

# **Curriculum and Syllabi**

**B.E. CSE with Specialization in Cloud Computing**



**Year 2020**

**Version 1.0**

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**Computer Science and Engineering**

# **University Institute of Engineering**



# **CHANDIGARH UNIVERSITY**

Discover. Learn. Empower.

**NH-95, Chandigarh-Ludhiana Highway, Gharuan, Mohali, Punjab  
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## SECTION 1

# Programme Educational Objectives, Programme Specific Outcomes and Programme Outcomes

The Computer Science and Engineering faculty members have formulated the **Programme Educational Objectives** (PEOs). The PEOs are broad statements that describe the career and professional accomplishments that the program is preparing its graduates to achieve in few years (for example three years) subsequent to receiving the degree. The PEOs of the B.E. program in Computer Science and Engineering are as follows:

**PEO 1** CU Computer Science and Engineering graduates will have a bright career as Cloud Developer, Cloud Architect, Cloud Analyst, Researcher, or Entrepreneur and be able to adapt to the evolving technical challenges and the changing career opportunities. Also will be learn to effectively communicate ideas in oral written or graphical form and to promote collaboration with other members of engineering teams.

**PEO 2** CU Computer Science and Engineering graduates will analyze a problem, identify and define the computing requirements appropriate to its solution in addition to the ability to design, implement and evaluate a computer based system, process, component, or programs to meet desired needs. They will be able to continue to demonstrate the professional skills and communicative abilities necessary to be competent employees, assume leadership roles and have career success and satisfaction.

**PEO 3** CU Computer Science and Engineering graduates will function effectively as a member or a leader of a diverse team under different environments and multidisciplinary work can be carried by the team.

**PEO 4** CU Computer Science and Engineering graduates will have the ability to readily adapt to changing environments by continuously learning new state of the art technologies.

**PEO 5** CU Computer Science and Engineering graduates will inculcate characteristics needed for leadership roles, professional ethics, excellence and active participation in a successful career while working in an interdisciplinary team.

**Programme Specific Objectives** (PSOs) are specific statements that describe the professional career accomplishments that the program is designed. The PSOs of the B.E. program in Computer Science and Engineering are as follows:

The PSOs are statements that describe what graduates are expected to learn and be able to perform in a specialized area of discipline of upon graduation from a program, therefore, frame it in very precise concise

**PSO 1** CU Computer Science and Engineering graduates will be able to develop and deploy cloud application using popular cloud platforms.

**PSO 2** CU CSE graduates will be able to compare, contrast, and evaluate the key trade-offs between multiple approaches to cloud system design, and identify appropriate design choices when solving real-world cloud computing problems.

**PSO 3:** CU CSE graduates will be able to make recommendations on cloud computing solutions for an enterprise.

**Programme Outcomes (POs)** are attributes of the graduates of the programme that are indicative of the graduates' ability and competence to work as an engineering professional upon graduation. Program Outcomes are statements that describe what students are expected to know or be able to do by the time of graduation. They must relate to knowledge and skills that the students acquire from the programme. The achievement of all outcomes indicates that the student is well prepared to achieve the program educational objectives down the road. The following 12 POs have been chosen by the Computer Science and Engineering Department of Chandigarh University. The Computer Science and Engineering curriculum at CU has been designed to fully meet all the 12 Programme Outcomes:

**PO 1** An ability to apply knowledge of science, mathematical foundations, algorithmic principles, and computer science and engineering theorems in the modelling and design of computer-based systems to real-world problems (*Engineering Knowledge*)

**PO 2** Honed skill set comprising of evolutionary tools and techniques applicable in computing & engineering practice (*Problem analysis*)

**PO 3** To recognize, understand the real world problems and to deploy and execute engineering solutions for sustainable eco system (*Design/development of solutions*)

**PO 4** Ability to harness design and development principles in the construction of verifying complex hardware and software systems (*Conduct investigations of complex problems*)

**PO 5** An ability to come forward with lateral & efficient solutions using modern tools for computing & engineering based problems (*Modern tool usage*)

**PO 6** An educational ideology to assess the local & global impact of computing and engineering solutions on individuals, organizations and society (*The engineer and society*)

**PO 7** An ability to develop a computer-based system, process, component, or program to meet the desired needs, within realistic constraints such as economic, environmental, social, political, health and safety, manufacturability, and sustainability (*Environment and sustainability*)

**PO 8** An ability to challenge and solve professional, interpersonal, ethical, security & social issues along with ability to perform responsibilities & duties (*Ethics*)

**PO 9** An ability to participate effectively in multi-disciplinary teams (*Individual and team work*)

**PO 10** The ability to work in Professional environment and to communicate effectively with peers (*Communication*)

**PO 11** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments (*Project management and finance*)

**PO 12** The knowledge by recognizing professional development by pursuing post graduate studies or face competitive examinations that offer challenging and rewarding careers in computing (*Life-long Learning*).

The following sections describe the requirements for earning a B. E. degree in Computer Science and Engineering and its break-down in terms of University Core courses, Program Core courses and electives at both the University and the Program levels.

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**SECTION 2**

# **Curriculum for B. E. in Computer Science and Engineering Programme**

## **UNIVERSITY CORE COURSES**

### **COURSE CATEGORY-WISE CREDIT DISTRIBUTION**

#### **A. Break-Down of Credits**

S.N.	Category	Number of Credits	Percentage Weightage
1	University Core	8	4%
2	University (Open) Elective	6	3%
3	Programme Core	129	70%
4	Programme Elective	41	22%
Total Credits		184	100%

#### **Category-Wise Break-Down of Subjects**

S.N.	Category	Number of Credits	Percentage Weightage
1	Engineering	135	73%
2	Sciences	38	21%
3	Humanities	10	5%
4	Management	1	1%
Total Number of Credits		184	100%

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## UNIVERSITY CORE COURSES

**Credits to be Earned:08**

SN	Code	Title	L	T	P	S	C	CH	Pre-requisite	Co-requisites
1	20UCT141	Communication Skills	0	2	0	0	2	2	-	20UCP142
2	20UCP142	Communication Skills Lab	0	0	2	0	1	2	-	20UCT141
3	20UCY146	Life Skill and Mentoring-1	0	1	0	0	1	1	-	-
4	20UCY186	Life Skills and Mentoring-2	0	1	0	0	1	1	-	-
5	20UCY246	Life Skills and Mentoring-3	0	1	0	0	1	1	-	-
6	20UCY-296	Life Skills and Mentoring-4	0	1	0	0	1	1	-	-
7	20UCX249	Entrepreneurship	0	0	0	1	1	1	-	-
<b>Total</b>			<b>0</b>	<b>6</b>	<b>2</b>	<b>0</b>	<b>8</b>			

## UNIVERSITY (OPEN) ELECTIVE COURSES

**Credits to be Earned: 06**

S N	Code	Title	L	T	P	S	C	C H	Pre-requisite	Co-requisites
1	20CSO411	Open Elective-I	3	0	0	0	3	3	-	-
2	20CSO451	Open Elective II	3	0	0	0	3	3	-	-
<b>Total</b>			<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>6</b>		

  
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## PROGRAMME CORE COURSES

Credits to be Earned: 56

S N	Code	Title	L	T	P	S	C	C H	Pre-requisite	Co-requisite s
1	20CST-231	Data Structures	3	0	0	0	3	3	20CST151	20CSP-236
2	20CST-232	Operating system	3	0	0	0	3	3	20CST151	20CSP-232
3	20CST-233	DBMS	3	0	0	0	3	3	20CST151	20CSP-233
4	20CST-234	Programming in Java	3	0	0	0	3	3	20CST151	-
5	20CST-235	Software Engineering	3	0	0	0	3	3	20CST151	-
6	20CST216	Probability and Statistics	3	0	0	0	3	3	20SMT175	-
7	20CSP-233	DBMS Lab	0	0	2	0	1	2	20CSP152	20CST-233
8	20CSP-236	Data Structures Lab	0	0	2	0	1	2	20CSP152	20CST-231
9	20CSP-232	Operating System lab	0	0	2	0	1	2	20CSP152	20CST-232
10	20CST290	Cloud Fundamental	3	0	0	0	3	3	20CST151	20CST264
11	20CST291	Design Thinking	3	0	0	0	3	3	-	20UCY-293
12	20CS T251	Computer Organization & Architecture	3	0	0	0	3	3	20ECT155	-
13	20CST-282	Design and Analysis of Algorithm	3	0	0	0	3	3	20CST-231	20CSP261
14	20CST-284	Programming in Python	0	2	0	0	2	2	20CST-231	20CSP-286

15	20CSP261	Design and Analysis of Algorithm Lab	0	0	2	0	1	2	20CSP-236	20CST-282
16	20CSP-286	Programming in Python Lab	0	0	4	0	2	4	20CSP-236	20CST-284
17	20CSP-287	Project Based Learning in Java Lab	0	0	6	0	3	6	-	-
18	20CSA-335	Computer Networks	3	0	0	0	3	3	-	-
19	20CSP-342	Computer Networks Lab	0	0	2	0	1	2	-	-
20	20CST351	Theory of Computation	3	0	0	0	3	3	20CST-282	-
21	20CST352	Network Operating System	3	0	0	0	3	3	20CSA-335	20CSP357
22	20CSP357	Network Operating System Lab	0	0	2	0	1	2	20CSP-342	20CST352
23	20CST457	Digital Image Processing	3	0	0	0	3	3	20CSP-286	20CSP458
24	20CSP458	Digital Image Processing Lab	0	0	2	0	1	2	20CSP-286	20CST457
<b>Total</b>			4		2		5			
			2	2	4	0	6			

  
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## PROGRAMME ELECTIVE COURSES

**Credits to be Earned: 41**

S N	Code	Title	L	T	P	S	C	C H	Pre-requisite	Co-requisites
1	20CST264	Introduction to Virtualization and Cloud Computing	3	0	0	0	3	3	20CST151	20CST290
2	20CSA-331	Microservices Architecture And Its Implementation Lab	0	0	2	0	1	2	20CSP265	20CSA-333
3	20CSA-332	Cloud Application Development Lab	0	0	2	0	1	2	20CSP265	20CSA-334
4	20CSA-333	Microservices Architecture And Its Implementation	3	0	0	0	3	3	20CST264	20CSA-331
5	20CSA-334	Cloud Application Development	3	0	0	0	3	3	20CST264	20CSA-332
6	20CSP328	Cloud Computing Architecture Lab	0	0	2	0	1	2	20CSP265	20CSA-332
7	20CST325	Cloud Computing Architecture	3	0	0	0	3	3	20CST264	20CSA-334
8	20CSA-383	Agile Development Methodologies	3	0	0	0	3	3	20CSP328	20CSP365
9	20CST363	Web Services	3	0	0	0	3	3	20CSP328	20CSP366
10	20CSP365	Agile Development Methodologies Lab	0	0	2	0	1	2	20CSP328	20CSA-383
11	20CSP366	Web Services Lab	0	0	2	0	1	2	20CSP328	20CST363
12	20CSP418	Deployment of Private Cloud Lab	0	0	2	0	1	2	20CSP328	20CSA-432
13	20CSP-438	Cloud Design Pattern Lab	0	0	2	0	1	2	20CSP328	20CST-437
14	20CST-437	Cloud Design Pattern	3	0	0	0	3	3	20CST325	20CSP-438
15	20CST-440	Web frame work in Cloud(Angular JS)	3	0	0	0	3	3	20CSP328	20CSP-441

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16	20CSP-441	Web frame work in Cloud(Angular JS) Lab	0	0	2	0	1	2	20CST325	20CST-440
17	20CSA-432	Deployment of Private Cloud	3	0	0	0	3	3	20CST325	20CSP418
18	20CST451	Artificial Intelligence and Natural Language Processing	2	0	0	0	2	2	20CSP-286	20CSP454
19	20CST456	Cloud Security	2	0	0	0	2	3	20CST-437	20CSP457
20	20CSP454	Artificial Intelligence and Natural Language Processing Lab	0	0	2	0	1	2	20CSP-286	20CST451
21	20CSP457	Cloud Security Lab	0	0	2	0	1	2	20CST-437	20CST456
<b>Total</b>			3 1	0	2 0	0	4 1			

  
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## SEMESTER-WISE COURSE-STRUCTURE

### First Semester

SN	Code	Title	L	T	P	S	C	CH	Pre-requisite	Co-requisite
1	20SMT-125	Computational Mathematics	0	4	0	0	4	4	-	-
2	20ELT-111	Basic Electrical and Electronics Engineering	3	0	0	0	3	3	-	20ELP112
3	20CST-111	Problem Solving with Programming	0	2	0	0	2	2	-	20CSP112
4	20UCT-141	Communication Skills	0	2	0	0	2	2	-	20UCP142
5	20MEP-114	Computer Graphics using CAD Lab	0	1	2	0	2	3	-	-
6	20ELP-112	Basic Electrical and Electronics Engineering Lab	0	0	2	0	1	2	-	20ELT111
7	20CSP-112	Problem Solving with Programming Lab	0	0	4	0	2	4	-	20CST111
8	20ECP-118	Foundations of AI Applications Lab	0	0	2	0	1	2	-	-
9	20UCP-142	Communication Skills Lab	0	0	2	0	1	2	-	20UCT141
10	20UCY-146-1	Life Skill and Mentoring-1	0	1	0	0	1	1	-	-
11	20SZT-148	Biology for Engineers	3	0	0	0	3	3		-
<b>Total</b>			6	10	14	0	22			

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**Second Semester**

SN	Code	Title	L	T	P	S	C	CH	Pre-requisite	Co-requisites
1	20SMT-175	Calculus and Vector Spaces	3	2	0	0	5	5	20SMT125	-
2	20ECT-155	Digital Electronics	3	0	0	0	3	3	-	20ECP156
3	20CST-151	OBJECT ORIENTED PROGRAMMING USING C++	0	2	0	0	2	2	20CST111	20CSP152
4	20PCT-154	Professional Communication Skills	0	2	0	0	2	2	20UCT141	20PCP158
5	20ECP-156	Digital Electronics Lab	0	0	2	0	1	2		20SJT188
6	20CSP-152	OBJECT ORIENTED PROGRAMMING USING C++ LAB	0	0	4	0	2	4	20CSP112	20CST151
7	20PCP-158	Professional Communication Skills Lab	0	0	2	0	1	2	20UCP142	20PCT154
8	20CSP-155	Computer Workshop	0	1	2	0	2	3	-	-
9	20ECP-154	Foundation of IOT Lab	0	0	2	0	1	2	-	-
10	20UCY-196	Life Skills and Mentoring-2	0	1	0	0	1	1	-	-
11	20SPP-182	QUANTUM AND SEMICONDUCTOR PHYSICS LAB	0	0	2	0	1	2	-	-
12	20SPT-181	Quantum and Semiconductor Physics	3	0	0	0	3	3	-	-
<b>Total</b>						1	2			
			9	8	2	0	4			

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**Third Semester**

SN	Code	Title	L	T	P	S	C	CH	Pre-requisite	Co-requisite
1	20CST-231	Data Structures	3	0	0	0	3	3	20CST151	20CSP-236
2	20CST-232	Operating system	3	0	0	0	3	3	20CST151	20CSP-232
3	20CST-233	Database Management System	3	0	0	0	3	3	20CST151	20CSP-233
4	20CST-235	Programming in Java	3	0	0	0	3	3	20CST151	-
5	20CST-234	Probability and Statistics	3	0	0	0	3	3	20SMT175	-
6	20CSA-231	Cloud Computing and Virtualization	3	0	0	0	3	3	20CST151	20CST290
7	20UCX-249	Entrepreneurship	0	0	0	1	1	1	-	-
8	20CSP-233	DBMS Lab	0	0	2	0	1	2	20CSP152	20CST-233
9	20CSP-236	Data Structures Lab	0	0	2	0	1	2	20CSP152	20CST-231
10	20CSP-232	Operating System lab	0	0	2	0	1	2	20CSP152	20CST-232
11	20UCY-246	Life Skills and Mentoring-3	0	1	0	0	1	1	-	-
12	20TDP-201	Soft Skills	0	0	2	0	1	2	-	-
13	20CSI-239	Institutional Training	0	0	0	2	2	2	-	-
14	20CSM-238	MOOCs -I	0	0	0	2	2	2	-	-
15	20CSP-235	Programming in Java Lab	0	0	2	0	1	2		
<b>Total</b>			2 1	1	8	5	2 9			

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**Fourth Semester**

SN	Code	Title	L	T	P	S	C	CH	Pre-requisite	Co-requisite
1	20CST-281	Computer Organization & Architecture	3	0	0	0	3	3	20ECT155	-
2	20CST-282	Design and Analysis of Algorithm	3	0	0	0	3	3	20CST-231	20CSP261
3	20CST-284	Programming in Python	0	2	0	0	2	2	20CST-231	20CSP-286
4	20CSP-285	Design and Analysis of Algorithm Lab	0	0	2	0	1	2	20CSP-236	20CST-282
5	20CSP-286	Programming in Python Lab	0	0	4	0	2	4	20CSP-236	20CST-284
6	20CSP-287	Project Based Learning in Java Lab	0	0	6	0	3	6	-	-
7	20CSR-289	Minor Project -I	0	0	2	1	2	2	-	-
8	20UCY-293	Creativity and Critical Thinking	0	2	0	0	2	2	-	-
9	20TDT-252	Aptitude	0	2	0	0	2	2	-	-
10	20UCY-296	Life Skills and Mentoring-4	0	1	0	0	1	1	-	-
11	20CSM-292	MOOCs-II	0	0	0	4	4	4	-	-
12	20CSA-288	Managing Virtual Environment	3	0	0	0	3	3	-	-
13	20CSA-291	Managing Virtual Environment Lab	0	0	2	0	1	2	-	-
14	20CST-283	Advanced Probability and Statistics	3	0	0	0	3	3	-	-
<b>Total</b>			12	7	14	5	31			

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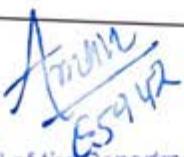
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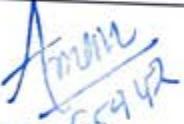
**Fifth Semester**

SN	Code	Title	L	T	P	S	C	CH	Pre-requisite	Co-requisites
1	20CSA-331	Microservices Architecture And Its Implementation Lab	0	0	2	0	1	2	20CSP26-5	20CSA-333
2	20CSA-332	Cloud Application Development Lab	0	0	2	0	1	2	20CSP26-5	20CSA-334
3	20CSA-333	Microservices Architecture And Its Implementation	3	0	0	0	3	3	20CST26-4	20CSA-331
4	20CSA-334	Cloud Application Development	3	0	0	0	3	3	20CST26-4	20CSA-332
5	20CST-335	Computer Networks	3	0	0	0	3	3	-	-
6	20CSP-342	Computer Networks Lab	0	0	2	0	1	2	-	-
7	20CSR-339	Minor Project-II	0	0	2	1	2	2	-	-
8	20CSI-338	Industrial Training	0	0	0	0	2		-	-
9	20CSM-340	MOOCs-IV	0	0	0	4	4	4	-	-
10	20CSP-334	Advanced Programming Lab	0	0	2	0	1	2	-	-
11	20CST-337	ADVANCED PROGRAMMING	3	0	0	0	3	3	-	-
12	20TDY-301	Soft Skills	0	0	2	0	1	2	-	-
13	20TDY-302	Aptitude	0	0	2	0	1	2	-	-
<b>Total</b>			<b>12</b>	<b>0</b>	<b>10</b>	<b>5</b>	<b>26</b>			

  
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**Sixth Semester**

SN	Code	Title	L	T	P	S	C	CH	Pre-requisite	Co-requisites
1	20CSA-383	Agile Development Methodologies	3	0	0	0	3	3	20CSP328	20CSP365
2	20CST-390	Theory of Computation	3	0	0	0	3	3	20CST-282	-
3	20CST-397	Network Operating System	3	0	0	0	3	3	20CSA-335	20CSP357
4	20CSA-392	Web Services	3	0	0	0	3	3	20CSP328	20CSP366
5	20CSA-384	Agile Development Methodologies Lab	0	0	2	0	1	2	20CSP328	20CSA-383
6	20CSA-387	Web Services Lab	0	0	2	0	1	2	20CSP328	20CST363
7	20CSR-389	Minor Project III	0	0	2	3	4	2	-	-
8	20CSP-396	Network Operating System Lab	0	0	2	0	1	2	20CSP-342	20CST352
9	20TDY-351	Soft Skills	0	0	4	0	2	4	-	-
10	20TDY-352	Aptitude	0	2	0	0	1	2	-	-
11	20CSP-382	Technical Training	0	1	0	1	1	1	-	-
12	20CSM-381	MOOCs-V	0	0	0	3	3	3	-	-
<b>Total</b>			15	3	12	7	26			

  
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**Seventh Semester**

SN	Code	Title	L	T	P	S	C	CH	Pre-requisite	Co-requisites
1	20CSO411	Open Elective-I	3	0	0	0	3	3	-	-
2	20CSA-431	Deployment of Private Cloud Lab	0	0	2	0	1	2	20CSP32 8	20CSA-432
3	20CSP-438	Cloud Design Pattern Lab	0	0	2	0	1	2	20CSP32 8	20CST-437
4	20CST-437	Cloud Design Pattern	3	0	0	0	3	3	20CST32 5	20CSP-438
5	20CST-440	Web frame work in Cloud(Angular JS)	3	0	0	0	3	3	20CSP32 8	20CSP-441
6	20CSP-441	Web frame work in Cloud(Angular JS) Lab	0	0	2	0	1	2	20CST32 5	20CST-440
7	20CSA-432	Deployment of Private Cloud	3	0	0	0	3	3	20CST32 5	20CSP41 8
8	20CSR-435	Major Project-I	0	0	2	2	3	2	-	-
9	20CSM-444	MOOCS-VI								
<b>Total</b>			1 2	2	8	2	1 8			

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**Eighth Semester**

SN	Code	Title	L	T	P	S	C	CH	Pre-requisite	Co-requisite
1	20CSO451	Open Elective II	3	0	0	0	3	3	-	-
2	20CST488	Artificial Intelligence and Natural Language Processing	2	0	0	0	2	2	20CSP-286	20CSP454
3	20CST486	Cloud Security	2	0	0	0	3	2	20CST-437	20CSP457
4	20CSP491	Artificial Intelligence and Natural Language Processing Lab	0	0	2	0	1	2	20CSP-286	20CST451
5	20CSP487	Cloud Security Lab	0	0	2	0	1	2	20CST-437	20CST456
6	20CSR489	Capstone Project	0	0	2	3	4	-	-	-
7	20CST481	Digital Image Processing	3	0	0	0	3	3	20CSP-286	20CSP458
8	20CSP483	Digital Image Processing Lab	0	0	2	0	1	2	20CSP-286	20CST457
9		Internship	-	-	-	-	-	-		
<b>Total</b>			<b>10</b>	<b>0</b>	<b>8</b>	<b>3</b>	<b>18</b>			

  
Head of the Department (CSE)

Apex Institute of Technology

Chandigarh University,

Gharuan, Mohali, Punjab

# **Semester-1**

208MT125		COMPUTATIONAL MATHEMATICS	L	T	P	S	C	C
Version 1.00			0	4	0	0	4	4
Pre-requisites/ Exposure	Knowledge of mathematics up to senior secondary level							
Co-requisites	-							

### COURSE OBJECTIVES

The Course aims to:

Impart analytical ability in solving mathematical problems as applied to the respective branch of Engineering.

### COURSE OUTCOMES

On completion of this course, the students are expected to

1. (i) Apply the fundamental mathematical concepts and terminology related to various types of sets, relations and functions.  
 (ii) Evaluate the rank of matrix and apply this concept in real life problems. Write original short compositions, in the form of paragraph writing, business correspondence, blogs etc. through logical support and argument.
2. (i) Apply and analyze recursive relations and generating functions.  
 (ii) Evaluate the problems relating permutation and combination.
3. (i) Analyze the different types of graphs as well as the tree & paths and difference between them such as binary/spanning/minimal spanning/traversal trees.  
 (ii) Apply the strategies of optimization in game theory.

