduction, Types of Integer Programming Problems, All Integer Programming Problem, Mixed Integer Programming Problem, Solution of IPP, Cutting Plane Method, Branch and	6

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		Bound Method.	
X.	**Sensitivity Analysis** Changes in the Right Hand Side, Changes in the Objective Function, Changes Affecting Feasibility, Changes Affecting Optimality.		5
XI.	**Transportation Problem** Mathematical Formulation of Transportation Problem, Transportation Method For Initial BFS, North-West Corner Rule, Row-Minima Method, Column-Minima Method, Least Cost Method, VAM Method, Optimization using Stepping Stone Method and Modified Distribution(MODI) Method, Degeneracy in Transportation Problem, Unbalanced Transportation Problem, Maximization in Transportation Problem.		8
XII.	**Assignment Problem** Mathematical Formulation of Assignment Problem, Assignment Model as a Particular Case of Transportation Model, Hungarian Method for Solving Assignment Problem, Maximization in Assignment Problem, Unbalanced Assignment Problem, Alternate Assignment Problem, Traveling Salesman Problem.		4
XIII.	**Game Theory** Introduction, Competitive Situations, Characteristics of Competitive Games, Two Person Zero-Sum Game, Pay-off Matrix, Saddle Point, Maxi-min and Mini-max Principle, Pure and Mixed Strategies, Solution of Game using Algebraic and Graphical Methods.		3

Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
4	4	25	50	75	8 / 5

Question Pattern

1. **Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).**
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   a. **Objective type or very short answer type or fill in the blanks type or true-false type.**
   b. **Short answer and Long answer type question.**
   A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Books:

SL. No.	Book Name
1.	G. Hadley: Linear Programming. Narosa, 2002 (reprint).
2.	A. Ravindran, D. T. Phillips and James J. Solberg: Operations Research-Principles and Practice, John Wiley & Sons, 2005.
3.	Hamdy A. Taha: Operations Research-An Introduction, Prentice Hall, 8th Edition, 2008.
4.	F.S. Hillier. G.J. Lieberman: Introduction to Operations Research- Concepts and Cases, 9th Edition, Tata McGraw Hill. 2010.

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Website: www.sxcran.org

Computer Application (DSE-II (B)): Operational Research Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	30	4

SL. No.	Programs
1.	To solve Linear Programming Problem using Graphical Method with Unbounded Solution, Infeasible Solution Alternative or Multiple Solutions.
2.	Solution of LPP with simplex method.
3.	Problem solving using M-Charnes method.
4.	Problem solving using Two Phase method.
5.	Illustration of following special cases in LPP using Simplex method Unrestricted variables Unbounded solution Infeasible solution Alternative or multiple solutions.
6.	Solution of simultaneous linear equations by simplex method.
7.	Problems based on Dual simplex method.
8.	Problems Solving based on IPP using Cutting Plane Method.
9.	Problems Solving based on IPP using Branch and Bound Method.
10.	Problems based on sensitivity analysis.

Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
2	4	0	25	25

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Sixth Semester

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Computer Application (C-XIII): Theory of Computation

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
6	Theory	45	4	1	1

Unit	Contents	Lecture
I.	**Languages** Alphabets, string, language, Basic Operations on language, Concatenation, Kleene Star.	8
II.	**Finite Automata and Regular Languages** Regular Expressions, Transition Graphs, Deterministic and non-deterministic finite automata, NFA to DFA Conversion, Regular languages and their relationship with finite automata, Pumping lemma and closure properties of regular languages.	20
III.	**Context free languages** Context free grammars, parse trees, ambiguities in grammars and languages, Pushdown automata (Deterministic and Non-deterministic), Pumping Lemma, Properties of context free languages, normal forms.	17
IV.	**Turing Machines and Models of Computations** RAM, Turing Machine as a model of computation, Universal Turing Machine, Language acceptability, decidability, halting problem, Recursively enumerable and recursive languages, unsolvability problems.	15

Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
6	4	25	75	100	8 / 5

Question Pattern

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   a. **Objective type or very short answer type or fill in the blanks type or true-false type.**
   b. **Short answer and Long answer type question.**
   A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Books:

SL. No.	Book Name
1.	Nagpal C. K. , Theory of Automata-
2.	Daniel I.A.Cohen, Introduction to computer theory – John Wiley (1996 2nd Edition).
3.	Lewis & Papadimitriou, Elements of the theory of computation – II Edition PHI 1997.