### COURSE DESCRIPTION

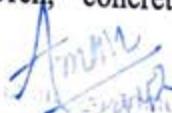
The course begins with the introduction of set theory which is widely utilized in all engineering applications. The students are then introduced to Matrix algebra and its applications in real life. The course further emphasizes on the concept of basic counting principle, graph theory and trees. Then the students are introduced optimization technique with the help of game theory.

### TEXT BOOKS

- T1 C.L. Liu "Elements of Discrete Mathematics". McGraw Hill, 3rd Edition.
- T2 Santha, "Discrete Mathematics with Graph Theory, Cengage Learning, 1st Edition.
- T3 G. Ronald, Knuth, Donald and Patashik, Oren, " concrete Mathematics: A Foundation for Computer Science ", Addison-Wesley.

### REFERENCE BOOKS

- R1 B. Kolaman, and R.C. Busby, "Discrete Mathematical Structures", PHI, 1st Edition.

  
 HANDBOOK OF COMPUTATIONAL MATHEMATICS  
 Apex Institute of Technology  
 Chandigarh University  
 Mohali, Punjab

- R2 Gersting, L.Judith, "Mathematical Structures for computer Science", Computer Science Press.
- R3 Docrand Levasseur, "Applied Discrete Structure for Computer Science".
- R4 Tembley & Manohar, "Discrete Mathematical Structures with Applications to Computers", McGrawHill.
- R5 K.H. Rosen, "Discrete Mathematics and its applications", Mc-Graw hill.
- R6 N Ch SN Lyengar. V.M.Chandrasekaran, "Discrete Mathematics".

### COURSE CONTENT

#### Unit I: Basic Structure

Introduction to set theory, Set operations, Algebra of sets, Combination of sets, Duality, Finite and Infinite sets, Cardinality of sets Classes of sets, Power sets, Min sets & Max sets, Cartesian product, Principles of inclusion & exclusion. 16 Contact Hours

**Relations and functions:** Binary relations, types of relations, equivalence relations and partitions, partial order relations, functions and its types, composition of function and relations, inverse of relations and functions.

**Matrix Algebra:** Introduction, Types of Matrices, Rank of matrix, Solution of linear equations-Gauss elimination, Jacobi and Gauss Seidal, Eigen values and Eigen vectors

#### Unit II: Basics of Computing

16 Contact Hours

**The Foundations: Logic and Proofs:** Basic operations: AND ( $\wedge$ )OR ( $\vee$ ), NOT( $\neg$ ) Truth value of a compound statements, propositions, tautologies, contradictions, Applications of Propositional, Propositional equivalences, Predicates and quantifiers, Rules of Inference.

**Counting Techniques:** Recursive definitions, Recurrence relations with constant coefficients, homogeneous and particular solutions, solutions of recurrence relation using generating functions, Fibonacci Series, Divide-and-Conquer Algorithms.

**Permutations and combinations:** Linear permutation and circular permutation, Combination, Pigeon hole principle.

#### Unit III: Advanced Theories

16 Contact Hours

**Lattices:** Introduction, Properties of Lattices, Sub-Lattices, Homomorphism and isomorphism, Hasse diagram.

**Graph Theory:** Introduction to graphs, directed and undirected graphs, homomorphic and isomorphic graphs, sub graphs multi graphs and weighted graphs, paths and circuits, shortest path in weighted graphs, Eulerian paths and circuits, Hamiltonian paths and circuits, planer graphs Euler's formula.

**Trees:** Introduction to trees, difference between graphs and a tree rooted trees, path length in trees, spanning trees & cut-sets, minimum spanning trees, binary trees and its traversal.

**Game Theory:** Pay of Matrix, Mini-Max criteria, Saddle points, Optimal Strategy, Mixed Strategy, Value of game.

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Aviation Engineering Technology

Chandigarh University

Gharuan, Mohali, Punjab

*Anup Singh ES 912*

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

<b>Theory</b>		
<b>Components</b>	<b>Continuous Internal Assessment (CAE)</b>	<b>Semester End Examination (SEE)</b>
<b>Marks</b>	40	60
<b>Total Marks</b>	100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

<b>Mapping Between COs and Pos</b>		
<b>SN</b>	<b>Course Outcome (CO)</b>	<b>Mapped Programme Outcome (PO)</b>
1	(i) Apply the fundamental mathematical concepts and terminology related to various types of sets, relations and functions. (ii) Evaluate the rank of matrix and apply this concept in real life problems.	1 to 5, 12
2	(i) Apply and analyze recursive relations and generating functions. (ii) Evaluate the problems relating permutation and combination.	1 to 5, 12
3	(i) Analyze the different types of graphs as well as the tree& paths and difference between them such as binary/spanning/minimal spanning/ traversal trees. (ii) Apply the strategies of optimization in game theory.	1 to 5, 12

		Conduction	Design / development	Innovation	Environment	Individual	Project management	Lifelong Learning					
20SMT12 5	Computational Mathematics	1	2	3	4	5	6	7	8	9	10	11	12

1=addressed to small extent

2= addressed significantly

3=major part of course

Head of the Department (CSE)

Akex Institute of Technology

Chandigarh University

Gharuan, Mohali, Punjab

<b>20ELT111</b>	<b>BASIC ELECTRICAL AND ELECTRONICS ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>CH</b>
Version 1.00		3	0	0	0	3	36
Pre-requisites/ Exposure	Basic concepts of electrical circuits						
Co-requisites	Physics						

### COURSE OBJECTIVE

To create, design, identify & analyse analog electrical circuits & systems for constrained & open environments.

### COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Design and analyse basic resistive, reactive & magnetic circuits.
2. Appraise power consumption of single phase AC circuits
3. Critique/Outline safety & wiring methods in electrical systems.
4. Evaluate characteristics of rotating electrical machines & transducers.
5. Select battery for any product.
6. Evaluate characteristics of op-amps
7. Design and analyse basic op-amp circuits

### COURSE DESCRIPTION

The course starts with an insight to DC & AC circuits, from understanding basic laws to design and analysis of electrical circuits (including magnetic circuits like transformers). Students are then introduced to transducers & DC motors from the perspective of use in real world. The course further emphasizes upon the design and analysis of op-amp based circuits.

### TEXT BOOKS

**T1 Basic Electrical Engineering**, Nagrath, 2001, McGraw-Hill Education (India) Pvt Limited

**T2 Basic Electrical and Electronics Engineering**, Bhattacharya, S.K., 2011, Pearson

**T3 Electronic Devices and Circuit Theory**, Boylestead, 2009, Pearson

**T4 Op-Amps and Linear Integrated Circuits**, Ramakant A. Gayakwad ,2000, PHI, 4<sup>th</sup> Ed

**T5 A course in Electrical & Electronics Measurement and Instrumentation**, A K Sawhney, 2014, DhanpatRai

**T6 Battery**, Thomas Crompton, Newnes, 3rd edition, 2000.

### REFERENCE BOOKS

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Chandigarh University

Gharuan, Mohali, Punjab

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**R1 Electric Circuits**, Charles K. Alexander & Matthew N. O. Sadiku, 4th edition, McGrawHill, Publication 2012

**R2 Electrical Engineering Fundamentals**, Vincent Del Toro, 2nd edition, Prentice Hall of India

**R3 Electronic Principles**, Albert Paul Malvino , (6th edition),T.M.H., 1993

**R4 Digital Design**, M. M. Mano, Pearson Publications, 2007

**R5 Electric Machines**, AshfaqHussain, 3rd Edition, DhanpatRai

## COURSE CONTENT

### Electrical Circuits and Safety

Unit I:

12 Contact Hours

**DC & AC Circuits:** Introduction to DC and AC circuits, Active and passive two terminal elements, Ohms law, Voltage-Current relations for resistor, inductor, capacitor, Kirchhoff's laws, Ideal sources -equivalent resistor, current division, voltage division, Sinusoids, Generation of AC, Average and RMS values, Form and peak factors, Analysis of R-L, R-C circuits

**Magnetic Circuits and Transformers:** Magnetic effects of electric current, Law of Electromagnetic Induction, Self-Inductance, Mutual Inductance, Single Phase Transformer: Construction, Working principle

**Electrical safety and wiring:** Safety measures in electrical system, types of wiring, Difference between grounding and earthing, Basic principles of earthing, components of earthing system

### II: Motors, transducers & batteries

Unit

12 Contact Hours

**Rotating Electrical Machines:** Operating characteristics of DC motor, working principle, construction and applications of Induction motor, Brushed DC motor, Geared DC motor, Brushless DC motors, Servo Motors, Stepper motors, Linear DC motor

**Transducers:** Principle of sensing, Basic requirements of transducers, classification of transducers, passive transducers: capacitive, inductive, LVDT, potentiometric, strain gauge, thermistor, Hall-Effect, Active transducers: piezoelectric, photoelectric and thermocouple

**Batteries:** Selecting Battery: Basic Battery Specifications, common parameters of battery/applications, Different types of Batteries used in different applications, Power Supplies: Linear and SMPS

### III: Operational Amplifiers

Unit

12 Contact Hours

**Operational amplifier and Applications:** Op-amp and its characteristics: Input Impedance, Output Impedance, Gain, Bandwidth, Open loop & closed loop configurations. Basic op-amp circuits: Inverting & Non-inverting voltage amplifiers, Comparator, adder, subtractor, integrator, differentiator

**Mode of Evaluation:** The performance of students is evaluated as follows:

Theory	Practical	Head of the Department (CSE)
		Ajay Apex Institute of Technology Chandigarh University Gurjran, Mohali, Punjab

Components	Continuous Internal Assessment (CIA)	Semester End Examination (SEE)
Marks	40	60
Total Marks		100

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Design and analyse basic resistive, reactive & magnetic circuits.	1,2,3
2	Appraise power consumption of single phase AC circuits	1,2,3
3	Critique/Outline safety & wiring methods in electrical systems.	1,6,7
4	Evaluate characteristics of rotating electrical machines & transducers.	1,2,3,4
5	Select battery for any product.	1,6,7
6	Evaluate characteristics of op-amps	1,2,3,4
7	Design and analyse basic op-amp circuits	1,2,3,4

1=addressed to small extent

2= addressed significantly

3=major part of course

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ES142*  
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Apeejay Institute of Technology  
Chandigarh University  
Gharuan, Mohali, Punjab

<b>20CST111</b>	<b>Problem Solving with Programming</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		0	2	0	0	2	24
Pre-requisites/ Exposure	Basic mathematics and computation						

## COURSE OBJECTIVES

1. The course aims to provide exposure to problem-solving through programming.
2. The course aims to raise the programming skills of students via logic building capability.
3. With knowledge of C programming language, students would be able to model real world problems.

## COURSE OUTCOMES

On completion of this course, the students are expected to

1. Identify situations where computational methods would be useful.
2. Approach the programming tasks using techniques learnt and write pseudo-code
3. Choose the right data representation formats based on the requirements of the problem.
4. Use the comparisons and limitations of the various programming constructs and choose the right one for the task.

## COURSE DESCRIPTION

The course begins with the introduction to Basic concepts of programming and its applications in numerous fields. After covering fundamentals, students will learn how to apply the more complex concepts including loops and arrays in order to solve the complex real world problems.

## TEXT BOOKS

**T1** Programming in ANSI C by E. Balaguruswamy, Tata McGraw Hill.

**T2** Programming in C Ansi standard, by YashwantKanetkar, BPB Publications.

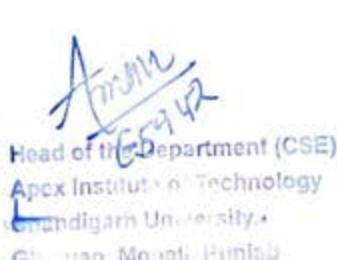
## REFERENCE BOOKS

**R1** Programming with C (Schaum's Outline Series) by Byron Gottfried JitenderChhabra, Tata McGraw Hill.

**R2** C Programming Language by Brian W. Kernighan, Dennis Ritchie, Pearson education.

**R3** C How to program by Harvey Deital, 8<sup>th</sup> edition

## COURSE CONTENT



<b>Unit I: Introduction to basic building blocks to programming</b>	<b>8 Contact Hours</b>
Introduction: Flow charts and Algorithms, Memory layout of a C program.	
Fundamentals of C: Features & Applications of C language, structure of writing a C Program, I/O functions in C, Indentation, Comments, Header Files, Data Types, Constants and Variables, Operators, Expressions, Evaluation of expressions, Type Conversion, Precedence and Associativity.	
Decision Control structure in C: Decision making statements (if, if-else, if-else-if, switch), nesting of decision control structures.	

<b>Unit II: Dealing with real-world problems</b>	<b>8 Contact Hours</b>
Loop Control structure in C: Looping statements (for, while, do-while), nested loop, use of jumping statements (goto, break, continue).	
Array & String: Concepts of array, one and two dimensional arrays, declaration and initialization of arrays, searching and sorting, string handling, string storage.	
Functions: Concepts of library functions, Built-in-string functions, user defined functions, prototypes, definition of function, parameters types, parameter passing, calling a function, recursive function, Macros.	
<b>Unit III: Handling heterogeneous data and memory management</b>	<b>8 Contact Hours</b>
Pointers: Basics of pointers, double pointer, smart pointers, pointer and array, pointer to array, array of pointers, functions returning a pointer, storage classes.	
Structure: Basics of structure, structure members, structure vs. union, accessing structure members, nested structures, array of structures, structure and functions, structures and pointers	
Dynamic memory allocation: Introduction to Dynamic memory allocation, malloc, calloc, realloc.	
Mode of Evaluation: The performance of students is evaluated as follows:	

<b>Theory</b>		
<b>Components</b>	<b>Continuous Internal Assessment (CAE)</b>	<b>Semester End Examination (SEE)</b>
Marks	40	60
Total Marks		100

#### **Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

<b>Mapping Between COs and POs</b>		
<b>SN</b>	<b>Course Outcome (CO)</b>	<b>Mapped Programme Outcome (PO)</b>
1	Identify situations where computational methods would be useful.	1,2,3,4,5,6,8,9,12
2	Approach the programming tasks using techniques learnt and write pseudo-code	1-12

3	Choose the right data representation formats based on the requirements of the problem.	1-6, 8-12
4	Use the comparisons and limitations of the various programming constructs and choose the right one for the task.	1-6, 8-12

	E n g i n e e r i n g K n o w l e d g e	P r o b e m / a n a v l e y s o i s m e n t o f s o l u t o n s	D e s i n c t t o n v e c t i n e v e s o l e s s a g a g e a t i f f o c o m p l e	C o n d u c t t o n g e e r e s s a n d s o c i t y a b il it y	M o d e r n t o n g e e r e s s a n d s o c i t y a b il it y	T h e e n g i n e r e n t r a n e r e s s a n d s o c i t y a b il it y	E n t h i c s i n e r e n t r a n e r e s s a n d s o c i t y a b il it y	E t h i c s i n e r e n t r a n e r e s s a n d s o c i t y a b il it y	I n d i v i d u a l o r t e a m w o r k	C o m m u n i c t i n a t i o n g e m e n t a n d f i n a n c e	P r o j e c t m a n a n a g e m e n t a n d f i n a n c e	Li fe - lo n g L ea rn in g
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1	2	3	4	5	6	7	8	9	1	1	1
									0	1	2

20CST11 1	Problem Solving with Programming	.	.	.	.	.	.	.	.	.	.	.
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1=addressed to small extent

2= addressed significantly

3=major part of course

Head of the Department (CSE)

Apex Institute of Technology

Gandigarh University,

Chandigarh, India, Punjab

<b>20UCT141</b>	<b>Communication Skills</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		2	0	0	0	2	24
Pre-requisites/ Exposure	Studied English Language upto senior secondary						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. Augment students overall communication and interpersonal skills by making them realize the importance of good oral and written English Language in professional life.
2. Enrich their reading capability with special emphasis on expanding vocabulary and grammatical formations.
3. Build exceptional reading and writing skills by correcting grammatical errors and pronunciation through practice.

## COURSE OUTCOMES

On completion of this course, the students are expected to

1. Produce correct contextual written text and speech in a wide range of communication situations.
2. Write original short compositions, in the form of paragraph writing, business correspondence, blogs etc. through logical support and argument.
3. Demonstrate linguistic competence through accuracy in grammar, pronunciation and vocabulary.

## COURSE DESCRIPTION

The course provides a strong foundation in English grammar and equips the students with the fundamentals of the language in LSRW skills. English proficiency is achieved by focusing on socio-linguistic usage. The course introduces basic business communication with special emphasis on effective business correspondence and digital content writing.

## TEXT BOOKS

- T1** Raman, M. and Sharma, S; Technical Communication-Principles and Practice, Oxford University Press (2018), New Delhi

## REFERENCE BOOKS

- R1** Lesikar R.V., Petit J.D., Business Communication, Tata McGraw (2016), New Delhi. *Amrit ES142*
- R2** Chaturvedi, P.D. and Chaturvedi, Business Communication, Pearson Education (2017), New Delhi
- R3** Murphy, R., Elementary Grammar, Cambridge University Press (2017), UK
- R4** Murphy, R., Essential Grammar in Use, 5th Edition Cambridge University Press, Chandigarh University, Mohali, Punjab (2018), UK
- R5** Hewing, Martin, English Grammar (Intermediate Level), Cambridge University Press (2017), UK

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Chandigarh University,

Mohali, Punjab

**Unit I: Business Communication**

8 Contact Hours

**Business Communication:** Meaning, importance, process, models and types, barriers to effective communication, verbal and non-verbal communication, Techniques for building LSRW Skills and Case Study

**Reading Skills:** Reading Comprehension

**Writing:** Paragraph writing, note making and note taking

**Grammar:** Parts of Speech, articles, modal verbs

**Vocabulary:** Word formation - Prefixes, suffixes and compounds, homonyms, homophones, homographs

**Unit II: Business Correspondence**

8 Contact Hours

**Ethics in Communication:** Significance, Factors, Dilemmas in Ethical Communication, Case Study

**Writing:** Précis writing, leave application, permission letter, business letters - sales, request, order, inquiry, acknowledgement, complaint and collection letters, memorandum writing, office order, circular, various types of notice writing.

**Grammar:** Tenses, concord (subject-verb agreement), punctuation

**Vocabulary:** One-word substitutes, synonyms, antonyms – contextual usage.

**Unit III: Digital Content Writing**

8 Contact Hours

**Cross-Cultural Communication:** Significance, elements, cultural context and barriers to Cross Cultural Communication, Case Study

**Writing:** Summarizing, creative writing, email writing, digital content writing (blogs and websites), proofreading

**Grammar:** Narration, voice, transformation and correction of sentences

**Vocabulary:** Collocations, idioms

**Mode of Evaluation:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

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**Mapping Between COs and POs**

SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Produce correct contextual written text and speech in a wide range of communication situations.	10

2	Write original short compositions, in the form of paragraph writing, business correspondence, blogs etc through logical support and argument.	10
3	Demonstrate linguistic competence- through accuracy in grammar, pronunciation and vocabulary.	10

		Project management Life-long Learning											
		1	2	3	4	5	6	7	8	9	10	11	12
20UCT14 1	Communication Skills	0	0	0	0	0	0	0	0	0	3	0	0
1=addressed to small extent 2= addressed significantly 3=major part of course													

1=addressed to small extent

2= addressed significantly

3=major part of course

<b>20MEP114 (Odd Sem)</b>	<b>COMPUTER GRAPHICS USING CAD LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>CH</b>
<b>20MEP154 (Even Sem)</b>							
<b>Version 1.00</b>		<b>0</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>24</b>
<b>Pre-requisites/ Exposure</b>	<b>None</b>						

## COURSE OBJECTIVE

1. To introduce the students to engineering drawing, the universal language and tools of communication of engineers.

## COURSE OUTCOMES

After completion of the course, the students will be able to

1. Sketch the different conventions and representations of engineering graphics on AutoCAD software. Explain the use of engineering drawing, compare and predict the geometrical details of common engineering objects.
2. Classify, examine and draw the dimensioned figures expressing information about the shape and size of physical objects.
3. Identify and express the geometrical features of a product on AutoCAD software. Draw orthographic views of computer components.

## COURSE DESCRIPTION

This course is based on the subject Engineering Drawing employed for 1<sup>st</sup> year students. In this subject, the students will learn the basics of technical drawing. All the figures are to drawn on AutoCAD software. In this figure, the students will draw the orthographic projections of basic computer components on the software.

## TEXT BOOKS

**T1** Rhodes R.S, Cook L.B; Basic Engineering Drawing, 1st Edition, Pitman Publishers.

**T2** Rana and Shah; Engineering Drawing, 2nd Edition, Pearson Education India Publishers,(2009).

**T3** Jolhe D.A; Engineering Drawing: With an Introduction to AutoCAD, 2nd Edition, Tata McGraw Hill (2007)

## REFERENCE BOOKS

**R1** Ostrowsky.O; Engineering Drawing with CAD application 2nd Edition, Routledge Publishers 2007.

**R2** Aggarwal B; Engineering Drawing, 1st Edition, Tata McGraw Hill Publications,2008.

**R3** Gill P.S; Engineering Drawing ,5th Edition, S.K. Kataria and Sons Publications, 2011.

**R4** Dhawan R. K; Engineering Drawing, 7th Edition ,S. Chand and Sons Publishers.

**R5** Bhatt N.D; Engineering Drawing,50th Edition, Charotar Publication,2011.

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 Amrit Institute of Technology  
 Chandigarh University  
 Gharuan, Mohali, Punjab

## COURSE CONTENT

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Unit I:

8 Contact Hours

### Fundamentals of Engineering Drawing

Scope and Importance of Engineering Drawing, Conventions for lines, Introduction to general principles of dimensioning, Scales, R.F, full size, reduced and enlarged scales, Introduction to basics of CAD software's like AutoCAD and various draw, modify, dimensioning and layer commands; model and layout view; plotting of sheet.

#### Projection of points

Introduction to projection, their principals & various types of projection systems; Orthographic Projection; Introduction to planes of projection (reference planes) and auxiliary planes, Orthographic Projection of point in all the four quadrants 2-D drawing of points in AutoCAD software.

Unit  
II:

8 Contact Hours

#### Projection of lines

Projection of lines in different quadrants according to its orientation/position with horizontal, vertical plane; true and apparent lengths, Projection of lines parallel to both HP and VP, inclined to one plane and parallel to the other. 2-D drawing of lines in AutoCAD software

#### Projection of Planes

Projections of plane surfaces-triangle, square, rectangle, pentagon, hexagon and circular planes in different positions when plane is parallel to one of the reference planes, inclined to one of the reference planes and perpendicular to other only. 2-D drawing of planes in AutoCAD software

Unit  
III:

8 Contact Hours

#### Isometric Projection

Introduction, isometric scale, isometric projection of simple plane figures, isometric projection of cube, square block, pyramid, cylinder & cones

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Chandigarh University,  
Guru Nanak Dev University, Mohali, Punjab

#### Orthographic Projection of Computer Components

Orthographic projections of simple solids from the given 3D/isometric view, orthographic projections of computer components such as USB storage device, 4 port switch hdmi 2.0 splitter, wireless router, single cellular mobile router, etc.

**Mode of Evaluation:** The performance of students is evaluated as follows:

Components	Practical	
	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks	100	

#### Instructions For Practical Examination :

- The final examination will be conducted as an external practical in a computer lab on CAD software.
- The question paper will have 7 questions from which, Section-A will have question 1 and it will be compulsory to be attempted by the students. Students will have to attempt total 3 questions from sections B, C and D.
- Sections B, C and D will consist of 2 questions each, out of which attempting at least 1 question from every section will be compulsory.
- Students have to attempt Section- A on answer sheet/sketch sheet and all the remaining questions will be answered on CAD software.
- The print out of the attempted questions on CAD software on A4 size sheet is to be plotted and attached with the answer sheet for final evaluation.

#### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

SN	Mapping Between COs and POs	
	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Sketch the different conventions and representations of engineering graphics on AutoCAD software. Explain the use of engineering drawing, compare and predict the geometrical details of common engineering objects.	1,2
2	Classify, examine and draw the dimensioned figures expressing information about the shape and size of physical objects.	1,2
3	Identify and express the geometrical features of a product on AutoCAD software. Draw orthographic views of computer components.	1,2,3

	D	n	i		E				P			
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	1	2	3	4	5	6	7	8	9	10	11	12
20MEP114 (Odd Sem)	Computer Graphics	2	2	2		3			1		2	3
20MEP154 (Even Sem)	using CAD											

1=addressed to small extent

2= addressed significantly

3=major part of course

*Arun  
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Head of the Department (CSE)

Asian Institute of Technology

Chandigarh University

Guruman, Mohali, Punjab

<b>20ELPII2</b>	<b>BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB</b>	L	T	P	S	C	CH
Version 1.00		0	0	2	0	1	12
Pre-requisites/ Exposure	Basic concepts of electrical circuits						
Co-requisites							

## COURSE OBJECTIVE

To create, design, identify & analyse analog electrical circuits & systems for constrained & open environments.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Demonstrate Kirchhoff's Law.
2. Appraise LVDT characteristics
3. Design open source embedded system based solutions
4. Design and analyse basic op-amp circuits

## COURSE DESCRIPTION

The course starts with an insight to DC & AC circuits. Students are then introduced to transducers & DC motors from the perspective of use in real world with Open source embedded platforms. The course further emphasizes upon the design and analysis of op-amp based circuits.

## COURSE CONTENT

Note: Along with the prescribed practical syllabus, every student is required to pursue one Project during the semester. The project report will be submitted & final presentation will be made. The evaluation of the Project will be done as one of the experiments.

### Unit I:

4 Contact Hours

1. To verify Kirchhoff's Laws.
  2. To study voltage-current relationship in an R-L series circuit and to determine the power factor of the circuit.
  3. To verify and demonstrate the working of LVDT.
- Project finalization in consultation with the faculty member.

### Unit II:

4 Contact Hours

4. To design a LED flasher.
  5. To design Christmas dual led chaser lights.
  6. To design a door bell using push button.
  7. To design LED Brightness Control System using LDR.
- Completion of experimentation/fabrication of project finalized.

**Unit III:****4 Contact Hours**

8. To design Inverting and Non Inverting amplifier using Op-amp.
  9. To temperature based DC Motor Speed Control system using Op-amp.
  10. To design a Monotone Generator using Op-amp.
- **Final Presentation of viva voce examination of the Project.**

**Mode of Evaluation:** The performance of students is evaluated as follows:

Components	LAB	
	Continuous Internal Assessment (CIA)	Semester End Examination (SEE)
Marks	60	40
Total Marks	100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

SN	Mapping Between COs and POs		Mapped Programme Outcome (PO)
	Course Outcome (CO)	Mapped Programme Outcome (PO)	
1	Demonstrate Kirchhoff's Law.		1,2,4
2	Appraise LVDT characteristics		1,2,4
3	Design open source embedded system based solutions		1,2,3,4
4	Design and analyse basic op-amp circuits		1,2,3,4

 Head of the Department (CSE) Apeejay Institute of Technology, Chandigarh University, Mohali, Punjab India	E	D	C	T	E	I	P	L
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	e	o	d	i	n	d	c	n
	r	b	e	r	e	u	a	o
	i	v	n	t	n	m	m	g
	n	le	t	e	e	a	m	L
	g	el	e	o	e	l	u	e
	m	el	st	r	r	o	u	a
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	le	n	s	a	s	h	o	t
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20ELP11 2	Basic Electrical And Electronics Engineering Lab	1 3	2 2	3 1	4 2	5	6	7	8	9 2	10 2	11 1	12 2

1=addressed to small extent

2= addressed significantly

3=major part of course

Head of the Department (CSE)  
 Apex Institute of Technology  
 Chandigarh University  
 Gharuan, Mohali, Punjab

<b>20CSP112</b>	<b>Problem Solving with Programming Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		0	0	4	0	2	24
Pre-requisites/ Exposure	Basic mathematics and computation						
Co-requisites							

## COURSE OBJECTIVES

1. The course aims to provide exposure to problem-solving through programming.
2. The course aims to raise the programming skills of students via logic building capability.
3. With knowledge of C programming language, students would be able to model real world problems.

## COURSE OUTCOMES

On completion of this course, the students are expected to

1. Identify situations where computational methods would be useful.
2. Approach the programming tasks using techniques learnt and write pseudo-code
3. Choose the right data representation formats based on the requirements of the problem.
4. Use the comparisons and limitations of the various programming constructs and choose the right one for the task.

## COURSE DESCRIPTION

The course begins with the introduction to Basic concepts of programming and its applications in numerous fields. After covering fundamentals, students will learn how to apply the more complex concepts including loops and arrays in order to solve the complex real world problems.

## TEXT BOOKS

- T1** E. Balaguruswamy, "Programming in ANSI C", Tata McGraw Hill.  
**T2** Yashwant Kanetkar , "Programming in C Ansi standard", BPB Publications.

## REFERENCE BOOKS

- R1** Byron Gottfried Jitender Chhabra,"Programming with C (Schaum's Outline Series)", Tata McGraw Hill.  
**R2** Brian W. Kernighan, Dennis Ritchie, "C Programming Language", Pearson education.  
**R3** Harvey Deitel , " C How to program", 8<sup>th</sup> edition.

## COURSE CONTENT

Unit I: Introduction to basic building blocks to programming 8 Contact Hours

Practical 1.1: Write a program to input following details of a under-graduate student  
Name (string)

Contact number (long long integer)

Percentage in metric class (float / double)

Your program should generate output as follows:

\*\*\*\*\*STUDENT DATABASE\*\*\*\*\*

Enter name in capital letters: xyz pqr

Enter age : 18

Enter contact number : 9876543210

Enter percentage in metric : 86.84

Thank you. Your data has been saved in our system

Practical 1.2: A cube having a side of 6 cm is painted red on all the faces and then cut into smaller cubes of 1 cm each. Write a program to find the total number of smaller cubes so obtained.

Practical 1.3: A train can travel 50% faster than a car. Both start from point A at the same time and reach point B 75 kms away from A at the same time. On the way, however, the train lost about 12.5 minutes while stopping at the stations. Write a C program to compute the speed of car.

Practical 1.4: Sonu ranked m<sup>th</sup> from the top and n<sup>th</sup> from the bottom in a class. How many students are there in the class?

Practical 1.5: A can do a piece of work in 8 days. B can do the same work in 14 days. Write a program to calculate and print the number of days to be taken to complete the work if A and B work together.

Practical 2.1: Ram , Mohan and Sohan took loan of Rs. x, y and z on rate of interest r %,p %,q % for time t1,t2 and t3 years respectively . Calculate simple interest they will pay and find who will pay the most using ternary operator ?

Practical 2.2: Inside the CPU, mathematical operations like addition, subtraction, multiplication and division are done in bit-level. To perform bit-level operations in C programming, bitwise operators are used. Apply the knowledge you gained while learning bitwise operators.

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Write a program to input two integers from user by using single scanf. Compute and display the value for  $a/b$ ,  $a/b$ ,  $a \oplus b$ .

Practical 2.3: Write a C program to find out year in which Mr. kavi was born from the following information :

- Kavi is m years younger than his mother.
- Kavi's brother who born in year  $y$  ( $1900 \leq y \leq 2019$ ) is n years younger to his mother
- If kavi's brother is reading in class r then On the basis of your common sense also predict In which class Kavi is reading?

Practical 2.4: If last day of  $m^{\text{th}}$  month of the year is Friday then find out nth day ( $1 \leq n \leq 31$ ) of the same month

Practical 2.5: In a class of N students where girls and boys ratio is p:q Savita ranked rth from the top. If there are m ( $m < r$ ) boys ahead of Savita, how many girls are after her rank? Also find whether she is among top 10 students of the class or not?

Practical 3.1: In a class of n students the boys to girls ratio is p:q. Find no. boys and girls in the class and print :

- If boys are more than or equal to 70% in the class then print gender partiality in education
- If difference of boys are girls is diff and in range  $-5 \leq \text{diff} \leq 5$  then print equal opportunities of education for both
- If girls are more than equal to 70% then print girls dominating in education.
- For all others cases print no conclusion drawn

Practical 3.2: Write a menu driven program that allow the user to perform any one of the following operations based on the input given by user

- Check number is even or odd
- Check number is positive or negative
- Printing square of the number
- Printing square root of the number (use math.h)

Use switch statement for a menu driven program. Also, use validation checks wherever necessary.

Practical 3.3: AmbaAambika and Ambalika have money in the ratio  $x:y:z$ . All go to market and spend money in ratio p:q:r .total money they have initially is Rs. N .After spending money in the market who has maximum amount left with ?

Practical 3.4: While travelling in a train, you observe some college students pulling the alarm chain simply to get down at their desired point. Out of n students m  $\leq n$  times students pull the chain .You have to print according to the following:

- If m is  $\geq 80\%$  of n then print strict action is required to restrict this event
- If m is between 50 to 80 % then print guidelines should be issued
- If between 10 to 50% then print request to restrict the event
- If less than 10% then print No action required

## Unit II: Dealing with real-world problems

8 Contact Hours

**Practical 4.1:** A salesman has  $n$  things to sale .The cost price of all  $n$  things is different out of which  $p$  things he is selling on  $m\%$  profit and  $n-p$  things he is going to sell on  $x\%$  loss . Find his net profit or loss

**Practical 4.2:** Find  $m$  greatest 6-digit and  $n$  smallest 7-digit numbers which are divisible by number  $p$ . Print these numbers on the screen.

**Practical 4.3:** There are  $n$  customer of bank who took loan of different amounts (Entered by User) and for different time periods but same rate of interest. The interest is compounded annually find the total interest earned by bank from all  $n$  customers.

**Practical 4.4:** On reaching the railway station, you find that the train you wanted to catch is just to start and there is hardly any time for purchasing the ticket. The same situation faced by many people in our country. You have to do data analysis task for which you will record responses from  $N$  people and then print your report accordingly. User enter option a for "Rush to train to catch it and inform T.T at next stop, b for" Catch the train and perform journey without ticket", c for "purchase the ticket first otherwise wait for next train", and d for "Miss the train and take ticket for next train ".On the basis of responses print in your report about the habit of our countrymen. If responses of any two options are equal then print it in either or form. If more than two responses are equal or having difference  $<=1$  then print no conclusion drawn.

**Practical 4.5:** You are given task to write numbers from  $m$  to  $n$ , during this task how many times do you write digit  $d$ . e.g. if  $m=10$  and  $n=25$  and  $d=1$  you write from 10 to 20 on screen and count how many times you write 1. In this case count for  $d=1$  is 11 as from 10 to 19 you write 1, 10 times and once in 21 so total count is 11?

**Practical 5.1:** There are  $n$  persons each have 25 paise coins , 50 paise coins and Rs1 coins in the ratio  $p:q:r$  but have different amounts stored in a single list . Find and print no. of 25 paise coins, 50 paise coins and 1 Rs coins each person have.

**Practical 5.2:** Write a program to perform various matrix operations Addition, Subtraction, Multiplication, Transpose using switch-case statement

**Practical 5.3:** In a list there is cost price of  $n$  goods. On the most expensive thing there is a loss of  $x\%$  and on the cheapest thing there is a gain of  $y\%$  and on rest of things there is a gain of  $p\%$ . Find loss or gain on whole transaction in Rupees.

**Practical 5.4:** Suppose you have a device which when fed with the input numbers, rearranges them in a particular order using some rules. The following is a step-by-step process of rearrangement for the given input of numbers.

Input :- 1 2 3 4 9 10 8 6

Step I :- 4 1 2 3 9 10 8 6

Step II :- 9 4 1 2 3 10 8 6

Step III :- 10 9 4 1 2 3 8 6

Step IV :- 8 10 9 4 1 2 3 6

Step V:- 6 8 10 9 4 1 2 3

In first step you select 5<sup>th</sup> last element and places it as first and append rest of the list, in second step you select 4<sup>th</sup> last element and place it as first element and append the remaining list and so on. Take the input and print output as specified by 5<sup>th</sup> step

Practical 5.5: N students of your class ride their vehicles to reach University, the distances from their homes and time taken to reach are recorded. University issued the guidelines mentioned speed limit of m Kmph for safe driving. On the basis of your class data you have to print whether your class is following university guidelines or not.

Practical 6.1: Sonali joined a social networking site to stay in touch with her friends. The signup page required her to input a name and a password. However, the password must be strong. The website considers a password to be strong if it satisfies the following criteria:

Its length is at least 6.

It contains at least one digit.

It contains at least one lowercase English character.

It contains at least one uppercase English character.

It contains at least one special character. The special characters are: !@#\$%^&\*()\_-+

She typed a random string of length n in the password field but wasn't sure if it was strong. Given the string she typed, can you find the minimum number of characters she must add to make her password strong?

Practical 6.2: A string of length N contains  $(N*(N+1))/2$  substrings. Write a program to input string and print its multiple substrings.

Example: String "abc" will have {a, b, c, ab, bc, abc} set of substrings.

Practical 6.3: You store name of your friends in string array. You are given task to print name of your friend whose name start with particular character and after you find first name in the list you have stop searching and print name you search the list.

Practical 7.1: A function is provided with zero or more arguments, and it executes the statements on it. Based on the return type, it either returns nothing (void) or something. Develop a program to find greatest of four numbers using function intmax\_of\_four(int a, int b, int c, int d) which reads four arguments and returns the greatest of them.

Practical 7.2: Write a recursive function for computing factorial of a number. Write main to test its functioning.

Practical 7.3: Write a program to create functions for following

- i Input details of employee using `input_data()` (name, employee id, number of working days, date of joining, initial salary, contact number, designation, department)
- ii Calculate monthly salary using `calc_salary()`
- iii Display the monthly salary with deductions if any using `display()`

Practical 7.4: Store age of all students of your class in an array. Pass this array as an argument and find average height of the class and return it to calling function.

### Unit III: Handling heterogeneous data and memory management

8 Contact Hours

Practical 8.1: WAP to read an array of elements and print the same in the reverse order along with their addresses using pointer.

Practical 8.2: Write a function code that is returning pointer to the larger value out of two passed values.

Practical 8.3: The bank balance of N persons of a city are recorded. Due to COVID-19 government has decided to credit accounts with Rs. 1000 of all those persons whose balance is null , Write a function `Update_balance()` by passing pointer to an array as argument and print the updated bank balance list in calling function.

Practical 8.4: The CGPA of 5 semesters of N students has stored in NX5 array and names of corresponding students are stored in separate string array The student who got average CGPA  $\geq 8$  is eligible for placements .Pass pointers to both array to function `not_eligible()` and print list of non eligible students

Practical 9.1: Create a structure hospital and include the following data members:

- i Name of patient
- ii Patient id (as static)
- iii Blood group
- iv Contact number (long long)
- v Name of disease
- vi Date of admission

Including the functions to input and print the data for N number of patients.

Practical 9.2: What will be the difference if above program is going to be implemented through union. Implement the same program through union and differentiate the output as well as memory allocation.

Practical 9.3: You are given task to store records of mothers and fathers of all students of your class in two separate structures mother and father. Each record will contain name, age, work\_status, and height. On the basis of these records you have to print the following.

- 1) How many mothers are working? If more than 70 % of women are working then print women are job oriented.
- 2) If difference in heights of mother and father is  $\geq 10$  inches you have to print like Rama Mismatches Sham where Rama and Sham are names of mother and father
- 3) You also have to find average difference in the ages of mother and father.

Practical 9.4: Store N student records including fields name, First MST marks .Second MST marks ,lecture attended ,Lecture delivered , If student got average marks of two MST  $\geq 80$  ,He/She will be eligible for taking exams without taking care of attendance otherwise attendance should be  $\geq 75\%$ .Print name of all those students who are detained from final exams .

**Practical 10.1:** WAP to store a character string in block of memory space created by malloc and then modify the same to store a large string.

**Practical 10.2:** At the start of your class lecture , n students were present . You declare array dynamically to store roll numbers of these students after 5 Mins m more students join the class now you will reallocate memory space to store n+m roll numbers . Write a program by using functions malloc(), realloc() and free() .

**Practical 10.3:** Sort the list of N elements where memory is allocated dynamically using pointers

**Practical 10.4:** Marks of group A having m students and group B having n students have stored in two dynamically allocated arrays. Find the average aggregate marks of the whole class.

[Mode of Evaluation: The performance of students is evaluated as follows:

Lab		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks		100

#### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and Pos		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Identify situations where computational methods would be useful.	1,2,3,4,5,6,8,9,12
2	Approach the programming tasks using techniques learnt and write pseudo-code	1-12
3	Choose the right data representation formats based on the requirements of the problem.	1-6, 8-12
4	Use the comparisons and limitations of the various programming constructs and choose the right one for the task.	1-6, 8-12

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Apex Institute of Technology

L Chandigarh University

Gharial, Mohali, Punjab

		E	P	D	C	M	T	E	E	I	C	P	L	
		ng in ee er in na g K n o w l e d g e	ro b e m a n a l y s i s m e n t o f u t i o n s	ro i n /t d c n v l e s o p i g e a s t i o n s s o o f c o m p l e x	ss d e n o o e v l e s a n d d s s o c s t e t i n a b i l i t y	h e e n r g o n e r a n e r t a n d d s u s c s t a i n a b i l i t y	n v i s i d i n e n m e n r t a n d d s u s c s t a i n a b i l i t y	t h i c s i d u a l o r t e a m w o r k	i d i c a t i o n g a r e m e n t a n d f i n a n c e	o m m j e c t m a a t i o n g e m i n g	r o j e - l o n g L e a r n i n g			
		1	2	3	4	5	6	7	8	9	1	1	1	
20CSP1 12	Problem Solving with Programming Lab									0	1			2

1=addressed to small extent

2= addressed significantly

3=major part of course

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<b>20ECP-118</b>	<b>Foundations of AI Applications Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C</b>
<b>Version 1.0</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>12</b>
<b>Pre-Requisites/Exposure</b>	<b>None</b>						
<b>Co-requisites</b>	<b>None</b>						

### COURSE OBJECTIVE

The course will expose students to learn to specify, design and program modern IoT based platforms to capture real-world data and control end devices.

### COURSE OUTCOMES

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

1. Demonstrate an understanding of AI concepts, problem-solving strategies, and knowledge representation techniques.
2. Implement and analyze different search techniques such as BFS, DFS, A\* Algorithm, and heuristic-based approaches to solve real-world AI problems.
3. Design and implement basic machine learning models using Python libraries such as NumPy, Pandas, Scikit-learn, and TensorFlow for classification and prediction tasks.

### COURSE CONTENT

#### Introduction Session

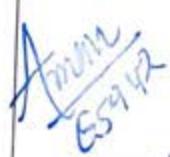
- The **Foundation of AI Applications Lab** introduces students to the fundamental concepts, techniques, and tools required to develop intelligent systems.
- This lab emphasizes practical exposure to core AI methodologies such as problem-solving through search algorithms, knowledge representation, machine learning, and natural language processing.
- Students will gain hands-on experience using Python and AI libraries to design and implement AI models applicable to real-world scenarios.

Mode of Evaluation: The performance of students is evaluated as follows:

		<b>Lab</b>	
<b>Components</b>		<b>Continuous Internal Assessment (CIA)</b>	<b>Semester End Examination (SEE)</b>
<b>Marks</b>	<i>AI/ML</i>	<b>60</b>	<b>40</b>
<b>Total Marks</b>	<i>Hon'ble Department of E&amp;T Apeejay Institute of Technology</i>	<b>100</b>	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

<b>Mapping Between COs and Pos</b>		
S. No.	Course Outcome (CO)	Mapped Program Outcome (PO)
1.	Demonstrate knowledge of AI principles, problem-solving techniques, and various search strategies.	2, 3, 4, 5, 8, 9, 12
2.	Implement and analyze search techniques such as Breadth-First Search (BFS), Depth-First Search (DFS), and A* Algorithm for solving AI-related problems.	1, 5
3.	Design and implement supervised and unsupervised machine learning models using Python libraries like NumPy, Pandas, Scikit-learn, and TensorFlow.	1, 4, 5

 Head of the Department (CSE) A.P.C. Institute of Technology Chandigarh University, Mohali, Punjab - 160062	E n g i n ee ri n g k n o w le d g e	Pr o bl em s m e nt s o p t i o n s o lu ti o ns	D es ig n/ D u e ct In v el o es p ti m g at nt of so lu ti o ns	C o n d u n er e nt s o p t i o n s o lu ti o ns	M o d e r n er n T o n ol U sa g e at io ns of c o m pl e x pr o bl	T h e e n n gi n e n e n t a n bi lit y	E n vi ro n e n e n t a n bi lit y	Et hi cs ics m m n i al u u or T ea m W or k	In di vi d u u ca T ti o m n or k	C o m m u u ni a n a n g e m n	Pr oj ec t m a n a n g e m n	Li fe - lo n g ar ni n g e m n a n d fi n a n ce
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											e	m	s								
		1	2	3	4	5	6	7	8	9	1	1	1	2							
20ECP11 8	Foundation of AI Applications Lab	3	3	3	2	3			2	3	0	1	1	2							1

Practical No.	Practical Title	CO Mapping
1	Introduction to Python and AI Libraries	CO1
2	Implementation of Search Algorithms (BFS, DFS)	CO1
3	Implementation of A* Algorithm	CO1
4	Solving Constraint Satisfaction Problems (CSP)	CO2
5	Building a Classification Model	CO2
6	Implementation of Clustering Algorithm	CO2
7	Text Preprocessing and Sentiment Analysis	CO2
8	Implementing Named Entity Recognition (NER)	CO3
9	Image Processing Using OpenCV	CO3
10	Developing an AI-Based Mini Project	CO3

1 = Addressed to small extent

2 = Addressed significantly

3 = Major part of the course

  
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 Chandigarh University City  
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<b>20UCPI42</b>	<b>Communication Skills Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		0	0	2	0	1	12
Pre-requisites/ Exposure	Studied English Language upto senior secondary						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. Equip students with listening, reading and speaking skills important in academic, professional and cultural situations.
2. Foster self awareness, confidence and a positive attitude in students' ability to communicate effectively in English.
3. Monitor, remediate and strengthen comprehensible pronunciation, intonation and accent.
4. Enhance soft skills of students for preparation to the corporate world.

## COURSE OUTCOMES

On completion of this course, the students are expected to

1. Display confidence in listening and speaking skills necessary for interaction in academic, professional and cultural situations
2. Exhibit language effectively for group discussions and public speaking.
3. Use non-verbal skills and soft skills effectively in the social and professional environment.
4. Use correct intonation, stress, pronunciation and neutral accent to communicate in English.

## COURSE DESCRIPTION

The course focuses on the enhancement of listening comprehension and speaking fluency in everyday situations by focusing on some essential grammar, vocabulary, and pronunciation. It will help students to cultivate soft skills like time management, stress management and enhance self awareness through SWOC analysis shaping them to become better team players.

## TEXT BOOKS

- T1** Globarena EL- Client Software for Communication Skills, Hyderabad

## REFERENCE BOOKS

- R1** Sethi, J., Dhamija, P.V., A Practice Course in English Pronunciation, Prentice Hall of India, New Delhi.