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E-Mail:dept_computersc@sxcran.org
Website: www.sxcran.org

| 4. | Hoperoft, Aho, Ullman, Introduction to Automata theory, Language & Computation –3rd Edition 2006, Pearson Education. |
| 5. | P. Linz, An Introduction to Formal Language and Automata 4th edition Publication Jones Bartlett 2006. |

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ST. XAVIER'S COLLEGE   Fax: 0651-2207 672
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Computer Application (C-XIV (A)): Computer Graphics

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	4	0	0

Unit	Contents	Lectures
I.	**Introduction** Basic elements of Computer graphics, Pixels, Resolution, Aspect Ratio, Applications of Computer Graphics, Architecture of Raster and Random scan display devices, Working Principle of Cathode Ray Tubes, Refresh Rate and Persistence Relation, Input/output devices.	6
II.	**Fundamental Techniques in Graphics** Raster scan line, Digital differential Analyzer Algorithm, Bresenham's Line Drawing Algorithm, Circle drawing algorithms, Scan Line Polygon filling, Inside Outside test and Pairing Method, Clipping Algorithms: Point Clipping, Line Clipping (Cohen Sutherland's Algorithm), Polygon Clipping (Sutherland Hodgeman's Algorithm), Text Clipping, Geometric Transformations: Translation, Rotation and Scaling, Window to Viewport Transformations.	22
III.	**Geometric Modeling** Representing curves: Bezier Curves, Parametric Equations of Bezier Curves.	4
IV.	**Visible Surface determination** Hidden surface elimination, Back Face Removal Method, Algorithms for Visible Surface Detection: Depth Buffer/Z Buffer Algorithm, Scan Line Algorithm, Area Subdivision Method for Surface Detection.	12
V.	**Colors and Surface Rendering** Basic color models, Additive and Subtractive Color generation concepts, CMYK and RGB Models and their Applications, Basic Elements of Computer Animation.	6

Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
4	4	25	50	75	8 / 5

Question Pattern

1. **Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).**
2. **A general pattern of the questions may be**
   a. **Objective type or very short answer type or fill in the blanks type or true-false type.**
   b. **Short answer and Long answer type question.**

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Recommended Books:

SL. No.	Book Name
1.	J.D.Foley, A.Van Dan, Feiner, Hughes Computer Graphics Principles & Practice 2nd edition Publication Addison Wesley 1990.
2.	D.Hearn, Baker: Computer Graphics, Prentice Hall of India 2008.
3.	D.F.Rogers Procedural Elements for Computer Graphics, McGraw Hill 1997.
4.	D.F.Rogers, Adams Mathematical Elements for Computer Graphics, McGraw Hill 2nd edition 1989.

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Computer Application (C-XIV (B)): Computer Graphics Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	30	4

SL. No.	Program
1.	Write a program to implement Bresenham's line drawing algorithm.
2.	Write a program to implement mid-point circle drawing algorithm.
3.	Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
4.	Write a program to clip a polygon using Sutherland Hodgeman algorithm.
5.	Write a program to fill a polygon using Scan line fill algorithm.
6.	Write a program to apply various 2D transformations on a 2D object (use homogenous coordinates).

Examination Scheme

Credits	Lab periods per Week	Marks		Full Marks
		MSE	ESE	
2	4	0	25	25

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E-Mail:dept_computersc@sxcran.org
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Computer Application (DSE-III (A)): E-Commerce and PHP Programming

Teaching Scheme

Credits	Paper Type	Lectures/Semester	Lectures/Week	Assignment	Tutorial
4	Theory	45	4	1	0

Unit	Contents	Lectures
I.	**Introduction to Electronic commerce** What is E-Commerce (Introduction And Definition), Main activities E-Commerce, Goals of E-Commerce, Technical Components of E-Commerce, Functions of E-Commerce, Advantages and disadvantages of E-Commerce, Scope of E-Commerce, Electronic Commerce Applications, Different types of business models ie. B2B, B2C, C2C, C2B and B2G.	8
II.	**Internet Security: 7 lectures** Secure Transaction, Privacy on Internet, Corporate Email privacy, Threats, Attack on Computer System, Hacking, Computer Virus(How it spreads, Virus problem, virus protection, Authorisation and Authentication, Firewall, Digital Signature.	7
III.	**Electronic Data Exchange** Introduction, Concepts of EDI , Applications of EDI, Disadvantages of EDI, EDI model, Electronic Payment System: Introduction, Types of Electronic Payment System(Electronic Tokens, E-Cash, E-Cheque, Smart Card, Credit Card, Debit Card, Proximity, Biometric), Electronic Fund Transfer, Electronic Cash	10
IV.	**Online business Transaction** Meaning, Purposes, Advantages and disadvantages of transacting online, E-commerce applications in various industries like {banking, insurance, payment of utility bills, online marketing, e-tailing(popularity, benefits, problems and features)}, online shopping(amazon, snapdeal, alibaba, flipkart etc.).	7
V.	**PHP Programming** Introduction to PHP, Uses of PHP, Characteristics of PHP, Environment Setup, Important tools and software requirements, Syntax Overview, Features of PHP, Variable Types, Variable scope, Constant types, Operators(Arithmetic, Comparison, Logical, Assignment, Conditional), Precedence of PHP Operators, Decision making(if..else, elseif, switch), loop types(for, while, do-while, for each), break and continue, Arrays(Numeric, Associative and Multidimensional Arrays), Strings(String concatenation, strlen(), strpos()), rand() function, Forms(Capturing Form Data, GET and POST methods, Dealing with multivalue fields0, File inclusion(include() function, require() function), Functions(Creating a Function, Default Arguments in function, Functions with parameters, Passing Arguments by reference, Functions returning value, Using PHP to send email.	18

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Website: www.sxcran.org

Examination Scheme

Credits	Lecture Hours per Week	Marks		Full Marks	Number of Questions to be Offered/Answered
		CIA	ESE		
4	4	25	50	75	8 / 5

Question Pattern

1. **Total 8(eight) questions are to be asked out of which candidates will have to answer any five questions (all questions will have equal marks but marks is sub sections may vary).**
2. **A general pattern of the questions may be**
    a. **Objective type or very short answer type or fill in the blanks type or true-false type.**
    b. **Short answer and Long answer type question.**
   A question setter/examiner may select both (a.) and (b.) or only (b.).