- R2** Roach P., English Phonetics and Phonology: A Practical Course (English), Cambridge University Press, 4th Edition, UK

- R3 O'Connor, J. D. Better English Pronunciation, 2nd Edition, Cambridge University Press, (2012), UK
- R4 Hornby, A.S. Oxford Advanced Learners Dictionary of Current English, 7th Edition, Oxford University Press, UK.

## COURSE CONTENT

### Unit I:

4 Contact Hours

**Soft Skills:** Self Awareness- Personal attributes, SWOC Analysis

**Verbal Skills:** Art of Public Speaking- just a minute, extempore, news discussion

**Non-Verbal Skills:** Positive body language, posture, gestures, symbols and signs

**Reading Skills:** Reading Comprehension -1 & 2, vocabulary building -1 & 2

**Listening Skills:** Listening exercises for word stress and pronunciation -1 & 2

**Phonetics:** Classification of Speech Sounds, Vowel sounds, Introduction to phonetic symbols

### Unit II:

4 Contact Hours

**Soft Skills:** Goal Setting, Time Management

**Verbal Skills:** Art of self introduction, extempore, cross talk, news discussion

**Reading Skills:** Reading Comprehension -3 & 4, vocabulary building- 3 & 4

**Non-Verbal Skills:** Personal appearance and grooming

**Phonetics:** Vowel Sounds, Consonant Sounds.

### Unit III:

4 Contact Hours

**Soft Skills:** Stress Management, Team Building

**Verbal Skills:** Greetings, Complementing and Inviting, Making Requests

**Reading Skills:** Reading Comprehension -5 & 6, vocabulary building-5 & 6

**Speaking Skills:** Group discussion

**Phonetics:** Diphthongs Sounds, Stress & Intonation rules and practice

**Mode of Evaluation:** The performance of students is evaluated as follows:

Lab		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks		100

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Churuau, Mohali, Punjab

## Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

### Mapping Between COs and POs

SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Display confidence in listening and speaking skills necessary for interaction in academic, professional and cultural situations	10
2	Exhibit language effectively for group discussions and public speaking.	10
3	Use non-verbal skills and effective soft skills for the professional and social environment.	10
4	Use correct intonation, stress, pronunciation and neutral accent to communicate in English.	10

 Head of the Department (CSE) Apeejay Institute of Technology Chandigarh University Mohali, Punjab, India	C o n d u ct  D e si gn / d e v el o g i n e e r n g o b K n o w le d g e C o n d u ct  E n v ir on m e n t a n d i n d i v i d u al o r te a m ic t h i c r o n e P r o j e ct  T e n e m e n t a n d i n d i v i d u al o r te a m ic t h i c r o n e I n d i n d i v i d u al o r te a m ic t h i c r o n e L i f e - l o n g L e a r n i n g
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														<b>m</b>	<b>s</b>
<b>20UCP14 2</b>	<b>Communication Skills Lab</b>	1	2	3	4	5	6	7	8	9	10	11	12		
		0	0	0	0	0	0	0	0	0	3	0	0		

1=addressed to small extent

2= addressed significantly

3=major part of course

  
 Amrit  
 65942  
 Head of the Department (CSE)  
 Apex Institute of Technology  
 Chandigarh University  
 Gharuan, Mohali, Punjab

<b>20UCY146</b>	<b>Life Skills and Mentoring-I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>CH</b>
<b>Pre-requisites/ Exposure</b>	NA	0	1	0	0	1	12
<b>Co-requisites</b>							

## **COURSE OBJECTIVE**

1. To enhance one's ability to be fully self aware by helping oneself to overcome all fears and insecurities and to grow fully from inside out and outside in.
2. To increase one's knowledge and awareness of emotional competency and emotional intelligence at place of study/work

## **COURSE OUTCOMES**

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

1. Gain Self Competency and Confidence
2. Practice Emotional Competency
3. Gain Intellectual Competency
4. Gain an edge through Professional Competency

## **COURSE DESCRIPTION**

To develop interpersonal skills and adopt good leadership behavior for empowerment of self and others.

### **Text Books:**

1. Mentoring Programme Handbook, Chandigarh University, 2019

### **Reference Books:**

1. Goals! How to get everything you want –Faster than you ever thought possible. By Brian Tracy
2. Daniel Goleman (2012). Working with Emotional Intelligence. Bloomsbury Publishing India Private Limited

### **Web Resources:**

1. <http://www.skillsyouneed.com/ips/improving-communication>.
2. <https://www.mindtools.com/>
3. [www.psychologytoday.com](http://www.psychologytoday.com)

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Chandigarh University,  
Gharuan, Mohali, Punjab

## **COURSE CONTENT**

### **UNIT-I**

1. **Self Awareness:** Definition of self awareness, Recognizing one's own attitude, feelings, motives, strengths, The areas of self awareness, How to develop self awareness

- Goal Setting:** Effective Planning, Differentiating short term and long term goals, enhancing perseverance
- Self Esteem:** Definition of self esteem, Assessing one's own worth, How to develop self esteem

## UNIT-II

- Self Confidence:** Understanding self confidence, benefits self-confidence, characteristics of self-confidence, how to build self- confidence
- Stress management:** Understanding stress and stressors, its effect on brain, how to cope with it
- Say no to Drugs:** Types of drugs, causes of addiction, sign of troubles, behavioral signs of drug abuse, Prevention
- Interpersonal Relationships:** Understanding Relationships, What are examples of good interpersonal skills, Good interpersonal skills, How Do You Show Good Interpersonal Skills

## UNIT-III

- Values and ethics:** Understanding values, classification of values, importance of values, Core values
- Empathy:** Understanding empathy, how to develop empathy, assessing your empathy
- Harmony in the relations:** Family is a natural laboratory, Values in human to human relationships, Respect is right evaluation

**Mode of Evaluation:** The performance of students is evaluated as follows:

		Theory	
Components		Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks		NA	NA
Total Marks		NA	

## Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

SN	Mapping Between COs and Pos	
	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Understand the concept and nature of Self Awareness, Developing and assessing the Self Awareness, Developing planning and organizational skills, Developing and assessing the Self Esteem	1, 2,3,4
2	Understanding ways to build self confidence and develop Introspection ability, Understanding stressors, and Active coping, Awareness on Drug abuse and Prevention, Understanding of interpersonal skills to manage relationships	1, 2,3,4

3	Clarifying the concept of value-education, Inculcate good manners and responsible behavior, Enhances tolerance, Promotes sense of respect for others feelings, Role of a student towards family, Society and their educational institute	1, 2, 3,4
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		C o n d u ct	D e s i g n / d e v el o p m e P ri n o g b K n o w le d g e	E n v ir on e n t h e n g i n e n d e r e s u a st ai d n a s b ci et it ic r o k	T o n e n t a n d e s u a st ai d n a s b ci et it ic r o k	I n d i v i d u al o r te a m w t h o i r o n e	P r o je ct m a n a g e m e l C n t o m a n d u n f i n a n i n c n e						
		1	2	3	4	5	6	7	8	9	10	11	12
20UCY14 6	Life Skills and Mentoring-1	0	0	0	0	0	0	1	1	0	0	0	0

- 1=addressed to small extent
- 2= addressed significantly
- 3=major part of course

<b>20S2T148(ODD)</b>	<b>Biology For Engineers</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		3	0	0	0	3	36
Pre-requisites/ Exposure	NIL						
Co-requisites							

#### **COURSE OBJECTIVES**

1. This subject is designed to impart fundamental knowledge on emerging fields of sciences like bioinformatics.
2. It is designed to impart knowledge that how to apply different softwares in research.

#### **COURSE OUTCOMES**

On completion of this course, the students are expected

1. To apply knowledge of cell biology to identify, formulate, and solve problems.
2. To excel in career as researcher in both traditional and emerging fields of science .
3. To apply knowledge of molecular biology, biosensors and immunology to excel in areas such as entrepreneurship, medicine, government, and education.
4. To think critically and creatively, especially about the use knowledge about biology of cancer and new areas of biology to address local and global problems.

#### **COURSE DESCRIPTION**

The course begins with the theoretical study of cell biology which is widely utilized in medical sciences. The students are then introduced to medical instrumentation. The course further emphasizes on the use of softwares, as well as disease.

#### **TEXT BOOKS**

- T1. C.B.Powar, 2010. Cell Biology. 5<sup>th</sup> Ed, Himalyan Publishing House.
- T2. Leslie Cromwell, Fred.J. Weibell and Erich. A.Pfeiffer. 2003. Biomedical instrumentation and measurements. 2<sup>nd</sup> edition, PHI.
- T3. John G. Webster 1998. Medical Instrumentation: Applications and Design, 3<sup>rd</sup> edition, Jon Wiley and Sons, New York.
- T4. Fundamental concepts of bioinformatics. Dan E. Krane, Michael L. Raymer
- T5. Bioinformatics Methods and applications. S.C Rastogi P Rastogi

## **REFERENCE BOOKS**

- R1. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer. 2006. "Biochemistry," 6th Ed. W.H. Freeman and Co. Ltd.
- R2. Robert Weaver. 2012 "Molecular Biology," 5th Edition, McGraw-Hill.
- R3. Jon Cooper, 2004. "Biosensors A Practical Approach" Bellwether Books.
- R4. Martin Alexander, 1994 "Biodegradation and Bioremediation," Academic Press.
- R5. Kenneth Murphy, 2011. "Janeway's Immunobiology," 8th edition, Garland Science.
- R6. Eric R. Kandel, James H. Schwartz, Thomas M. J. 2012. "Principles of Neural Science, 5th Edition, McGraw-Hill.
- R7. S. Thyagarajan, N. Selvamurugan, M. P. Rajesh, R. A. Nazeer, Richard W. Thilagaraj, S. Barathi, and M. K. Jaganathan. 2012 "Biology for Engineers," Tata McGraw-Hill, New Delhi.

## **COURSE CONTENT**

### Unit I: Basic Cell Biology

12 Contact Hours

Introduction: Living Organisms, Cells and Cell theory, Cell Structure and Function, Genetic information, protein synthesis, and protein structure, Cell growth, Cell Division, and differentiation, aging, apoptosis, stem cell Biology and Tissue engineering

### Unit II: Uses of Biology in Engineering

12 Contact Hours

Medical Instrumentation and Techniques- Electrocardiogram (ECG), Electroencephalogram (EEG), Electro Myogram (EMG), Magnetic Resonance Imaging- principles of MRI,X-ray.

Biosensors -Chemoreceptors, hot and cold receptors, baro receptors, sensors for smell, sound, vision, osmolality and taste, Transducers.

Recombinant DNA Technology- Vectors, Types of Vectors, BAC, YAC, DNA Fingerprinting ,PCR Electrophoresis Blotting Technique, Chromatography.

Immunology-Innate, Adaptive, Lymphoid Organs, types of cell

### Unit III: Uses of Softwares

12 Contact Hours

Enzymes and Industrial Application- Enzymes: Biological catalysts, Proteases, Carbonic anhydrase, Restriction enzymes and Nucleoside monophosphate kinases-Photosynthesis

Nervous System- Neuron ,structure, PNS,CNS,Action potential

Bioinformatics-Introductory Bioinformatics, BLAST, FASTA, Data mining

Disease – HIV, CoronaVirus, Diabetes, Cancer

**Mode of Evaluation:** The performance of students is evaluated as follows:

Components	Theory	
	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	

#### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	The student will be able to apply knowledge of cell biology to identify, formulate, and solve problems.	1,2
2	To excel in career as researcher in both traditional and emerging fields of science	1,2,3
3	The student will be able to apply knowledge of molecular biology, biosensors and immunology to excel in areas such as entrepreneurship, medicine, government, and education.	1,2,3
4	The student will be able to think critically and creatively, especially about the use knowledge about biology of cancer and new areas of biology to address local and global problems.	1,2,3

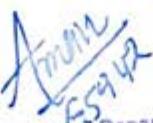
 Head of the Department (CSE) Alex Institute of Technology Chandigarh University Gharuan, Mohali Punjab, India	E	P	D	C	M	T	E	E	I	C	P	Li
	n	r	e	o	o	h	n	t	n	o	r	fe -
	g	o	s	n	d	e	v	h	d	m	o	lo
	i	b	i	d	e	e	i	i	i	m	j	ng
	n	l	g	u	r	n	o	c	v	u	e	L
	e	e	n	c	n	g	n	s	i	n	c	ea
	e	m	/	t	t	i	m	d	i	t	m	m
	r	a	d	i	o	n	e	u	c	a	a	in
	n	n	e	n	o	e	n	a	a	a	a	g
	g	a	v	v	l	e	t	l	t	i	n	g
	K	l	e	e	u	r	a	o	o	a	a	
	n	y	l	st	s	a	n	r	o	a	g	

	o w l e d g e	s i s e n t o	o p m e n t o	i g a t n n s	a g e ti o c i e t a b il it y	d s u s t a n a b il it y	t e a m w o r k	n c e m e n t a n d f i n a n c e							
				1	2	3	4	5	6	7	8	9	1	1	1
												0	1		

1=addressed to small extent

2= addressed significantly

3= major part of course

  
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 Chandigarh University  
 Gharuan, Moga, Punjab

# Semester-2

<b>20SMT175</b>	<b>CALCULUS &amp; VECTOR SPACES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C</b>
Version 1.00		3	2	0	0	5	60
Pre-requisites/ Exposure	Knowledge of mathematics up to senior secondary level						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. Familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra.
2. Equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards solving more advanced level of mathematics and applications that they would find useful in their respective disciplines.

## COURSE OUTCOMES

On completion of this course, the students are expected to

1. Understand and apply the concept of partial derivatives to solve mathematical problems and understand its application in real life situations.
2. Analyze the concept of Group theory and its application of analysis to Engineering problems.
3. Demonstrate the concept of vector spaces in a comprehensive manner.

## COURSE DESCRIPTION

The course provides a strong foundation in Calculus and Vector Spaces and equips the students with the fundamentals of mathematical tools for solving basic mathematics problems. This is achieved by focusing on concept understanding and appropriate application of that. The course introduces basic calculus topics and introduces the students to vector spaces with discussion of their applications in various engineering fields.

## TEXT BOOKS

**T1** E. Kreyszig, Advanced Engineering Mathematics, John Wiley, 10th Ed. 2011., New Delhi

**T2** H.K. Dass., Higher Engineering Mathematics, S Chand Publishers, 3rd revised edition, 2014.

**T3** B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42<sup>th</sup> ed. 2013, New Delhi.

## REFERENCE BOOKS

**R1** R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, 3rd Edition, Narosa Publishing House, 2004, New Delhi.

**R2** B.V. Ramana Advanced Engineering Mathematics, McGraw Hill, July 2006, New Delhi.

**R3** B. Thomas and R.L. Finney, Calculus and Analytic Geometry, Pearson Education, 11th Edition.

**R4** N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

<b>20ECT155</b>	<b>DIGITAL ELECTRONICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>CH</b>
Version 1.00		3	0	0	0	3	36
Pre-requisites/ Exposure	None						
Co-requisites	None						

## COURSE OBJECTIVES

1. To understand Merits of digitization.
2. To enable learners to understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
3. To impart knowledge about various digital circuits and designing of systems

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Analyse the merits of digital systems, various number systems and their applications.
2. Evaluate combinational circuit design along with providing solutions to basic digital problems.
3. Design asynchronous and synchronous sequential circuits.
4. Outline the logic design of different semiconductor memories.

## COURSE DESCRIPTION

The course starts with an introduction to digital systems with an extensive description of different number systems used by digital circuits/ systems along with its arithmetic principles. Learners are then coursed towards basic logic gates and circuit/ logic expression realization using different logic gates. The course further extends on to combination and sequential circuit designing laying emphasis on the design of different digital logic applications.

## TEXT BOOKS

- T1. **Digital Design**, Morris Mano, Prentice Hall of India.
- T2. **Digital Principle and Applications**, Malvino, Tata McGraw Hill.
- T3. **Digital Fundamentals**, Floyd & Jain, Pearson.

## REFERENCE BOOKS

- R1. **An Engineering Approach to Digital Design**, Fletcher, Prentice Hall of India.
- R2. **Fundamentals of Logic Design**, C.H. Roth, CL Engg.
- R3. **Digital Electronics**, SubrataGhoshal, Cengage.

## COURSE CONTENT

Unit I: Introduction to Digital Electronics and Number Systems

**Basics:** Introduction to digital electronics, Need of digital, Merits and Demerits, Difference between Analog and Digital Electronics.

**Number System:** Introduction, Binary, Octal and Hexadecimal number system. Signed and unsigned number; Binary operations: Addition, Subtraction, Multiplication and division; Subtractions using 1's and 2's compliment, BCD code and Gray code.

**Logic gates and Minimization:** Introduction to basic gates: OR, AND, NOT, NOR, NAND, EX-OR, Basic theorem of Boolean algebra, sum of products and product of sums, canonical form, Simplifications using K-map (4 variable)

## II: Digital Circuit Design

Unit

12 Contact Hours

**Combinational Circuits:** Introduction to Combinational circuit design, half adder, full adder, BCD Adder, Half Subtractor, Full Subtractor, Multiplexer, Demultiplexer, encoder, decoder and magnitude comparator.

**Sequential Circuits :**Introduction to sequential circuits, latch & flip flop (SR, JK, D and T), race around condition, conversion of various flip flops.

## Unit III: Sequential Circuit Design

12 Contact Hours

**Designing of Sequential Circuits:** Basic introduction to Counters: synchronous and asynchronous counters and designing.

**Shift Registers:** Types, Circuit Diagram, Timing waveforms.

**Semiconductor Memories:** Introduction, Classification: RAM, ROM, PROM, EPROM, and EEPROM.

**Mode of Evaluation:** The performance of students is evaluated as follows:

Components	Theory	
	Continuous Internal Assessment (CIA)	Semester End Examination (SEE)
Marks	40	60
Total Marks		100

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
H	1. To understand the Department (G)	
A	2. To understand the Institution (Technology)	
C	3. To understand the Curriculum	
L	4. To understand the Learning Environment	
E	5. To understand the Evaluation System	
I	6. To understand the Infrastructure	
N	7. To understand the National Curriculum Framework	
S	8. To understand the Syllabus	
T	9. To understand the Teaching Methods	
U	10. To understand the University (G)	
D	11. To understand the Department (G)	
O	12. To understand the Organization (G)	
P	13. To understand the Pedagogy (G)	
R	14. To understand the Research (G)	
M	15. To understand the Mentoring (G)	
W	16. To understand the Work Experience (G)	
E	17. To understand the Entrepreneurship (G)	
S	18. To understand the Society (G)	
G	19. To understand the Globalization (G)	
U	20. To understand the Universalization (G)	
M	21. To understand the Multiculturalism (G)	
A	22. To understand the Academic Environment (G)	
C	23. To understand the Cultural Environment (G)	
I	24. To understand the Industrial Environment (G)	
N	25. To understand the National Environment (G)	
S	26. To understand the Social Environment (G)	
T	27. To understand the Technological Environment (G)	
E	28. To understand the Economic Environment (G)	
R	29. To understand the Regional Environment (G)	
O	30. To understand the Organizational Environment (G)	
P	31. To understand the Personal Environment (G)	
R	32. To understand the Professional Environment (G)	
E	33. To understand the Ethical Environment (G)	
S	34. To understand the Spiritual Environment (G)	
G	35. To understand the Global Environment (G)	
U	36. To understand the Universal Environment (G)	
M	37. To understand the Multicultural Environment (G)	
A	38. To understand the Academic Environment (G)	
C	39. To understand the Cultural Environment (G)	
I	40. To understand the Industrial Environment (G)	
N	41. To understand the National Environment (G)	
S	42. To understand the Social Environment (G)	
T	43. To understand the Technological Environment (G)	
E	44. To understand the Economic Environment (G)	
R	45. To understand the Regional Environment (G)	
O	46. To understand the Organizational Environment (G)	
P	47. To understand the Personal Environment (G)	
R	48. To understand the Professional Environment (G)	
E	49. To understand the Ethical Environment (G)	
S	50. To understand the Spiritual Environment (G)	
G	51. To understand the Global Environment (G)	
U	52. To understand the Universal Environment (G)	
M	53. To understand the Multicultural Environment (G)	
A	54. To understand the Academic Environment (G)	
C	55. To understand the Cultural Environment (G)	
I	56. To understand the Industrial Environment (G)	
N	57. To understand the National Environment (G)	
S	58. To understand the Social Environment (G)	
T	59. To understand the Technological Environment (G)	
E	60. To understand the Economic Environment (G)	
R	61. To understand the Regional Environment (G)	
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P	63. To understand the Personal Environment (G)	
R	64. To understand the Professional Environment (G)	
E	65. To understand the Ethical Environment (G)	
S	66. To understand the Spiritual Environment (G)	
G	67. To understand the Global Environment (G)	
U	68. To understand the Universal Environment (G)	
M	69. To understand the Multicultural Environment (G)	
A	70. To understand the Academic Environment (G)	
C	71. To understand the Cultural Environment (G)	
I	72. To understand the Industrial Environment (G)	
N	73. To understand the National Environment (G)	
S	74. To understand the Social Environment (G)	
T	75. To understand the Technological Environment (G)	
E	76. To understand the Economic Environment (G)	
R	77. To understand the Regional Environment (G)	
O	78. To understand the Organizational Environment (G)	
P	79. To understand the Personal Environment (G)	
R	80. To understand the Professional Environment (G)	
E	81. To understand the Ethical Environment (G)	
S	82. To understand the Spiritual Environment (G)	
G	83. To understand the Global Environment (G)	
U	84. To understand the Universal Environment (G)	
M	85. To understand the Multicultural Environment (G)	
A	86. To understand the Academic Environment (G)	
C	87. To understand the Cultural Environment (G)	
I	88. To understand the Industrial Environment (G)	
N	89. To understand the National Environment (G)	
S	90. To understand the Social Environment (G)	
T	91. To understand the Technological Environment (G)	
E	92. To understand the Economic Environment (G)	
R	93. To understand the Regional Environment (G)	
O	94. To understand the Organizational Environment (G)	
P	95. To understand the Personal Environment (G)	
R	96. To understand the Professional Environment (G)	
E	97. To understand the Ethical Environment (G)	
S	98. To understand the Spiritual Environment (G)	
G	99. To understand the Global Environment (G)	
U	100. To understand the Universal Environment (G)	
M	101. To understand the Multicultural Environment (G)	
A	102. To understand the Academic Environment (G)	
C	103. To understand the Cultural Environment (G)	
I	104. To understand the Industrial Environment (G)	
N	105. To understand the National Environment (G)	
S	106. To understand the Social Environment (G)	
T	107. To understand the Technological Environment (G)	
E	108. To understand the Economic Environment (G)	
R	109. To understand the Regional Environment (G)	
O	110. To understand the Organizational Environment (G)	
P	111. To understand the Personal Environment (G)	
R	112. To understand the Professional Environment (G)	
E	113. To understand the Ethical Environment (G)	
S	114. To understand the Spiritual Environment (G)	
G	115. To understand the Global Environment (G)	
U	116. To understand the Universal Environment (G)	
M	117. To understand the Multicultural Environment (G)	
A	118. To understand the Academic Environment (G)	
C	119. To understand the Cultural Environment (G)	
I	120. To understand the Industrial Environment (G)	
N	121. To understand the National Environment (G)	
S	122. To understand the Social Environment (G)	
T	123. To understand the Technological Environment (G)	
E	124. To understand the Economic Environment (G)	
R	125. To understand the Regional Environment (G)	
O	126. To understand the Organizational Environment (G)	
P	127. To understand the Personal Environment (G)	
R	128. To understand the Professional Environment (G)	
E	129. To understand the Ethical Environment (G)	
S	130. To understand the Spiritual Environment (G)	
G	131. To understand the Global Environment (G)	
U	132. To understand the Universal Environment (G)	
M	133. To understand the Multicultural Environment (G)	
A	134. To understand the Academic Environment (G)	
C	135. To understand the Cultural Environment (G)	
I	136. To understand the Industrial Environment (G)	
N	137. To understand the National Environment (G)	
S	138. To understand the Social Environment (G)	
T	139. To understand the Technological Environment (G)	
E	140. To understand the Economic Environment (G)	
R	141. To understand the Regional Environment (G)	
O	142. To understand the Organizational Environment (G)	
P	143. To understand the Personal Environment (G)	
R	144. To understand the Professional Environment (G)	
E	145. To understand the Ethical Environment (G)	
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M	149. To understand the Multicultural Environment (G)	
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C	167. To understand the Cultural Environment (G)	
I	168. To understand the Industrial Environment (G)	
N	169. To understand the National Environment (G)	
S	170. To understand the Social Environment (G)	
T	171. To understand the Technological Environment (G)	
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R	173. To understand the Regional Environment (G)	
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P	175. To understand the Personal Environment (G)	
R	176. To understand the Professional Environment (G)	
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S	178. To understand the Spiritual Environment (G)	
G	179. To understand the Global Environment (G)	
U	180. To understand the Universal Environment (G)	
M	181. To understand the Multicultural Environment (G)	
A	182. To understand the Academic Environment (G)	
C	183. To understand the Cultural Environment (G)	
I	184. To understand the Industrial Environment (G)	
N	185. To understand the National Environment (G)	
S	186. To understand the Social Environment (G)	
T	187. To understand the Technological Environment (G)	
E	188. To understand the Economic Environment (G)	
R	189. To understand the Regional Environment (G)	
O	190. To understand the Organizational Environment (G)	
P	191. To understand the Personal Environment (G)	
R	192. To understand the Professional Environment (G)	
E	193. To understand the Ethical Environment (G)	
S	194. To understand the Spiritual Environment (G)	
G	195. To understand the Global Environment (G)	
U	196. To understand the Universal Environment (G)	
M	197. To understand the Multicultural Environment (G)	
A	198. To understand the Academic Environment (G)	
C	199. To understand the Cultural Environment (G)	
I	200. To understand the Industrial Environment (G)	

1	Analyse the merits of digital systems, various number systems and their applications.	1,2,3,12
2	Evaluate combinational circuit design along with providing solutions to basic digital problems.	1,2,3,4,6
3	Design asynchronous and synchronous sequential circuits.	1,2,3,4,6
4	Outline the logic design of different semiconductor memories.	1,6,7,12

Course Outcomes													
		1	2	3	4	5	6	7	8	9	10	11	12
<b>20ECT15 5</b> Digital Electronics		3	2	2	2	0	1	1	0	0	0	0	2

1=addressed to small extent

2= addressed significantly

3=major part of course

*Arun  
ES142*  
Head of the Department (CSE)  
Avinash Institute of Technology  
Chandigarh University  
Gurugram, Haryana, India

<b>20PCT154</b>	<b>Professional Communication Skills</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C</b>
Version 1.00		2	0	0	0	2	2
Pre-requisites/ Exposure	Studied Communication Skills Course						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. Stress on students awareness of interpersonal communication skills and appropriate usage of verbal and non-verbal expression in social and professional environment.
2. Prepare the student for discourse in English, using a number of communication strategies.
3. Provide foundations for the placement process of the student.

## COURSE OUTCOMES

On completion of this course, the students are expected to

1. Research and write short official, technical or social research report.
2. Use grammatically correct English to present and summarize information, ideas and opinions in a business environment.
3. Perform effectively in the placement process.

## COURSE DESCRIPTION

The intermediate level course develops succinct written expression for modern business communication with special emphasis on technical report writing. Special emphasis is on improving writing skills. Students are introduced to the placement process through interview skills and resume writing.

## TEXT BOOKS

**T1** Raman, M. and Sharma, S; Technical Communication - Principles and Practice, Oxford University Press (2018), New Delhi

**T2** Professional Communication Skills Workbook, 2020

## REFERENCE BOOKS

**R1** Murphy, R, English Grammar in Use (Advanced Level – CEFR-B1, B2), 5th Edition, Cambridge University Press (2019), UK

**R2** Hewing, Martin, Advanced Grammar in Use, 4th Edition, Cambridge University Press (2016), UK

## COURSE CONTENT

*Amrit  
ES912*  
Head of the Department (CSE)  
LPU Institute of Technology  
Chandigarh University  
Guruan, Mohali

**Unit I:**

8 Contact Hours

**Reading Skills: Technical Reading**

**Writing:** Introduction to proposals, features of writing a good report, purpose of report writing; difference between business report and engineering report, types of reports-official reports and technical report writing, E-magazine on a Social Cause.

**Grammar:** Tenses, subject –verb agreement, punctuation

**Vocabulary:** Contextual Usage - Synonyms, Antonyms, homophones

**Unit II:**

8 Contact Hours

**Identity of Organization – Creating Communication material (Vision, Mission, Values, Branding)**

**Writing:** Media Writing - Press note, business letters, agenda and minutes of meeting, modern forms of communication: e-mails, memorandum, video conference and conference calls.

**Grammar:** Sentence correction and sentence completion

**Vocabulary:** Idioms, collocations

**Unit III:**

8 Contact Hours

**Introduce key concepts of Morality, Diversity & Inclusion, Case Study**

**Writing:** paragraph writing, summarizing, describing objects and processes, proofreading

**Interview Skills:** Cover letter and resume writing

**Grammar:** Para completion, sentence rearrangement, cloze test

**Vocabulary:** Analogy

**Mode of Evaluation:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks		100

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)****Mapping Between COs and POs**

SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Research and write short official and technical research report of the Department (CSB) 10	AICTE Institute of Technology Chandigarh University Guru Nanak Dev University

2	Use grammatically correct English to present and summarize information, ideas and opinions in business correspondence.	10
3	Perform effectively in the placement process.	10

	C	o	n	d	u	c	t		D	i	n	
	o	n	d	u	c	t		e	e	s	g	
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20PCT15 4	Professional Communication Skills	0	0	0	0	0	0	0	0	3	0	0

1=addressed to small extent

2= addressed significantly

3=major part of course

Head of the Department (CSE)

Asian Institute of Technology

Chandigarh -160014 INDIA

Gi. no. : 1013 Date : 15/07/2013

<b>20ECP156</b>	<b>Digital Electronics Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
<b>Version 1.0</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>1</b>	
<b>Pre-Requisites/ Exposure</b>	<b>None</b>						
<b>Co-requisites</b>	<b>None</b>						

### **COURSE OBJECTIVE**

To conceive, analyze, design and build combinational and sequential digital logic solutions for everyday problems.

### **COURSE OUTCOMES**

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

1. identify relevant information to the supplement the digital system design.
2. analyze the elements of digital system abstractions such as digital representations of information, digital logic and Boolean algebra.
3. design digital systems based on concepts that enable autonomous behavior.
4. prepare professional quality textual and graphical presentations.
5. work in a team that can propose, design, implement and report on digital systems' project.

### **COURSE CONTENT**

1. Validation of truth tables of logic gates(7400,7402,7404,7408,7432, and 7486).
2. (a) Design a burglar alarm(AND).
  - (b) Design a single door bell ringer for both front and back doors(OR).
  - (c) Design an automatic fan controller (NOT).
3. (a) Design a two-way switch for room light(XOR).
  - (b) Design an LED Flasher (NAND).
  - (c) Design a multiplayer game trigger mechanism(NOR).
4. Design a light based object counter with 7-segment display.
5. Design a pulse width modulated signals generator using 555.
6. Design a traffic light system using D Flip-Flop.
7. Design a home appliance control system with 3-to-8 decoder.
8. Design a stress measuring game using decade counter.
9. Design a multiple sensor data acquisition system using multiplexer.
10. Design a rolling LED display using MAX7219 shift register.
11. Project with technical report.

**Mode of Evaluation: The performance of students is evaluated as follows:**

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 Head of the Department (CIE)  
 Panjab Institute of Technology  
 Chandigarh University  
 Mohali, Punjab - 160030

**Lab**

Components	Continuous Internal Assessment (CIA)	Semester End Examination (SEE)
Marks	60	40
Total Marks		100

### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and POs		
S. No.	Course Outcome (CO)	Mapped Program Outcome (PO)
1.	identify relevant information to the supplement the digital system design.	1,2,4,5,7,9,10
2.	analyze the elements of digital system abstractions such as digital representations of information, digital logic and Boolean algebra.	1,3,4,5,6,8,9,10,11,12
3.	design digital systems based on concepts that enable autonomous behavior.	1,2,3,4,6,7,8,9,12
4.	prepare professional quality textual and graphical presentations.	1,2,3,4,5,6,7,8,9,10,11,12
5.	work in a team that can propose, design, implement and report on digital systems' project.	1,2,3,4,5,6,7,8,9,10,11,12

 Name of the Department (GSE) Gyan Institute of Technology Chandigarh University City Gharuan, Mohali	E n g i n e e r i n g / T e c h n o l o g y	P r o j e c t - L e a r n i n g	D e s i g n & M a n u f a c t u r i n g	C o m p u t e r S y s t e m s	M a t e r i a l S c i e n c e & E n g i n e e r i n g	T e c h n o l o g y O f I n d u s t r i a l P r o d u c t s	E n v i r o n m e n t a l S c i e n c e & T e c h n o l o g y	I n d u s t r i a l S y s t e m s & M a n a g e m e n t	C o m m u n i c a t i o n & I n f o r m a t i o n T e c h n o l o g y	P r o d u c t D e s i g n & M a n u f a c t u r i n g	L e a r n i n g & I n t e r a c t i o n
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20ECP156	Digital Electronics Lab	3	2	2	3	2	2	3	2	3	2	2
												12

1 = Addressed to small extent

2 = Addressed significantly

3 = Major part of the course

*Arman*  
Head of the Department (CSE)  
Apex Institute of Technology  
Chandigarh University  
Gharuan, Mohali, Punjab

<b>20CSP152</b>	<b>Object Oriented Programming using C++ Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C</b>
Version 1.00		0	0	4	0	2	H
Pre-requisites/ Exposure	Basic knowledge of Computer Programming						
Co-requisites							

## COURSE OBJECTIVES

1. To enable the students to understand various stages and constructs of C++ programming language and relate them to engineering programming problems.
2. To improve their ability to analyze and address variety of problems in programming domains.

## COURSE OUTCOMES

After studying this course student will be able to

1. Provide the environment that allows students to understand object-oriented programming Concepts. Basics of Probability distributions
2. Demonstrate basic experimental skills for differentiating between object-oriented and procedural programming paradigms and the advantages of object-oriented programs. Classification of Stochastic processes
3. Demonstrate their coding skill on complex programming concepts and use it for generating solutions for engineering and mathematical problems. Discrete parameter Markov Chains
4. Develop skills to understand the application of classes, objects, constructors, destructors, inheritance, operator overloading and polymorphism, pointers, virtual functions, templates, exception handling, file operations and handling. Continuous parameter Markov Chains

## COURSE DESCRIPTION

The course begins with the introduction to features of object-oriented programming and its applications in numerous fields. After covering fundamentals, students will learn how to apply the more complex concepts including Inheritance, Polymorphism and File Handling in order to solve the complex real-world problems.

### TEXT BOOKS

**T1** E Balagurusamy, "Object Oriented Programming in C++", Tata McGraw-Hill.

**T2** Robert Lafore, "Object Oriented Programming in C++", Waite Group.

### REFERENCE BOOKS

**R1** Herbert Schildt , "C++- The Complete Reference", Tata McGraw-Hill 2003, New Delhi.

**R2** BjarneStroustrup: "The C++ Programming Language" (4th Edition). Addison-Wesley.

**R3** Ravichandran , "Programming with C++", Tata McGraw-Hill Education.

**R4** Joyce M. Farrell," Object Oriented Programming Using C++", Learning.

**R5** Programming Languages: Design and Implementation (4th Edition), by Terrence W. Pratt, Marvin V. Zelkowitz, Pearson.

R6 Programming Language Pragmatics, Third Edition, by Michael L. Scott, Morgan Kaufmann.  
**COURSE CONTENT**

Unit I: Fundamentals of C++

8 Contact Hours

**Practical 1.1:** WAP to find the area of a triangle using Heron's Formula when three sides of the triangle are input by user.

**Practical 1.2:** A person walks  $x$  km toward east and turns to the right. Then he moves  $y$  km. WAP to find the distance between starting and final point. Values of  $x$  and  $y$  are input by user.

**Practical 2.1:** Program to generate the Fibonacci series up to user specified limit. Write all the missing terms (e.g. 4, 6, 7, 9, 10, 11, 12, 14, 15...) also at the end.

**Practical 2.2:** WAP to input a matrix of dimension 4x4. If base address is 1000. Find the address of given element of the matrix.

**Practical 3.1:** Create a class called employee that contains a name (an object of class string) and an employee number (type long). Include a member function called getdata() to get data from the user, and another function called putdata() to display the data. Assume the name has no embedded blanks. Write a main() program to exercise this class. It should create an array of type employee, and then invite the user to input data for up to 100 employees. Finally, it should print out the data for all the employees.

**Practical 3.2:** WAP to add two complex numbers using class and objects.

**Practical 4.1:** WAP to add two objects of type time using constructor and destructor in the format 11:59:59.

**Practical 4.2:** WAP to find area of rectangle using parametrized constructor.

Unit II: Inheritance, Polymorphism & Exception Handling

8 Contact Hours

**Practical 5.1:** WAP to explain all Inheritance types.

**Practical 5.2:** WAP to illustrate ambiguity in multiple Inheritance and resolve using scope resolution operator.

**Practical 5.3:** WAP to resolve the diamond ambiguity using virtual base class.

**Practical 6.1:** WAP to calculate and display cube of an integer and decimal number using function overloading.

**Practical 6.2:** Program to demonstrate the unary operator overloading for operator  $++$ . Make a class test. Create a default constructor to initialize the variable. Make a member function for operator  $++$  with definition to decrement the value of variable.

**Practical 6.3:** Create a class that imitates part of the functionality of the basic data type int. Call the class Int(note different spelling). The only data in this class is an int variable. Include member functions to initialize an Int to 0, to initialize it to an int value, to display it (it looks just like an int), and use operator overloading to add two Int values. Write a program that exercises this class by creating two initialized and one uninitialized Int values, adding these two initialized values and placing the response in the uninitialized value, and then displaying this result.

**Practical 7.1:** WAP to perform exception handling for Divide by zero Exception.

**Practical 7.2:** WAP to handle various exception handlings.

Unit III: Pointers, Virtual Functions, DMA & Files

8 Contact Hours

**Practical 8.1:** Write a program that reads a group of numbers from the user and places them in an array of type float. Once the numbers are stored in the array, the program should average them and print the result. Use pointer notation wherever possible.

**Practical 8.2:** WAP to implement function overriding using virtual functions.

**Practical 9.1:** Program to understand the concept of new and delete operator.

**Practical 9.2:** Write a program to store the information of about 5 students in a file and read the contents

and print them on screen.

**Practical 10.1:** WAP to demonstrate tellg() and tellp() functions.

Mode of Evaluation: The performance of students is evaluated as follows:

Components	Theory	
	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks		100

#### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Basics of Probability distributions	1, 2, 5, 8, 12
2	Classification of Stochastic processes	1-3, 5, 8, 11, 12
3	Discrete parameter Markov Chains	1-3, 5, 8-12
4	Continuous parameter Markov Chains	1-3, 5, 7-12

Aman  
ES942

- Head of the Department (CSE)  
Apeejay Institute of Technology  
Chandigarh University  
Gurugram, Haryana - 122001

<b>20ECP-154</b>	<b>Foundation of IOT Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C</b>
Version 1.00		0	0	2	0	1	2
Pre-requisites/ Exposure	Basic knowledge of Computer Programming						
Co-requisites							

## COURSE OBJECTIVES

1. To understand the basics of IoT architecture and components.
2. To gain hands-on experience with IoT hardware and software platforms.
3. To design and develop IoT-based applications using sensors and microcontrollers.
4. To implement IoT communication protocols and data transmission techniques.
5. To integrate IoT solutions with cloud platforms and analyze data.

## COURSE OUTCOMES

After successful completion of this course, students will be able to:

- CO1: Understand the architecture and working of IoT devices and platforms.
- CO2: Interface and program IoT devices using sensors and actuators.
- CO3: Implement communication protocols (MQTT, HTTP) for data exchange.
- CO4: Develop IoT-based real-time monitoring and control applications.
- CO5: Analyze IoT data and integrate with cloud platforms.

## Tools and Platforms:

- Arduino IDE
- Raspberry Pi OS
- NodeMCU and ESP8266
- MQTT Broker (Mosquitto)
- AWS IoT, Google Cloud, Thingspeak

## Reference Books:

1. Arshdeep Bahga, Vijay Madisetti – *Internet of Things: A Hands-On Approach*
2. Benson Hougland – *Learning Internet of Things*
3. Michael Margolis – *Arduino Cookbook*.

## Lab Experiments:

Experiment No.	Title	CO Mapping
1	Introduction to IoT architecture and components	CO1
2	Setting up and programming Arduino for sensor interfacing	CO2

Experiment No.	Title	CO Mapping
3	Working with Raspberry Pi GPIO pins	CO2
4	Implementing MQTT protocol for data exchange	CO3
5	HTTP request and response using NodeMCU	CO3
6	Publishing sensor data to AWS IoT	CO4
7	Displaying data on Thingspeak dashboard	CO4
8	Real-time monitoring using MQTT	CO4
9	Basic automation using NodeMCU and sensors	CO4
10	Cloud integration and data analysis	CO5
11	Controlling devices using HTTP requests	CO5
12	Secure data transmission using TLS	CO5
13	Jitter reduction and load balancing in MQTT	CO5
14	Remote device control using AWS IoT	CO5
15	Final project: Develop an IoT-based home automation system	CO5

Mode of Evaluation: The performance of students is evaluated as follows:

Components	Theory	
	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	

#### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Basics of Probability distributions	1, 2, 5, 8, 12
2	Classification of Stochastic processes	1-3, 5, 8, 11, 12

3	Discrete parameter Markov Chains	1-3, 5, 8-12
4	Continuous parameter Markov Chains	1-3, 5, 7-12

*Aman  
ES942*

Head of the Department (CSE)  
 Amrit Institute of Technology  
 Chandigarh University,  
 Gharuan, Mohali, Punjab

20CST151	Object Oriented Programming using C++	L	T	P	S	C	C H
Version 1.00		1	0	2	0	2	2
Pre-requisites/ Exposure	Basic knowledge of Computer Programming						
Co-requisites							

## COURSE OBJECTIVES

3. To enable the students to understand various stages and constructs of C++ programming language and relate them to engineering programming problems.
4. To improve their ability to analyze and address variety of problems in programming domains.

## COURSE OUTCOMES

After studying this course student will be able to

5. Provide the environment that allows students to understand object-oriented programming Concepts. Basics of Probability distributions
6. Demonstrate basic experimental skills for differentiating between object-oriented and procedural programming paradigms and the advantages of object-oriented programs. Classification of Stochastic processes
7. Demonstrate their coding skill on complex programming concepts and use it for generating solutions for engineering and mathematical problems. Discrete parameter Markov Chains
8. Develop skills to understand the application of classes, objects, constructors, destructors, inheritance, operator overloading and polymorphism, pointers, virtual functions, templates, exception handling, file operations and handling. Continuous parameter Markov Chains

## COURSE DESCRIPTION

The course begins with the introduction to features of object-oriented programming and its applications in numerous fields. After covering fundamentals, students will learn how to apply the more complex concepts including Inheritance, Polymorphism and File Handling in order to solve the complex real-world problems.

## TEXT BOOKS

**T1** E Balagurusamy., "Object Oriented Programming in C++", Tata McGraw-Hill.

**T2** Robert Lafore, "Object Oriented Programming in C++", Waite Group.

## REFERENCE BOOKS

**R1** Herbert Schildt , "C++- The Complete Reference", Tata McGraw-Hill 2003, New Delhi.

**R2** BjarneStroustrup: "The C++ Programming Language" (4th Edition). Addison-Wesley.

**R3** Ravichandran , "Programming with C++",Tata McGraw-Hill Education.

**R4** Joyce M. Farrell," Object Oriented Programming Using C++", Learning.

**R5** Programming Languages: Design and Implementation (4th Edition), by Terrence W. Wilcock, Marvin V. Zelkowitz, Pearson.

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Head of the Department (CSE)  
Panjab Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

**Unit 1: Introduction to Object-Oriented Programming and Classes (15 Lectures)**

- Procedural vs. Object-Oriented Programming
- Principles of OOP (Encapsulation, Abstraction, Inheritance, Polymorphism)
- Structure of a C++ Program
- C++ Data Types, Operators, and Control Structures
- Classes and Objects
- Constructors and Destructors
- Friend Functions and Friend Classes
- Static Members and Functions
- Function Overloading and Operator Overloading
- Type Conversion (Basic to Class, Class to Basic, Class to Class)

**Unit 2: Inheritance and Polymorphism (15 Lectures)**

- Types of Inheritance (Single, Multiple, Multilevel, Hierarchical, Hybrid)
- Constructor in Inheritance
- Virtual Functions and Dynamic Binding
- Abstract Classes and Pure Virtual Functions
- Multipath Inheritance and Virtual Base Classes
- Function Overloading and Operator Overloading
- Templates and Standard Template Library (STL) – Vectors, Lists, and Queues

**Unit 3: Exception Handling and File Handling (15 Lectures)**

- Exception Handling (try, catch, throw)
- Multiple Catch Blocks and Nested try Statements
- File Streams – Input and Output
- Opening and Closing Files
- Read and Write Operations on Files
- Random Access Files
- Error Handling during File Operations
- Applications of C++ in Real-World Scenarios

**Mode of Evaluation:** The performance of students is evaluated as follows:

	Theory	
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks		100

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Basics of Probability distributions	1, 2, 5, 8, 12
2	Classification of Stochastic processes	1-3, 5, 8, 11, 12
3	Discrete parameter Markov Chains	1-3, 5, 8-12
4	Continuous parameter Markov Chains	1-3, 5, 7-12

*Amrit  
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Apex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

<b>20PCP158</b>	<b>Professional Communication Skills Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		0	0	2	0	1	
Pre-requisites/ Exposure	Studied Communication Skills Lab Course						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. Prepare students for their careers through proficient use of English in professional and interpersonal communication in the globalized context.
2. Inculcate soft skills and a professional attitude in the student.
3. Impart expertise for effective presentation skills.

## COURSE OUTCOMES

On completion of this course, the students are expected to

1. Give presentations in English confidently using appropriate tools.
2. Illustrate effective soft skills while negotiating ethically in professional situations.
3. Use neutral accent in English with correct pronunciation.

## COURSE DESCRIPTION

The course aims to make students use information to practice strategic discourse. It will prepare them for the transition from academia to industry.