Recommended Books:

SL. No.	Book Name
1.	E-Commerce Concepts, Models, Strategies- :- G.S.V.Murthy Himalaya Publishing House
2.	E- Commerce :- Kamlesh K Bajaj and Debjani Nag
3.	Electronic commerce :- Gray P. Schneider
4.	E-Commerce, Fundamentals & Applications : Chand (Wiley)
5.	Bharat Bhaskar, Electronic Commerce—Framework Technologies and Applications, Tata McGraw Hill.
6.	Ravi Kalakota & A.B. Winston, Frontiers of Electronic Commerce, Pearson Education.
7.	Ravi kalakota & A.B. Winston, Electronic Commerce- A Manager's Guide, Pearson Education.
8.	Agarwala Kamlesh, N and Agarwala Deeksha, Business on the Net Introduction to the E-Com, Macmillan India.
9.	P.T. Joseph, E-Commerce: A Managerial Perspective, PHI, 2002.

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Computer Application (DSE-III (B)): E-Commerce and PHP Programming Lab

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab periods/Week
2	Practical	30	4

SL. No.	Problems
1.	Write a PHP script to print "Hello World".
2.	Write a PHP script to swap two variables with and without using a third variable.
3.	Write a PHP script to find the factorial of a given number.
4.	Write a PHP script to generate the Fibonacci series.
5.	Write a PHP script to check whether the given number is prime or not.
6.	Write a PHP script to print first n even numbers.
7.	Write a PHP script that finds out the sum of first n odd numbers.
8.	Write a PHP script using switch to print "Distinction" if marks > 75, "First Division" if marks >60, "Second Division" if marks>45, "Third Division" if marks>33 and "Fail" if marks<33.
9.	Write a PHP script using switch to fetch the system today's day(ie. Mon, Tue, Wed etc) and print accordingly. For example, if its "Monday", print "Today is Monday" and so on.
10.	Write a PHP script using while loop to reverse the number.
11.	Write a PHP script using foreach to display the values of an array.
12.	Write a PHP script to sort an array.
13.	Write a PHP script to demonstrate break and continue.
14.	Write a PHP script to demonstrate different methods to create an array.
15.	Write a PHP script to demonstrate Associative arrays.
16.	Write a PHP script to concatenate two strings.
17.	Write a PHP script to search for a string or character within a string.
18.	Write a PHP script that checks if a string is all lower case.
19.	Write a PHP script that checks whether a passed string is palindrome or not.
20.	Write a PHP script using switch to generate random number between 1 and 5 and for each value display a different image file.
21.	Write a PHP script to create a form that takes Name as text, Age as text and has a Submit button.
22.	Write a PHP script to create a form demonstrating the usage of Select tag.
23.	Write a PHP script to demonstrate the use of include() function of file inclusion.
24.	Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.
25.	Write a PHP script using function to take two numbers as parameters and display the sum.
26.	Write a PHP script using function to demonstrate passing arguments by reference.
27.	Write a PHP script using function to demonstrate functions returning a value.
28.	Create a PHP page using functions for comparing three integers and print the largest number.
29.	Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.
30.	Write a PHP script that removes the whitespaces from a string. Sample string : 'The quick " " brown fox' Expected Output : Thequick""brownfox

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Examination Scheme

Credits	Lab Periods per Week	Marks		Full Marks
		CIA	ESE	
2	4	00	25	25

DEPARTMENT OF COMPUTER SCIENCE
ST. XAVIER'S COLLEGE
(An Autonomous College of Ranchi University)
RANCHI, JHARKHAND 834 001

NAAC 'A'

Tel: 0651-2214 301, 2214 935
Fax: 0651-2207 672
E-Mail:dept_computersc@sxcran.org
Website: www.sxcran.org

Computer Application (DSE-IV (A)): Project and Viva Voice

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
4	Practical	00	0

Examination Scheme

Credits	Lab Period per Week	Marks		Full Marks
		CIA	ESE	
4	00	00	75	75

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Computer Application (DSE-IV (B)): Industrial Visit and Reporting

Teaching Scheme

Credits	Paper Type	Lab Periods/Semester	Lab Periods/Week
2	Practical	00	0

Examination Scheme

Credits	Lab Period per Week	Marks		Full Marks
		CIA	ESE	
2	00	00	25	25