## TEXT BOOKS

- T1**      Globarena EL- Client Software for Communication Skills, Hyderabad

## COURSE CONTENT

Unit I:                          4 Contact Hours

Soft Skills: Critical Thinking Skills, Creativity Skills

Presentation Skills: Elements & structure of effective presentation, preparation of presentation

Speaking Skills: Presentation on a given topic, extempore, cross talk, paper reading

Reading Skills: Technical Reading – inferring meaning, critical reading: exercise 7-8

Listening Skills: Listening exercises for word stress and pronunciation -3 & 4

**El Client Software:** Parts of Speech, subject–verb agreement, tenses – contextual usage exercises

**Phonetics:** Vowel sounds practice with speaking on software

Unit II:

4 Contact Hours

**Soft Skills:** Problem Solving Skills, Professional Ethics & Values

**Speaking Skills:** Group discussion, poster making and presentation, news discussion

**Phonetics:** Consonant Sounds practice with speaking on software

**El Client Software:** Correction of Sentences, Common Errors in English exercises

**Listening Skills:** Listening exercises for word stress and pronunciation -5 & 6

Unit III:

4 Contact Hours

**Soft Verbal Skills:** Negotiation Skills, Telephone Etiquette, Interview Skills

**Vocabulary building:** one-word substitutes, analogy

**Phonetics:** Diphthongs sounds practice

**Listening Skills:** Listening exercises for word stress and pronunciation -7 & 8

**Mode of Evaluation:** The performance of students is evaluated as follows:

Practical		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks	100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Give presentations in English confidently using appropriate tools.	10
2	Illustrate effective soft skills while negotiating ethically in professional situations.	10
3	Use neutral accent in English with correct pronunciation.	10

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		E ng in ee ri ng K no wl ed ge	P ro b le m an de al ve lo p m tio en ns of co m pl ex	D es ig n/ an de in ve sti us ga ag e ns of co m pl ex	C on du ct in ve sti us ga ag e ns of co m pl ex	M od er n to ol us ag d ci st y	T he ne gi on er an d ci st ai na bil ity	E nv ir on en t an d su st ai na bil ity	E t hi cs	In di vi du al or te a m w or k	C o m m un ic ati on a m w or k	Pr oj ec t m an ag e m en t an d fi na nc e	Li fe- lo ng Le ar ni ng
		1	2	3	4	5	6	7	8	9	10	11	12
20PCP15 8	Professional Communication Skills Lab	0	0	0	0	0	0	0	0	0	3	0	0

1=addressed to small extent

2= addressed significantly

3=major part of course

*Anmol  
ESY/12*  
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<b>20CSP-155</b>	<b>Computer Workshop</b> <b>(CSE, ECE, EE)</b> <b>(Fitting Shop, Electrical Shop, Electronics Shop)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>CH</b>
Version 1.00		0	1	2	0	2	
Pre-requisites/ Exposure	Nil						
Co-requisites							

### COURSE OBJECTIVES

1. To familiarize the students with various tools and operation in manufacturing like Fitting, Electrical and electronics.

### COURSE OUTCOMES

Student will be able to:

1. Familiarize the students with various tools & safety precautions as per the floor shops
2. To impart practical knowledge to perform basic operations & prepare an accurate job
3. Learn the applications of tools & processes in daily life routine tasks.

### COURSE DESCRIPTION

The course begins with the introduction to various tools and operation in manufacturing like Fitting Shop, Electrical Shop, Electronics Shop and its application in numerous fields. After experiments students will learn how to apply the more complex real-world problems.

### TEXT BOOKS:

1. Singh Swarn, Computer Workshop by S. Chand and Sons.

### REFERENCE BOOKS:

1. Chaudhury Hazra ,Workshop Technology, vol I, Media Promotors& Publication
2. Raghuvanshi B. S Workshop Technology, vol I, Dhanpatrai and Sons

### COURSE CONTENT

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<b>Unit I:</b>	<b>Fitting Shop</b>	<b>8 Contact Hours</b>
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1. **Fitting Shop:** Students to learn the use of Fitting Hand Tools, Marking Tools, Measuring Tools and Gauges etc. Exercises: Involving Jobs made out of MS Flats, to make a Square Fitting Job & a Triangular Fitting job Involving operations like Hacksawing, Marking, Filing, Drilling, Tapping and Radiusing etc.



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**Unit II: Electrical and Electronic Shop****8 Contact Hours**

2. **Electrical & Electronics Shop:** Introduction to tools and electrical accessories. Exercises: Including preparation of Stair Case wiring and Full Wave Centre Tap Rectifier, Involving the assembling of electronic components on PCB's using soldering.

**Unit III: Computer and its accessories shop****8 Contact Hours**

3. Introduction to PC, Motherboard and other components, accessories. Includes assembling and disassembling of Personal Computer.

**List of experiments:**

1. To make a 'T' part of Square Fitting Job involving different operations like, marking, measuring, punching, hack sawing, filing and squaring etc.
2. To make a U part of Square Fitting Job involving different operations like, marking, measuring, punching, hack sawing, filing and squaring etc.
3. Identification of electrical and electronics components: Resistors, Capacitors, Inductors, Diodes, Transistors.
4. Drawing of electronic circuit diagrams using BIS/IEEE symbols and introduction to EDA tools (Open Source Tools such as Dia or X Circuit), Interpret data sheets of discrete components and IC's, Estimation and costing.
5. Inter-connection methods and soldering practice: Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions, soldering practice in connectors and general-purpose PCB, Crimping.
6. Operation of Protective & Safety devices: Fuse, MCB, ELCB, Relay.
7. Troubleshooting of domestic devices: Dismantling, Repairing, Assembling and testing of domestic appliance like electric iron, Room heater, Electric toaster, Water heater, Electric kettle, Electric oven, Regulators, Alarm bell.
8. Motor: Demo model of Motor Principle, Assembly & Disassembly of different motors, Basic Troubleshooting of different motors, Voltage, Current, Power & Speed measurement of various motors
9. **Introduction to PC Hardware:** Types of Memories- Static RAM and Dynamic RAM, ROM, PROM, EPROM, EEPROM, CPU (Central Processing Unit) – ALU
10. **Assembling, Disassembling of PC:** Assembling and Disassembling of Personal Computer.

**Mode of Evaluation:** The performance of students is evaluated as follows:

Components	Practical	
	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks		100

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

**Mapping Between COs and Pos**

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Apex Institute of Technology

Chandigarh University

Chandigarh, Mohali, P

SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Knowledge of Fitting Shop	1, 5,9,12
2	Electrical and Electronic Shop	1, 5,9,12
3	Computers and Accessories Shop	1,5,9,12

	E n gi n ee ri n g K n o w le d g e	Pr o bl ig e m a n al ys is	D es n/ d u n in v el es ti g at io ns of so lu ti o ns	M o d er n to in v a r a n d so ci et y	T h e n gi m e e n t	E n vi ro n e n t	Et hi cs	In di vi d u al or te a m w or k	C o m m u u n ca ti o n d su st ai n a bi lit y	Pr oj ec t m u ni ca ti o n e m e nt a n d fi n a n ce	Li fe - lo m n a g L ea m in g			
			1	2	3	4	5	6	7	8	9	10	11	12
20MEP116/156	Workshop Practice	3					3				3			2

1=addressed to small extent

2= addressed significantly

3=major part of course

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Chandigarh University,  
Charuan, Mohali, Punjab

<b>20UCY196</b>	<b>Life Skills and Mentoring-2</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>CH</b>
Pre-requisites/ Exposure	NA	0	1	0	0	1	
Co-requisites							

### **COURSE OBJECTIVE**

1. To identify specific needs of student-Academic, Personal, Adjustment related and provide counselling. To help students build strength of character, ethics and values. Counselling students and provide confidence to improve their quality of life. To enable the parents to know about the performance and regularity

### **COURSE OUTCOMES**

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

1. Develop relationship around mentee's specific learning goals.
2. Provide objective feedback – focus on concrete actions and behavior in order to support mentee growth and development.
3. Share personal experience – openly disclose past and current experiences, successes, challenges, and lessons learned.

### **COURSE DESCRIPTION**

The course will build the capability to help in developing self awareness and sensitivity, feeling of equality, compassion and oneness.

#### **TEXT BOOKS:**

1. Mentoring Programme Handbook, Chandigarh University, 2019

#### **REFERENCE BOOKS:**

1. Daniel Goleman (2012). Working with Emotional Intelligence. Bloomsbury Publishing India Private Limited

#### **Web Resources:**

1. <http://www.skillsyouneed.com/ips/improving-communication>.
2. <https://www.mindtools.com/>
3. [www.psychologytoday.com](http://www.psychologytoday.com)

### **COURSE CONTENT**

#### **UNIT-I**

**4 Contact Hours**

1. **Positive Attitude:** Understanding positive attitude; List of positive attitudes; Characteristics and Traits of a Positive Mindset; Outcomes of a positive Attitude; Tips on How to Have & Keep a Positive Mindset in Life and at Work; Assessment of Positive Attitude
2. **Anger Management:** Understanding Anger Management; Unhelpful Angry Behavior Techniques To Manage Your Feelings.

- 3. Healthy Relationships:** Understanding Healthy Relationships; Keys of Healthy Relations; Building Healthy Relationships

### **UNIT-II**

**4 Contact Hours**

- 4. Character Strength:** Understanding Character Strength; What are major virtues by which we judge a person's actions and character? Focusing on your strengths; Use strength to boost happiness
- 5. Human Aspirations:** Understanding basic human aspirations
- 6. Social Responsibility:** Understanding Social Responsibilities; Contributing and connecting with the society
- 7. Assertiveness:** Understanding assertiveness; Benefits of assertiveness; Learning when to Be Assertive

### **UNIT-III**

**4 Contact Hours**

- 8. Happiness and Gratitude:** Understanding happiness and Gratitude; factors that affect our happiness; Interesting Facts and Findings about happiness; Useful tips for happiness; Benefits of gratitude; Modern Psychological Perspectives on Gratitude; how Happiness and Gratitude is related to well being
- 9. Human Dignity:** Understanding Human Dignity; Fundamental rights of a person
- 10. Earth, Our Home:** Our Role and Relationship with Nature

**Mode of Evaluation:** The performance of students is evaluated as follows:

<b>Theory</b>		
<b>Components</b>	<b>Continuous Internal Assessment (CAE)</b>	<b>Semester End Examination (SEE)</b>
<b>Marks</b>	NA	NA
<b>Total Marks</b>	NA	

### **Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

<b>Mapping Between COs and Pos</b>		
<b>SN</b>	<b>Course Outcome (CO)</b>	<b>Mapped Programme Outcome (PO)</b>
1	Knowing Happiness and Gratitude, Its Impact and benefits. Understanding Human Dignity and fundamental rights of human beings. Knowing our roles and responsibility towards environment and nature.	1, 2,3,4
2	Knowing your character strength and using it to build a happy life. Understanding basic human aspirations and its different dimensions. Understanding social responsibilities and their effect on individuals and society. Knowing to be more assertive to enhance our communication skills.	1, 2,3,4
3	Understanding to build positive mindset in life. Understanding and managing anger effectively. Understanding the importance of	1, 2,3,4

*[Signature]*  
 Head of the Department (CSE)  
 I apex Institute of Technology  
 Chandigarh University,  
 Charuan, Mohali, Punjab

		En gi ne eri ng kn o wl ed ge	Pr ob le m/ an al ys is	D esi gn / D ev el op m en t of so lut io ns	C on tr uct In ve sti ga tio n ns of co m pl ex pr ob le m s	M od er n To ol Us ag e	Th e n er er an d ci et y	En vir on m en er an d su ci ab ilit y	Et hi cs t an d sta in ab ilit y	In di vi du al or Te ati on	C o m m un ic ati on	Pr oj ec t m an ag e	Li fe- lo ng le ar ni ng
		1	2	3	4	5	6	7	8	9	10	11	12
20UCY196	Life Skills and Mentoring-2	0	0	0	0	0	0	1	1	0	0	0	0

1=addressed to small extent

2= addressed significantly

3=major part of course

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Gharuan, Mohali, Punjab

			L	T	P	S	C	CH
20SPT141 (Odd Sem)	Quantum & Semiconductor Physics							
20SPT181 (Even Sem)								
Version 1.00			3	0	0	0	3	36
Pre-requisites/ Exposure	Physics and Mathematics (10+2 level)							
Co-requisites	-							

## COURSE OBJECTIVES

1. The course is designed to make the students industry ready to contribute in the growing demand of the industry at local, national and international level.
2. It will make the students competent to understand basic concepts and applications of advanced engineering physics and apply its principles in their respective fields at global platform.
3. It will enhance the skill level of the students and shall make them preferred choice for getting employment in industry and research labs.
4. It will give thorough knowledge of the discipline to enable students to disseminate knowledge in pursuing excellence in academic areas.

## COURSE OUTCOMES

On completion of this course, the students are expected to learn

1. The basic concepts of semiconductor physics, illustrate the working of various semiconductor components and use its principles in design of devices and its applications.
2. To identify various components of laser and optical fibres and justify their importance and applications in different fields of computer science and technology
3. To explain the basic concepts of quantum mechanics, use its principles in solving quantum mechanical problems and recommend its applications in quantum computing and nanotechnology.

## COURSE DESCRIPTION

The course begins with the study of basic crystal structure of solids and then extended to semiconductors. The students will learn to apply the principles in design of various semiconducting components. The students are then introduced to the applications of laser and fiber optics which are the pillars of communication system. Then the students are introduced to the concepts of quantum mechanics and its application in quantum computing and nanotechnology.

## TEXTBOOKS

*Amrit  
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Charuan, Mohali, Punjab

- T1.** Malik H.K, Singh A.K. (2011) Engineering Physics, TMH, New Delhi. ISBN: 9780070671539
- T2.** Beiser A. (2002) Concepts of Modern Physics, McGraw Hill Education. ISBN: 9780070495531
- T3.** Sadiku M.N.O. (2007) Elements of Electromagnetics, Oxford University Press. ISBN: 0195300483
- T4.** C. T. Bhunia (2010) Introduction to Quantum Computing, New Age International Publishers ISBN 978-8122430752
- T5.** Szc S.M., K. Ng Kwok., Physics of Semiconductor Devices, Edition 3<sup>rd</sup>, (2011), Wiley India. KasapS.O., Principles of Electronic and materials and devices, Edition 1<sup>st</sup>, (2007), Tata McGraw-Hill, Noida.

## REFERENCEBOOKS

- R1.** Griffith D.J. (2012) Introduction to Electromagnetics, PHI Learning, 4th edition, ISBN: 9780138053260.
- R2.** Ghatak A. (2012) Optics, McGraw Hill Education. ISBN: 978-1259004346.
- R3.** Sahni V., Goswami D. (2008) Nano Computing, McGraw Hill Education Asia Ltd., ISBN: 978007024892  
Beiser A., Ghatak A, Garg S.C., Applied Physics, Edition 1<sup>st</sup>, (2013), Tata McGraw-Hill, Noida.

## COURSE CONTENT

### Unit I: Basics of Semiconductor Physics

12 Contact Hours

**CRYSTALLOGRAPHY:** Basic terms, types of crystal systems, Bravais lattices, Miller Indices, d-spacing, atomic packing factor for SC, BCC, FCC and HCP structures.

**SEMICONDUCTOR PHYSICS & DEVICES:** Basics of Semiconductor-Physics, Classical free electron theory and quantum free electron theory, Formation of energy bands in metals, semiconductors & insulators, Direct & Indirect Band Gap Materials, Fermi-Dirac Function, Position of Fermi level in intrinsic and extrinsic semiconductors, Conductivity, Mobility, Current density (drift & diffusion) in semiconductors (n-type and p-type), Generation and recombination of charges, Fermi Level diagram for p-n junction (unbiased, forward bias, reverse bias), formation of p-n junction diode, Zener-diode, Hall effect and Hall voltage, LED, Organic LED, Applications of semiconductor devices.

### Unit II: Lasers and Fibre Optics

12 Contact Hours

**LASERS** - Introduction, Spontaneous and Stimulated emission of radiation, Relation b/w Einstein's A and B coefficients, Population inversion & types of pumping, Main components of a Laser, Construction & working of Ruby Laser and its applications, Construction & working of Helium-Neon laser and its applications. **Holography:** Elementary idea of holography and constructive and reconstructive of holography

**FIBRE OPTICS :** Fundamental ideas about optical fibre, Types of fibres, Acceptance angle and the Department of Numerical aperture, Propagation mechanism and communication in optical fibres, Attenuation and losses Institute of Technology, Chandigarh University, Mohali, Punjab

### **Unit III:Quantum Mechanics**

**12 Contact Hours**

**QUANTUM MECHANICS:** Introduction of quantum physics- Planck's radiation theory, Wien displacement law, Rayleigh Jean law, Compton effect, Heisenberg's uncertainty principle, Wave particle duality, de Broglie wavelength, properties of matter waves, wave packet, phase velocity and group velocity, wave function, physical significance of wave function, Schrödinger's wave equation (Time Independent And Dependent), Motion of free particle, Particle in a box.

**INTRODUCTION TO QUANTUM COMPUTING -** Introduction to Nanotechnology, applications of nanotechnology, History of Computing, Quantum wire, Quantum well, Quantum dot., Sol-Gel technique, Quantum Computers, Nanocomputing Technologies, Nano Information Processing, Prospects and Challenges

**Mode of Evaluation:** The performance of students is evaluated as follows:

Components	Theory	
	Continuous Internal	Semester End
	Assessment(CAE)	Examination(SEE)
Marks	40	60
Total Marks		100

#### **Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Sno.	Course Outcome(CO)	Mapped Programme Outcome(PO)
1	The basic concepts of semiconductor physics, illustrate the working of various semiconductor components and use its principles in design of devices and its applications.	1,2,3,4,5,11
2	To identify various components of laser and optical fibres and justify their importance and applications in different fields of computer science and technology	1,2,5,6,11
3	To explain the basic concepts of quantum mechanics, use its principles in solving quantum mechanical problems and recommend its applications in quantum computing and nanotechnology.	1,2,3,4,5,6,11

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			Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning
			1	2	3	4	5	6	7	8	9	10	11	

20SPT141(Odd Sem)	Quantum & Semiconductor Physics	3	2	2	1	1	1							2
20SPT181 (Even Sem)														

1=addressed to small extent

2=addressed significantly

3=major part of course

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20SPP142 (Odd Sem)	Quantum & Semiconductor Physics Lab	L	T	P	S	C	CH
20SPP182 (Even Sem)		0	0	2	0	1	12
Version 1.00							
Pre- requisites/Exposure	Physics and Mathematics (10+2 level)						
Co-requisites	-						

## COURSE OBJECTIVES

- 1 To train engineering students in basis of measurements and the instruments.
- 2 To give practical training on basic of Physics experiments which are useful to engineers.
- 3 To equip the students with practical knowledge in electronics and optics.

## COURSE OUTCOMES

On completion of this course, the students are expected to learn

1. It will provide the modest experience that allows students to develop and improve their experimental skills and develop ability to analyze data.
2. Ability to demonstrate the practical skill on measurements and instrumentation techniques of some Physics experiments. Students will develop the ability to use appropriate physical concepts to obtain quantitative solutions to problems in physics.
3. Students will demonstrate basic experimental skills by setting up laboratory equipment safely and efficiently, plan and carry out experimental procedures, and report verbally and in written language the results of the experiment.

## COURSE DESCRIPTION

The course deals with the practical training of physics experiments related to optics, electrical and electronics.

## TEXTBOOKS

T1. Sharma Saroj, "Physics Experiments for engineers", Edition 1<sup>st</sup>, (2009), Oscar publications, New Delhi.

T2. Shukla R. K., and Srivastava Anchal, "Practical Physics", Edition 1<sup>st</sup>, (2006), New Age International (P) Ltd, New Delhi.

T3. Arora C.L., "B.Sc. Practical Physics", Revise Edition, (2007), S. Chand & Company Limited.

## REFERENCE BOOKS

*J. Singh*  
Head of the Department (CSE)  
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Gharuan, Mohali, Punjab

**R1.**Souires G. L., "Practical Physics", Edition 4<sup>th</sup>,(2001), Cambridge University, UK.

**R2.** Chattopadhyay D., Rakshit P. C., and Saha B., "An Advanced Course in Practical Physics",Edition 2<sup>nd</sup>,1990), Books & Allied Ltd., Calcutta.

## COURSE CONTENT

### Unit I:

**4 Contact Hours**

1. To find the divergence of LASER beam.
2. To determine the diffraction using LASER beam and find the grating element of diffraction grating.
3. To determine the numerical aperture of optical Fibre.
4. Determine the attenuation and propagation losses in optical Fibre.

### Unit II:

**4 Contact Hours**

Allocation of project in consultation with faculty

5. To find the resistivity and energy band gap of the semiconductor material using four probe method.
6. To draw the reverse characteristics of Zener diode.
7. To Determine Hall Voltage And Hall Coefficient Using Hall Effect.

### Unit III:

**4 Contact Hours**

8. To study ferroelectric behavior of any material.
9. To find the thermal conductivity of nanofluids.
10. To study magneto resistance of a material.
11. To determine the impedance of AC Circuit.
12. Mini Project – Concept based Demonstration.

**Mode of Evaluation:** The performance of students is evaluated as follows:

Components	Theory	
	Continuous Internal	Semester End
	Assessment(CAE)	Examination(SEE)
Marks	60	40
Total Marks	100	

*[Signature]*  
Head of the Department (CSE)

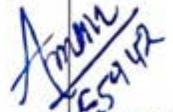
Apex Institute of Technology

Chandigarh University,

Gharuan, Mohali, Punjab

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Sno.	Course Outcome(CO)	Mapped Programme Outcome(PO)
1	It will provide the modest experience that allows students to develop and improve their experimental skills and develop ability to analyze data.	1,2,3,4,5,6,9,11,12
2	Ability to demonstrate the practical skill on measurements and instrumentation techniques of some Physics experiments. Students will develop the ability to use appropriate physical concepts to obtain quantitative solutions to problems in physics.	1,2,3,4,5,6,12
3	Students will demonstrate basic experimental skills by setting up laboratory equipment safely and efficiently, plan and carry out experimental procedures, and report verbally and in written language the results of the experiment	1,2,3,5,7,10,12

 Head of the Department (CSE) Apex Institute of Technology Chandigarh University, Mohali, Punjab	D	C			E			P	
	e	o	n		n	v		r	
	s	d	u		e	o	j	o	
	i	/	c		m	n	o	g	
	n	d	t		e	e	g	e	
	e	e	i		n	m	i	a	
	v	e	n		n	e	d	m	
	e	l	e		g	a	v	a	
	n	o	p		m	n	i	l	
	g	r	o		b	a	o	o	
	K	o	m		l	t	r	o	L
	n	o	o		a	o	s	m	if
	o	a	f		a	o	s	e	ee
	w	n	s		s	o	i	n	ll
	l	a	s		o	l	a	i	on
	e	l	o		o	c	b	c	g
	d	y	u		a	e	h	o	in
	g	si	ti		m	g	i	r	in
	e	s	o		p	e	t	o	an

					n s	i e	x p	r o	b l	e m s			c e	
20SPP14 2 (Odd Sem)	Quantum & Semiconducto r Physics Lab	1	2	3	4	5	6	7	8	9	10	11	12	
20SPP18 2 (Even Sem)		3	2	2	1	3								2

1=addressed to small extent

2=addressed significantly

3=major part of course

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# **SEMESTER -3**

<b>20CST-231</b>	<b>DATA STRUCTURES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		3	0	0	0	3	3
Pre-requisites/ Exposure	C and C++						
Co-requisites	20CSP-236						

### COURSE OBJECTIVES

The Course aims to:

1. Develop understanding among the students about the concept of the data structures
2. Demonstrate methods to perform operations on different data structures
3. Teach use and application of different data structures for modeling real world problems.

### COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Understand the properties of various data structures
2. Identify the strengths and weaknesses of different data structures
3. Design and employ appropriate data structures for solving computing problems

### COURSE DESCRIPTION

The course begins with the introduction of data structures which is the core engineering subject in computer science. The students are introduced with the meaning, types of data structures. Various operations to be performed and how they can be used to solve different real world problems like searching, sorting and organizing data.

### TEXT BOOKS

- T1** Lipchitz, Seymour, "Data Structures", Schaum's Outline Series, Tata McGraw Hill  
**T2** Gilberg/Forouzan, "Data Structure with C, Cengage Learning.  
**T3** Augenstein, Moshe J, Tanenbaum, Aaron M, "Data Structures using C and C++", Prentice Hall of India

### REFERENCE BOOKS

- R1** Goodrich, Michael T., Tamassia, Roberto, and Mount, David M., "Data Structures and Algorithms in C++", Wiley Student Edition.  
**R2** Aho, Alfred V., Ullman, Jeffrey D., Hopcroft, John E. "Data Structures and Algorithms", Addison Wesley

### COURSE CONTENT

Unit I:

12 Contact Hours

*Amrit  
E5242*  
Head of the Department (CSE)  
Apex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

**Introduction:** Concept of data and information, Introduction to Data Structures, Types of data structure: Linear and non-linear data structures, operations on Data Structures, Algorithm complexity, Time-space trade off, asymptotic notations.

**Arrays:** Basic terminology, Linear arrays and their representation, Traversing Linear Array, Insertion & Deletion in arrays, searching – linear search, binary search, sorting – insertion sort, selection sort, bubble sort, merging arrays & merge sort, complexity analysis of each algorithm, Multi-dimensional arrays and their representation, Pointers; Pointer Arrays, Records; Record structure, representation of records in Memory, Parallel Arrays, sparse matrices and their storage

Unit II:

12 Contact Hours

**Linked List:** Linear linked list, Representation of Linked Lists in Memory, Traversing a linked list, searching a linked list, insertion in & deletion from linked list, Header Linked List, doubly linked list, Operations on doubly linked list, complexity analysis of each algorithm, Application of linked lists.

**Stacks:** Basic terminology, Sequential and linked representations, Operations on stacks: PUSH & POP, Application of stacks: Parenthesis matching, evaluation of postfix expressions, conversion from infix to postfix representation, Quick Sort and its complexity analysis. Meaning and importance of recursion, principles of recursion & implementation of recursive procedure

**Queues:** Linear queue, Sequential and linked representation of Linear queue, Circular queue, Operations on queue, Deques, Priority queue.

Unit III:

12 Contact Hours

**Graphs:** Graph Theory terminology, sequential representation of graphs (adjacency matrix, PathMatrix), traversing a graph, Operations on Graph.

**Trees:** Basic terminology, Binary Trees, Representation of Binary Trees in Memory, traversing Binary Trees, Traversal Algorithms using stacks, Header Nodes; Threads, Binary Search trees, Searching, Inserting & Deleting in Binary Search Trees, AVL Search trees, B Trees, Heap & Heap Sort.

**Hashing & File Organization:** Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation. Concepts of files, Organization of records into Blocks, File organization: Sequential, Relative, Index Sequential, Inverted File

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	 Head of the Department (CSE) Apex Institute of Technology Chandigarh University, Gharuan, Mohali, Punjab

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

SN	Mapping Between COs and Pos										
	Course Outcome (CO)										Mapped Programme Outcome (PO)
1	Understand the properties of various data structures.										1 to 3
2	Identify the strengths and weaknesses of different data structures.										1 to 3, 5
3	Design and employ appropriate data structures for solving computing problems.										1 to 3, 12

		D e s i g n / d e v el o p m e n t / P r o t o r e n t / K b f s l e m o a l u n a l t i o n / d y s i n s s	E n v ir o n m e n t / T h e e n g i n e e r n e r a n d s u s a n d s a b t h i c r o k	I n d i v i d u al o r te a m w o r k	P r o j e c t m a n a g e m e n t / C o m m u n d f i n a n c e	L if e - l o n g L e a r n i n g							
		1	2	3	4	5	6	7	8	9	10	11	12
20CST-231	Data Structures	3	2	2	1	1	0	0	0	0	0	0	1

1=addressed to small extent

2= addressed significantly

3=major part of course

20CST-232	OPERATING SYSTEM	L	T	P	S	C	C H
Version 1.00		3	0	0	0	3	3
Pre-requisites/ Exposure	Basic knowledge of computer system						
Co-requisites	-						

### COURSE OBJECTIVES

The Course aims to:

1. To understand a fundamental understanding of operating systems and its functionalities.
2. To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS.
3. To understand the concepts and implementation Memory management policies and Virtual memory in advance operating system.

### COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Describe the important computer system resources and the role of operating system in their management policies and algorithms.
2. Understand the process management policies and scheduling of processes by CPU and familiar with memory management and its allocation policies.
3. Identify ,use and evaluate the storage management policies with respect to different storage management technologies

### COURSE DESCRIPTION

The course begins with the introduction of operating system which is the core engineering subject in computer science. The students are introduced with the meaning, types of operating system. Covers the classical internal algorithms and structures of operating systems, including CPU scheduling, memory management, and device management. Considers the unifying concept of the operating system as a collection of cooperating sequential processes. Covers topics including file systems, virtual memory, disk request scheduling, concurrent processes, deadlocks, security, and integrity.

### TEXT BOOKS

**T1** Galvin, Peter B., Silberchatz,A., "Operating System Concepts", Addison Wesley, 9th Edition.

**T2** William Stallings, Operating Systems: Internals and Design Principles, 7<sup>th</sup> edition Pearson Education Limited, 2014 ISBN:1292061944, 9781292061948.

Head of the Department (CSE)  
Apex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

### REFERENCE BOOKS

**R1** Andrew Tananbaum, "Operating System", PHIL earning.

**R2** Godbole , Kahate, "Operating System: A Concept Based Approach", Tata Mc-Graw-Hill.

## COURSE CONTENT

### Unit I:

**Introduction to the Operating System:** Introduction to Operating Systems ,Operating System Structure, Main Functions and characteristics of Operating Systems ,Types of Operating Systems, Systemcalls, Types of systemcalls, System programs, Reentrant Kernels, Monolithic and Microkernel Systems

12 Contact Hours

**Process Management:** Process Concept, Process Control Block, Process Scheduling, Threads, CPU Scheduling: Preemptive/Non Preemptive Scheduling, Scheduling Criteria, Scheduling Algorithms ,inter-process communication ,remote procedure calls, Process Synchronization.

**Deadlocks:** Dead lock characterization and conditions for dead lock ,dead lock prevention, Dead lock a voidance-safest ate ,resource allocation graph algorithm ,Banker's algorithms-Safety algorithm, Dead lock detection, Recovery from dead lock.

### Unit II:

12 Contact Hours

**Memory Management:** Address binding, logical versus physical address space, dynamic loading ,Swapping ,contiguous memory allocation ,Fragmentation, Paging, Segmentation, Segmentation with Paging, Virtual Memory Concept, Demand Paging, Page Replacement, Page Replacement Algorithms, Thrashing, Cache memory organization ,Locality of reference.

**Device Management:** Disk Structure, Disk formatting, Disk Scheduling Algorithms, RAID structure- RAID levels, problems with RAID.

**File Management:** File Concepts, Access Methods, Directory Structure, Allocation Methods, Free Space Management.

### Unit III:

12 Contact Hours

**System Protection and Security:** Goals, principles and domain of protection, Access matrix, implementation faces matrix, the security problem, program threats, system and network threats.

**Distributed and Network Operating Systems:** Overview: Topology, connection strategy, network operating system types: Peer to Peer & Client server, Distributed message passing.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	<i>Amrit ES 2022</i>

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Head of the Department (CSE)

Apex Institute of Technology

Chandigarh University,

Gharuan, Mohali, Punjab

SN	Course Outcome (CO)	Mapping Between COs and PoS										Mapped Programme Outcome (PO)
		Programme Outcomes										
1	Describe the important computer system resources and the role of operating system in their management policies and algorithms.											1 to 4
2	Understand the process management policies and scheduling of processes by CPU and familiar with memory management and its allocation policies.											1 to 5, 12
3	Identify, use and evaluate the storage management policies with respect to different storage management technologies											1 to 5, 12
		E	n	g	i	e	d	D	e	s	i	Proj
		n	g	e	n	v	e	e	g	g	r	ect
		e	g	e	n	o	l	o	p	o	m	ma
		n	g	e	n	o	l	o	p	o	a	na
		m	g	e	n	o	l	o	p	o	g	ge
		o	g	e	n	o	l	o	p	o	l	on
		w	g	e	n	o	l	o	p	o	o	ng
		le	g	e	n	o	l	o	p	o	o	Le
		d	g	e	n	o	l	o	p	o	m	an
		g	g	e	n	o	l	o	p	o	u	d
		e	g	e	n	o	l	o	p	o	u	fi
		s	g	e	n	o	l	o	p	o	c	ar
		s	g	e	n	o	l	o	p	o	at	n
		s	g	e	n	o	l	o	p	o	io	in
		s	g	e	n	o	l	o	p	o	c	ce
			1	2	3	4	5	6	7	8	9	10
												11
20CST-232	Operating System		3	3	2	1	3	0	0	0	0	0
												12

1=addressed to small extent

2= addressed significantly

3=major part of course

*Amrit  
CS242*  
Head of the Department (CSE)  
Apex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

<b>20CST-233</b>	<b>Database Management System</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		3	0	0	0	3	3
Pre-requisites/ Exposure	Knowledge of basic file management systems						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. Understand database system concepts and design databases for different applications and to acquire the knowledge on DBMS and RDBMS.
2. Implement and understand different types of DDL, DML and DCL statements.
3. Understand transaction concepts related to databases and recovery/backup techniques required for the proper storage of data.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Apply the relational database theory, and write relational algebra expressions for queries
2. Organize a Computer Incident Response Capability.
3. Understand the basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree, and hashing.
3. Understand the issues of transaction processing and concurrency control.

## COURSE DESCRIPTION

The course begins with the introduction of Database and relational algebra which are widely utilized in all engineering applications. The students are then introduced to Database storage and data accessing techniques. The course further emphasizes on the concept of Transaction and concurrency.

## TEXT BOOKS

**T1** Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database System", The Benjamin / Cummings Publishing Co.

**T2** Korth and Silberschatz Abraham, "Database System Concepts", McGraw Hall.

**T3** Pratt, " DBMS", Cengage Learning.

## REFERENCE BOOKS

**R1** C.J.Date, "An Introduction to Database Systems", Addison Wesley.

**R2** Rob, " Database Principal Fundamental Design, Cengage Learning.

**R3** Thomas M. Connolly, Carolyn & E. Begg, "Database Systems: A Practical Approach to Design, Implementation and Management", 5/E, University of Paisley, Addison-Wesley.

## COURSE CONTENT

### Unit I: Introduction to Databases and Relational Algebra

12 Contact Hours

**Overview of Databases:** Database concepts, DBMS, Data Base System Architecture (Three Level ANSI-SPARC Architecture), Advantages and Disadvantages of DBMS, Data Independence, DBA and Responsibilities of DBA, Relational Data Structure, Keys, Relations, Attributes, Schema and Instances, Referential integrity, Entity integrity.

**Data Models:** Relational Model, Network Model, Hierarchical Model, ER Model: Design, issues, Mapping constraints, ER diagram, Comparison of Models.

**Relational Algebra & Relational Calculus:** Introduction, Syntax, Semantics, Additional operators, Grouping and Ungrouping, Relational comparisons, Tuple Calculus, Domain Calculus, Calculus Vs Algebra, Computational capabilities.

### Unit II: Database storage structure and data accessing techniques 12 Contact Hours

**Functional dependencies and Normalization:** Functional dependencies, Decomposition, Full Functional Dependency (FFD), Transitive Dependency (TD), Join Dependency (JD), Multi-valued Dependency (MVD), Normal Forms (1NF, 2NF, 3NF, BCNF), De-normalization.

**Database Security:** Introduction, Threats, Counter Measures.

**Control Structures:** Introduction to conditional control, Iterative control and sequential control statements, Cursors, Views.

### Unit III: Transactions and concurrency

12 Contact Hours

**Package, Procedures and Triggers:** Parts of procedures, Parameter modes, Advantages of procedures, Syntax for creating triggers, Types of triggers, package specification and package body, developing a package, Bodiless package, Advantages of packages.

**Transaction Management and Concurrency Control:** Introduction to Transaction Processing, Properties of Transactions, Serializability and Recoverability, Need for Concurrency Control, Locking Techniques, Time Stamping Methods, Optimistic Techniques and Granularity of Data items.

**Database Recovery of database:** Introduction, Need for Recovery, Types of errors, Recovery Techniques.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	<i>Amrit ES-42</i>

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Apply the relational database theory, and write relational algebra expressions for queries Organize a Computer Incident Response Capability.	1 to 8,10,12
2	Understand the basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree, and hashing.	1 to 8,10,12
3	Understand the issues of transaction processing and concurrency control.	1 to 8,10,12

		E n g i n e e r i n g  K n o w l e d g e s	D es ig n/ d e v el o p r o m e nt of s ol ut io n s	T h e n i n g d e r a n s t o d u s a c i b i l i t h w o r k	E n vi ro n m e n t a n d e r a n s t o d u s a c i b i l i t h w o r k	In di vi d u al or te a m c w at u n i c a n o r i o n e	P ro je ct m a n a g e m e n t a n d f i n a r a n n e						
		1	2	3	4	5	6	7	8	9	10	11	12
20CST-233	Database Management System	3	2	3	2	2	2	2	1	0	1	0	1

1=addressed to small extent

2= addressed significantly

3=major part of course

20CST-235	PROGRAMMING IN JAVA	L	T	P	S	C	C H
Version 1.00		3	0	0	0	3	3
Pre-requisites/ Exposure	Knowledge of C/C++ programming language.						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
2. To use the Java JDK environment to create, debug and run simple Java programs, Event handling model.
3. To know how to design a simple graphical user interface (GUI), Networking, Java Database Connectivity with JDBC, and java web technology.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.
2. Create model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism
3. Learn the working of Threads, Exceptions and graphical control, Client server architecture, Web technology, database connectivity.

## COURSE DESCRIPTION

The course begins with the introduction of object oriented programming language in all programming applications. The students are then introduced to java technology and its applications in real life. The course further emphasizes on the concept of java client - server architecture and graphical interface. Then the students are introduced database connectivity and web application.

## TEXT BOOKS

**T1**      Herbert Schildt (2019), "Java The Complete Reference, Ed. 11,  
McGraw-Hill publishing company Ltd.

**T2**      Object Oriented Programming Using Java – IBM Study Material.

## REFERENCE BOOKS

**R1** Programming with Java by Balaguruswamy,- A primer, Tata Mc Graw Hill.

**R2** Understanding Object-Oriented Programming with JAVA by Timothy Budd

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 Apex Institute of Technology  
 Chandigarh University,  
 Gharuan, Mohali, Punjab

## COURSE CONTENT

Unit I:

12 Contact Hours

Introduction to Procedural Programming, Object-Oriented Programming, Features to Java Programming Language, JVM, Data types, Variables, Array, Operators, Control Statements, Classes and Object, Inheritance, final, Dynamic method dispatch ,Package and Interfaces.

Unit II:

12 Contact Hours

Exception Handling ,Multithread and Synchronization, Wrapper classes, I/O Streams(with NIO),File Handing and Serialization, Concrete class, Generics classes , Collections Interface and Classes, Strings & String Buffer ,Utility Classes , Networking classes and Interfaces , TCP/IP Client/Server socket.

Unit III:

12 Contact Hours

Event Handling ,AWT, Swings, Java Beans(getter-setter methods), Java Servlet (Servlet lifecycle, Http Request, Http Response),Java Server Pages (JSP architecture, client request, cookies handling),Database connectivity using different drivers and statements, callable statement, prepared statement

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Components	Theory	
	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks		100

### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and Pos		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	After completion of this course, student will be able understand Object oriented programming concepts, Working knowledge about all control statements in java and Implement Object oriented features.	1 to 5, 12

2	After completion of this course, student will be able understand Exception handling ,Input / output process ,file handling and Organizing a client – server architecture	1 to 5,6, 12
3	After completion of this course, student will be able Understanding Event handing with graphical controls and web control like: servlet and JSP concepts, Working with database connectivity	1 to 5,6,11 12

Project management Life long Learning											
Engineering Knowledge Design/development Environment Project management Problem oriented Conduct investigations Modern engineering Model analysis Environment and sustainability Individual dual orientation Computer and financial management Research work											
Engineering Knowledge Design/development Environment Project management Problem oriented Conduct investigations Modern engineering Model analysis Environment and sustainability Individual dual orientation Computer and financial management Research work											
		1	2	3	4	5	6	7	8	9	10
20CST-234	Programming in Java	3	3	3	2	3	3	2	0	0	1
											3

1=addressed to small extent

2= addressed significantly

3=major part of course

Amrit  
ES942

Head of the Department (CSE)  
 Apex Institute of Technology  
 Chandigarh University,  
 Gharuan, Mohali, Punjab

20CSP-235	PROGRAMMING IN JAVA LAB	L	T	P	S	C	C H
Version 1.00		0	0	2	0	1	2
Pre-requisites/ Exposure	Knowledge of C/C++ programming language.						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

- To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To use the Java JDK environment to create, debug and run simple Java programs, Event handling model.
- To know how to design a simple graphical user interface (GUI), Networking, Java Database Connectivity with JDBC, and java web technology.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

- Take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.
- Create model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism
- Learn the working of Threads, Exceptions and graphical control, Client server architecture, Web technology, database connectivity.

## COURSE DESCRIPTION

The course begins with the introduction of object oriented programming language in all programming applications. The students are then introduced to java technology and its applications in real life. The course further emphasizes on the concept of java client - server architecture and graphical interface. Then the students are introduced database connectivity and web application.

## TEXT BOOKS

**T1** Herbert Schildt (2019), "Java The Complete Reference, Ed. 11,  
McGraw-Hill publishing company Ltd.

**T2** Object Oriented Programming Using Java – IBM Study Material.

## REFERENCE BOOKS

**R1** Programming with Java by Balaguruswamy, – A primer, Tata Mc Graw Hill.

**R2** Understanding Object-Oriented Programming with JAVA by Timothy Budd

## COURSE CONTENT

Exp. No.	Title	Description	CO Mapping
1	Introduction to Java and Basic Syntax	Write a Java program to demonstrate basic syntax, data types, and control structures (if-else, switch, loops).	CO1
2	Class and Object Implementation	Create a class Student with fields like name, rollNumber, and marks. Create methods to display details and calculate average marks.	CO2
3	Constructor and Method Overloading	Create a Rectangle class with overloaded constructors and methods to calculate the area and perimeter.	CO2
4	Inheritance and Polymorphism	Implement multilevel inheritance with a Vehicle class, and demonstrate method overriding using polymorphism.	CO3
5	Abstract Classes and Interfaces	Create an abstract class Shape with an abstract method calculateArea() and extend it in Circle and Rectangle classes.	CO3
6	Exception Handling	Write a program to demonstrate try-catch, finally, throw, and throws keywords using custom exceptions.	CO4
7	File Handling	Write a Java program to read and write data to a file using FileReader and FileWriter.	CO4
8	Multithreading	Create a multithreaded program using Thread class and Runnable interface to demonstrate thread lifecycle and synchronization.	CO5
9	Collections Framework	Write a Java program using ArrayList, HashSet, and HashMap to store and manipulate data.	CO5
10	JDBC Connectivity	Write a Java program to connect to a MySQL database using JDBC, execute queries, and display results.	CO6

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks	100	

#### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and Pos		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	After completion of this course, student will be able understand Object oriented programming concepts, Working knowledge about all control statements in java and Implement Object oriented features.	1 to 5, 12 <i>Amrit ES/KA</i>

2	After completion of this course, student will be able understand Exception handling ,Input / output process ,file handling and Organizing a client – server architecture	1 to 5,6,12
3	After completion of this course, student will be able Understanding Event handing with graphical controls and web control like: servlet and JSP concepts, Working with database connectivity	1 to 5,6,11 12

Project management Life long Learning													
Design and Development Environment Individual Contributors Project Management and Finance													
Engineering Problems Conduct investigations of complex problems Engineering Analysis and Solutions													
20CST-234	Programming in Java	1	2	3	4	5	6	7	8	9	10	11	12

1=addressed to small extent

2= addressed significantly

3=major part of course

  
 Head of the Department (CSE)  
 Apex Institute of Technology  
 Chandigarh University,  
 Gharuan, Mohali, Punjab

	<b>PROBABILITY AND STATISTICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C</b>
<b>Version 1.00</b>		3	0	0	0	3	3
<b>Pre-requisites/ Exposure</b>	Knowledge of basic probability and basic concepts of statistics.						
<b>Co-requisites</b>	-						

## COURSE OBJECTIVES

The Course aims to:

1. Identify and apply basic and advance concepts of probability, Regression, Correlation and discrete and continuous probability distributions.
2. Apply the knowledge and skills obtained to investigate and solve a variety of data science and machine learning problems.
3. Identify and apply the basic concepts of estimation, weak law of large numbers and central limit theorem.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Understand the concept of probability, Random Variable and Knowledge about probability distribution.
2. Understand the important bi-variate random variable, functions of random variable
3. Understand how to apply regression and correlation in data sciences.

## COURSE DESCRIPTION

The course begins with the introduction of random variables and probability distributions, Multiple Correlation and Regression which is widely utilized in all engineering applications. The students are then introduced to two dimensional random variables. The course further emphasizes on the concept of method of estimation. Then the students are introduced algorithms using regression which is highly used in machine learning and Data Sciences.

## TEXT BOOKS

**T1** Ross S. M., Introduction to Probability Models, Edition 6<sup>th</sup> 1997, Academic Press.

**T2** Spiegel Murray R., Schiller John J., R. Alu Srinivasan, 3<sup>rd</sup> edition, Schaum Series.

**T3** Fundamental of mathematical Statistics. SC Gupta and VK Kapoor 6<sup>th</sup> edition, Sultan Chand.

## REFERENCE BOOKS

**R1** Blake I., An Introduction to Applied Probability, John Wiley & Sons.

**R2** Yagolam A. M. and Yagolam I. M.: Probability and Information, Hindustan Publishing Corporation, Delhi, 1983.

## COURSE CONTENT

Unit I

*J. M. N.  
ES-442*

Head of the Department (CSE)  
Apex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

12 Contact Hours

**Random Variable and probability distributions:** Basics of one dimensional random variable- Introduction, Discrete and continuous random variable, Expectation of random variable, Moments, Geometric distribution, Negative Binomial, Exponential and uniform distribution.

**Curve fitting and multiple correlation and regression:** Partial and multiple Correlation, curvilinear regression, polynomial fit of Non-linear regression, fitting of power curves and fitting of exponential and normal curves.

### Unit II

12 Contact Hours

**Two-dimensional Random variable and distribution function:** 2d-joint P.M.F, Marginal prob. Functions, Conditional Prob. Function, two dimensional distribution function, joint density function, Marginal density function, Conditional distribution function and conditional probability density function.

**Moments and Expectation:** Elementary knowledge of double integrals and Jacobian, Transformation of 2-d random variable, distribution of difference, Product, quotient of two R.V, moments of bivariate probability distribution, conditional expectation and conditional variance for discrete and continuous case.

### Unit III

12 Contact Hours

**Methods of estimation:** Difference between likelihood and probability, Characteristics of estimators, Method of maximum likelihood estimation, Method of minimum variance, Method of moments, Method of least squares.

**Algorithm using regression:** Gradient descent algorithm, locally weighted regression, logistic regression. Weak law of large numbers and Central limit theorem.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Components	Theory	
	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks		100

### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Program Outcome (PO)
1	Understand the concept of probability, Random Variables, the Department (CSE), knowledge about probability distribution	ES1, ES2, 3, 4, 5, 12 Apex Institute of Technology, Chandigarh University, Gharuan, Mohali, Punjab

2	Understand the important bi-variate random variable, functions of random variable	1, 2, 3, 4, 5, 12
3	Understand how to apply regression and correlation in data sciences.	1, 2, 3, 4, 5, 12

Project management											
Lifelong Learning											
Engineering Development Environment											
	D es ig n/ d e v el o p m bl e nt inve stigati on s ol ut ion s ys s			T h e n e n gi n er a n d er a n st o s ci et y	E n vi ro n m e n t a n d s u n a bi li t y	In di vi d u al or te a m w or k					
1	2	3	4	5	6	7	8	9	10	11	12
20CST216	Probability and Statistics	3	2	2	1	1	0	0	0	0	1

1=addressed to small extent

2= addressed significantly

3=major part of course

*Amrit  
ES942*

Head of the Department (CSE)  
Apex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

20UCX249	Entrepreneurship -self study mode (MNG)	L	T	P	S	C	C H
Version 1.00		0	0	0	1	1	1
Pre-requisites/ Exposure	General awareness Entrepreneurship and entrepreneurial challenges.						
Co-requisites	-						

### COURSE OBJECTIVES

The Course aims to:

1. Introduce the students to the defining characteristics of an entrepreneur.
2. Introduce the students to concepts related to Strategy, Finance and Planning essential for an entrepreneur to take into consideration for conceiving and launching an enterprise.
3. Impart knowledge about Institutional Support available for financing an enterprise.

### COURSE OUTCOMES

On completion of this course, the students are expected to:

1. Understanding the concept of Entrepreneur and process models.
2. Understanding of different regulations related to an Entrepreneur.
3. Broad understanding of Institutional support available to an Entrepreneur.

### COURSE DESCRIPTION

The course attempts to create understanding about the various aspects of the Entrepreneurial challenges and start-up basic elements. Tasks will help students to build the practical approach towards the entrepreneurial world. This course will make students able to create the business ideas will also help to set up their own startups.

### TEXT BOOKS

- T1** Dr. K.C. Sharma,(2012) Entrepreneurship Development, JAIN PUBLICATIONS.

### REFERENCE BOOKS

- R1** "Entrepreneurial Development and Small Business Management" by Dr P T Vijayashree & M Alagammai
- R2** "Entrepreneurial Development" by Khanka S S.
- R3** "Dynamics of Entrepreneurial Development and Management" by V Desai
- R4** Entrepreneurship Development by G.P.Prasain(2015), McGraw Hill Publications.
- R5** Entrepreneurship Development and Management by Dr. A K Singh (2006), Modern Publishers

### COURSE CONTENT

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## Unit-I: Introduction and planning stage

**INTRODUCTION:** - Entrepreneurship, Role of Entrepreneurship, Scope and Importance of Entrepreneurship, Introduction to new Venture, Opportunities and challenges.

**IDEA GENERATION:** - SWOT analysis, New and Existing Product and Services, Franchising and its benefits.

## Unit-II: Implementation stage

**BUSINESS PLAN DEVELOPMNT:** - Value Propositions, Customer segments, Channels, Customer relation, Revenue streams, Key resources, Partners, Activities, Costs.

**SOURCES FOR START-UP:** - Financial Analysis/Project estimation cost, Financial institution, loans etc.

**REGISTRATION PROCESS:** - Government policies and prospects.

## Unit-III: Sustainability and growth

Selling plan, Vendor Management, Branding and Advertising, Business Growth, Social effect of business and its eco-friendliness

### Mode of Evaluation:

"The performance evaluation will be Rubric based through CUIMS".  
"Internal = 0 & External = 0"

Students have to perform certain tasks related to practical aspects of Entrepreneurship; based on that 'QUALIFIED AND NON-QUALIFIED' status will be given.

### **Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and Pos		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Understanding the concept of Entrepreneur and process models.	-
2	Understanding of different regulations related to an Entrepreneur.	-
3	Broad understanding of Institutional support available to an Entrepreneur. <i>Amrit ESYD</i>	-

		Project management	Life-long Learning										
		1	2	3	4	5	6	7	8	9	1	1	12
20UCX249	Entrepreneurship – self study mode (MNG)	0	0	0	0	0	0	0	0	0	0	0	0

1=addressed to small extent

2= addressed significantly

3=major part of course

*Arvind  
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Gharuan, Mohali, Punjab

20CSP-233	Database Management System Lab	L	T	P	S	C	C H
Version 1.00		0	0	2	0	1	1
Pre-requisites/ Exposure	Knowledge of basic file management systems						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. Understand database system concepts and design databases for different applications and to acquire the knowledge on DBMS and RDBMS.
2. Implement and understand different types of DDL, DML and DCL statements.
3. Understand transaction concepts related to databases and recovery/backup techniques required for the proper storage of data.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Apply the relational database theory, and write relational algebra expressions for queries
2. Organize a Computer Incident Response Capability.
3. Understand the basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree, and hashing.
3. Understand the issues of transaction processing and concurrency control.

## COURSE DESCRIPTION

The course begins with the introduction of Introduction to DBMS and RDBMS and SQL Commands which are widely utilized in all engineering applications. The students are then introduced to Database Joins, Indexes, views, cursors and triggers. The course further emphasizes on the concept of Database System Designing.

## TEXT BOOKS

**T1** Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database System", The Benjamin / Cummings Publishing Co.

**T2** Korth and Silberschatz Abraham, "Database System Concepts", McGraw Hall.

**T3** Pratt, "DBMS", Cengage Learning.

## REFERENCE BOOKS

**R1** C.J.Date, "An Introduction to Database Systems", Addison Wesley.

**R2** Rob, "Database Principal Fundamental Design, Cengage Learning.

**R3** Thomas M. Connolly, Carolyn & E. Begg, "Database Systems: A Practical Approach to Design, Implementation and Management", 5/E, University of Paisley, Addison-Wesley.

## COURSE CONTENT

Unit I: Introduction to DBMS and RDBMS and SQL Commands      4 Contact Hours

1. Introduction to DBMS, RDBMS, Oracle and basic SQL Commands
2. Create tables and specify the Queries in SQL.
3. To Manipulate the Operations on the table.
4. To implement the restrictions on the table.
5. To implement the structure of the table.

Unit II: Database Joins, Indexes, views, cursors and triggers

4 Contact Hours

1. To implement the concept of Joins.
2. To implement the concept of grouping of Data.
3. To implement the concept of Sub Query.
4. To implement the concept of Indexes, cursors, triggers and views.

Unit III: Database System Designing

4 Contact Hours

1. Design a case study for Company Database System./ Hospital Management System/ Railway Reservation System.

MODE OF EVALUATION: The performance of students is evaluated as follows:

Components	Practical	
	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks		100

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and Pos		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Apply the relational database theory, and write relational algebra expressions for queries Organize a Computer Incident Response Capability <i>Arman CSE</i>	1 to 8,10,12

2	Understand the basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree, and hashing.	1 to 8,10,12
3	Understand the issues of transaction processing and concurrency control.	1 to 8,10,12

Engineering Knowledge												Project Management
Engineering Environment												Lifelong Learning
Industrial Environment												Contemporary and Future Trends
	D	e	s	i	n	T	E	I	P			
	e	n	g	e	n	h	n	n	r	ro	je	ct
	i	n	e	e	v	e	o	i	a	m	m	m
	n	g	i	n	o	p	m	g	d	u	g	g
	w	o	o	o	m	r	o	i	e	o	e	e
	l	o	o	o	w	o	n	n	s	o	a	l
	d	o	o	o	l	o	a	a	u	r	n	o
	g	o	o	o	u	o	s	s	t	o	d	g
	e	s	s	s	s	o	o	o	o	o	f	g
						Con-	duc-	en-	vi-	di-	ma-	ge-
						duct	inves-	gi-	de-	vi-	an-	me-
						inves-	tigati-	na-	er-	du-	de-	nt
						tigati-	on	to-	er-	al-	re-	lo
						on	of	ol-	d-	o-	te-	n
						of	com-	u-	s-	u-	am-	g
						com-	plex	s-	o-	o-	ni-	an
						plex	probl-	a-	ci-	o-	c-	ni
						probl-	ems	g-	et-	o-	at	ce
						ems		y	ty	s	io	ce
	1	2	3	4	5	6	7	8	9	10	11	12
20CSP-233	Database Management System Lab	3	2	3	2	2	2	1	0	1	0	1

1=addressed to small extent

2= addressed significantly

3=major part of course

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20CSP-236	DATA STRUCTURES LAB	L	T	P	S	C	C H
Version 1.00		0	0	2	0	1	1
Pre-requisites/ Exposure	C and C++						
Co-requisites	20CSP-236						

## COURSE OBJECTIVES

The Course aims to:

1. Develop the ability of the students for identifying and applying the suitable data structure for the given real world problem
2. Demonstrate design skills and analyse- simple, linear and non-linear data structures.
3. Teach and apply through programming languages to model real world problems.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Argue the correctness of algorithms using inductive proofs and invariant.
2. Compare between different data structures. Pick an appropriate data structure for a design situation.
3. Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures.

## COURSE DESCRIPTION

The main purpose of this course is to provide the students with solid foundations in the basic concepts of data structures. Students will gain exposure to coding and visualizing data structures. Through the course students will be given a concrete understanding of data structures by writing their own programs. This course covers the concepts of linear and non-linear data structures in computer science. Topics covered include: arrays; linked lists; stack; queue; trees; hashing; graphs; searching; sorting; space and time complexity, asymptotic analysis.

## TEXT BOOKS

- T1 Lipchitz, Seymour, "Data Structures", Schaum's Outline Series, Tata McGraw Hill
- T2 Gilberg/Forouzan," Data Structure with C,Cengage Learning.
- T3 Augenstein, Moshe J, Tanenbaum, Aaron M, "Data Structures using C and C++", Prentice Hall of India

## REFERENCE BOOKS

- R1 Goodrich, Michael T., Tamassia, Roberto, and Mount, David M., "Data Structures and Algorithms in C++", Wiley Student Edition.
- R2 Aho, Alfred V., Ullman, Jeffrey D., Hopcroft, John E. "Data Structures and Algorithms", Addison Wesley

## COURSE CONTENT

Unit I:

4 Contact Hours

1. Write a menu driven program that implements following operations (using separate functions) on a linear array:
  - a. Insert a new element at end as well as at a given position
  - b. Delete an element whose value and positions are given
  - c. Find the location of an element
  - d. Display elements of linear array
2. Write a program to implement the following operations on strings:
  - a. Read a string, replace string, perform pattern matching, find and replace any occurrences of a pattern
3. Write a program to implement the functions on a stack:
  - a. PUSH
  - b. POP
  - c. OVERFLOW& UNDERFLOW
4. Write a program for converting an Infix Expression to Postfix Expression

Unit II:

4 Contact Hours

1. Design, Develop and Implement a Program for the following Stack Applications:
  - a. Evaluation of Suffix expression with single digit operands and operators: +, -, \*, /, %, ^
  - b. Solving Tower of Hanoi problem with n disks.
2. A menu driven Program for the operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX)
3. A menu driven Program for operations on Singly Linked List (SLL)
4. A menu driven Program for the operations on Doubly Linked List (DLL)
5. Design, Develop and Implement a Program for the following operations on Singly Circular Linked List (SCLL) with header nodes
  - a. Represent and Evaluate a Polynomial  $P(x,y,z)$
  - b. Find the sum of two polynomials  $POLY1(x,y,z)$  and  $POLY2(x,y,z)$  and store the result in  $POLYSUM(x,y,z)$
  - c. Support the program with appropriate functions for each of the above operations

Unit III:

4 Contact Hours

1. Design, Develop and Implement a menu driven Program for the following operations on Binary Search Tree (BST) of Integers
2. Design, Develop and Implement a Program in C for the following operations on Graph(G) of Cities
3. Given a File of N employee records with a set K of Keys(4-digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table(HT) of m memory locations with L as the set of memory addresses (2-digit) of locations in HT. Let the keys in K and addresses in L are Integers. Design and develop a Program in C that uses Hash function  $H: K @ L$  as  $H(K)=K \bmod L$

- m (remainder method), and implement hashing technique to map a given key K to the address space L.
- Resolve the collision (if any) using linear probing
  - Program to Sort an Array of Integers in Ascending Order Using Heap Sort
  - Program To Sort An Array Of Integers In Ascending Order Using Merge Sort

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Components	Practical	
	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks	100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

SN	Course Outcome (CO)	Mapping Between COs and Pos	Mapped Programme Outcome (PO)
1	Argue the correctness of algorithms using inductive proofs and invariant.		1 to 5, 12
2	Compare between different data structures. Pick an appropriate data structure for a design situation.		1 to 3
3	Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures.		1 to 4, 12

Engineering / Design	Modern Engineering Environment	Industrial Project Management	Project Management	Lifelong Learning
Principles of Programming	Concurrent Engineering	Industrial Project Management	Project Management	Lifelong Learning
Robotics	Product Development Environment	Industrial Project Management	Project Management	Lifelong Learning
Robotics	Product Development Environment	Industrial Project Management	Project Management	Lifelong Learning
Robotics	Product Development Environment	Industrial Project Management	Project Management	Lifelong Learning

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														<b>n a n c e</b>
														<b>b il it y</b>
														<b>o l u t i o n s</b>
<b>20CSP- 236</b>	<b>Data Structures Lab</b>	1	2	3	4	5	6	7	8	9	10	11	12	
1=addressed to small extent 2= addressed significantly 3=major part of course		3	2	2	1	1	0	0	0	0	0	0	0	1

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<b>20CSP-232</b>	<b>OPERATING SYSTEM LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		0	0	2	0	1	1
Pre-requisites/ Exposure	C and C++						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. To implement Linux commands and system calls.
2. To implement shell programming and concepts.
3. To perform various scheduling algorithms.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Understand and apply basic commands and system calls of operating System by using Linux environment.
2. Understand and Perform the shell programming and its concepts
3. Understand and implement the various operating system algorithms

## COURSE DESCRIPTION

This lab complements the operating systems course. Students will gain practical experience with designing and implementing concepts of operating systems such as system calls, CPU scheduling, process management, memory management, file systems and deadlock handling using C language in Linux environment.

## TEXT BOOKS

**T1** Galvin, Peter B., Silberchatz,A., "Operating System Concepts", Addison Wesley, 9th Edition.

**T2** William Stallings, Operating Systems Internals and Design Principles, 7<sup>th</sup> edition Pearson Education Limited, 2014 ISBN: 1292061944, 9781292061948.

## REFERENCE BOOKS

**R1** Andrew Tananbaum , "Operating System", PHIL earning.

**R2** Godbole, Kahate, "Operating System :A Concept Based Approach", Tata Mc- Graw-Hill.

## COURSE CONTENT

Unit I:

4 Contact Hours

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1. Installation of Linux operating system.
2. Study of basic Linux commands.
3. Programs using the following system calls of Linux operating system
  - a. fork, getpid, getppid, exit, wait, close.
  - b. I/O system calls of Linux operating system (open, read, write etc).
4. Study of basics of shell programming.

**Unit II:**

4 Contact Hours

5. Write a program
  - a. to show the use of echo .
  - b. to read the keywords in shell programming.
6. Write programs using
  - a. Arithmetic operators in shell programming.
  - b. Boolean operators in shell programming.
7. Write programs using
  - a. Control structures in shell programming.
  - b. Difference between while and until statement.

**Unit III:**

4 Contact Hours

8. Simulation of First come first serve CPU scheduling algorithm.
9. Simulation of Shortest job first CPU scheduling algorithm.
10. Simulation of Round Robin CPU scheduling algorithm.
11. Simulation of Priority based CPU scheduling algorithm.
12. Simulate the Bankers algorithm for deadlock avoidance and deadlock prevention.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Practical		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks	100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and Pos		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
	Head of the Department (CSE) Apex Institute of Technology Chandigarh University, Gharuan, Mohali, Punjab	

	Understand and apply basic commands and system calls of operating System by using Linux environment.	1 to 5, 12
2	Understand and perform the shell programming and its concepts	1 to 5
3	Understand and implement the various operating system algorithms	1 to 5, 12

												Pr o j ec t m a n a g e m e n t a n d f i n a n n g
	E n g i n e er in g K n o w le d g e	D es ig n/ d e v el o p m e nt i nves tigati on s of so lu com plex probl ems	T h e e n v e n vi r o n m e n t a n d s u st a n d so ci bi lit y	M o d e r a n d r a n d s o ci bi lit y	In di v i d u al m o r a n a m w or k	C o m m a n u n i c a n t i o n	L if e lo n g L e ar ni n g					
20CSP- 232	Operating Structures Lab	1    2    3    4    5    6    7    8    9    10    11    12	3    2    3    1    2    1    2    1    2    1    0    3									

1=addressed to small extent.

2= addressed significantly

3=major part of course

*Amrit  
ES142*

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20UCY246	Life Skills and Mentoring-3	L	T	P	S	C	C H
Version 1.00		0	1	0	0	1	1
Pre-requisites/ Exposure	Life Skills and Mentoring-2						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. Mentoring-To monitor, motivate and guide students, Monitor the regularity and discipline of students. Monitoring, extra-curricular activities, Co-curricular activities, Social Internship and participation in Clubs
2. Personal Self-Management Skills-Students develop skills that help them enhance self-esteem, Transact the skill of self-awareness to students, develop problem-solving abilities, reduce stress and anxiety, and manage anger for better mental health. Helping them to understand the importance of Goal setting and developing the skill of perseverance.
3. General Social Skills- Students gain skills to meet personal challenges, communicating clearly, building relationships, and avoiding violence. Students strengthen their communication skills and learn how to build healthy relationships.
4. Value Inculcation- Students to know about the relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realize one's potentials.

## COURSE DESCRIPTION

To develop interpersonal skills and adopt good leadership behavior for empowerment of self and others.

### Text Books:

1. Mentoring Programme Handbook, Chandigarh University, 2019

### Reference Books:

1. Goals! How to get everything you want –Faster than you ever thought possible. By Brian Tracy
2. Daniel Goleman (2012). Working with Emotional Intelligence. Bloomsbury Publishing India Private Limited

### Web Resources:

1. <http://www.skillsyouneed.com/ips/improving-communication>.
2. <https://www.mindtools.com/>
3. [www.psychologytoday.com](http://www.psychologytoday.com)

## COURSE CONTENT

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 Gharuan, Mohali, Punjab  
 Gharuan, Mohali, Punjab

### Unit I: Emotional Intelligence

4 Contact Hours

Coping with emotions  
Positive thinking

### Unit II: Active coping

4 Contact Hours

Coping with stress  
Coping with anger  
Building Resilience

### Unit III: Values

4 Contact Hours

Giving

**Mode of Evaluation:** The performance of students is evaluated as follows:

Components	Theory	
	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	NA	NA
Total Marks	NA	NA

### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

SN	Mapping Between COs and Pos	
	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Understand the concept and nature of Self Awareness, Developing and assessing the Self Awareness, Developing planning and organizational skills, Developing and assessing the Self Esteem	1, 2,3,4
2	Understanding ways to build self confidence and develop Introspection ability, Understanding stressors, and Active coping, Awareness on Drug abuse and Prevention, Understanding of interpersonal skills to manage relationships	1, 2,3,4
3	Clarifying the concept of value-education, Inculcate good manners and responsible behavior, Enhances tolerance, Promotes sense of respect for others feelings, Role of a student towards family, Society and their educational institute	1, 2, 3,4

		D e s i g n / d e v e l o p m e n t			E n v i r o n m e n t			I n d i v i d u al	P r o j e c t	m a n a g e m e n t	L if e - l o n g L e a r n i n g	
		E n g i n e e r i n g K n o w le d g e	P r o b l e m a n a l y s i s	Con duct inve stiga tions of com plex prob lems	M o d e r n t o o l u s a g e	T h e e n g i n e r a n d s o ci et y	a n d s o ci et y	s t a b il it y	E t h ic s	C o m m u n ic at i o n	I n d i v i d u al o r te a m w o r k	
20UCY24 6	Life Skills and Mentoring-3		1 2 3 4 5 6 7 8 9 10 11 12									

1=addressed to small extent

2= addressed significantly

3=major part of course

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20TDP-201	Soft Skills	L	T	P	S	C	C H
Version 1.00		0	0	2	0	1	1
Pre-requisites/ Exposure	Basic Knowledge of English Language and Grammar						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. impart soft skills practical knowledge to enable students enhance their communication skills and employability.
2. Work upon the students' accent, pronunciation and MTI.

## COURSE OUTCOMES

On completion of this course, the students are expected-

1. To enhance the Creative Thinking and effective Presentation Skills of the students.
2. To build a learning attitude among students and enhance their general awareness about various categories to become globally smart and be proficient in performing in group discussions
3. To make students self-aware and interview ready.

## COURSE DESCRIPTION

The course focuses on the building and enhancing the basic soft skills required by the students to become employable and augment their chances of securing a job while sharpening their communication skills. The course will focus on sharpening the spontaneity in the students and build their confidence by effectively handling various situations related to individual and team performances. Various activities planned in the course will also focus on augmenting fluency and listening skills of the students while deliberating on essential grammar, vocabulary, and pronunciation.

## TEXT BOOKS

- T1** CU-DCDP Verbal Ability Book- Comprehending Verbal Ability for Success.

## REFERENCE BOOKS

- R1** Edward de. Bono., Serious Creativity, Paperback
- R2** James Webb Young, A Technique for Producing Ideas, Mc. Graw Hill
- R3** Rashmi Bansal, Connecting the Dots, Westland Limited

## COURSE CONTENT

### Unit I:

- Goal Setting
- Idea Generation Skills
- Group Discussions
- Strengthening Grammar
- Accent Neutralization

4 Contact Hours

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**Unit II:**

- Self Perlustration
- Abstract Topic Based Mock GDs
- Presentation Skills
- Effective Writing
- Verbal Wrangle

4 Contact Hours

**Unit III:**

- Presentation Duo
- Personal Interview Basics
- Video Analysis
- LinkedIn Profiling and Blog Writing
- The Anchor Show

4 Contact Hours

**Mode of Evaluation:** The performance of students is evaluated as follows:

Practical		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks	100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

SN	Course Outcome (CO)	Mapping Between COs and POs	
		Mapped Programme Outcome (PO)	
1	To enhance the Creative Thinking and effective Presentation Skills of the students.		
2	To build a learning attitude among students and enhance their general awareness about various categories to become globally smart and be proficient in performing in group discussions		
3	To make students self-aware and interview ready.		

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		C	o	n	d	u	c	t	i	n	v	e	r	o	n	m	e	n	t	a	s	s	u	s	t	a	i	n	a	b	E	t	h	i	c	o	o	1	1	12	
		1	2	3	4	5	6	7	8	9	1	0	1	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20TDP-201	Soft Skills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1=addressed to small extent

2= addressed significantly

3=major part of course

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20CSI239	Institute Training	L	T	P	S	C	C H	Course type
Version 1.00		0	0	0	4	1	0	Summer Training
Pre-requisites/ Exposure	-							
Co-requisites	-							
Anti-requisites	-							

#### Rubrics for Evaluation of Training

The internship of the students will be evaluated as follows:

Evaluation by Industry Supervisor: 50%

Evaluation through presentation/viva-voce at the University: 50%

Evaluation Dimensions	Evaluation by Industry Supervisor – Grading Rubric			Score	
	Performance Rating				
	Needs Improvement	Meets Expectations	Excellent		
	40% - 60%	60% - 80%	80% - 100%		
<b>Internship Evaluation Dimensions – Grading Criteria</b>					
Quality of Work	Work was done in a careless manner and was of erratic quality; work assignments were usually late and required review; made numerous errors	With a few minor exceptions, adequately performed most work requirements; most work assignments submitted in a timely manner; made occasional errors	Thoroughly and accurately performed all work requirements; submitted all work assignments on time; made few if any errors	S11	
Ability to Learn	Asked few if any questions and rarely sought out additional information from appropriate sources; was unable or slow to understand new concepts, ideas, and work assignments; was unable or unwilling to recognize mistakes and was not receptive to making needed changes and improvements	In most cases, asked relevant questions and sought out additional information from appropriate sources; exhibited acceptable understanding of new concepts, ideas, and work assignments; was usually willing to take responsibility for mistakes and to make needed changes and improvements	Consistently asked relevant questions and sought out additional information from appropriate sources; very quickly understood new concepts, ideas, and work assignments; was always willing to take responsibility for mistakes and to make needed changes and improvements	S12	
Initiative and Creativity	Had little observable drive and required close supervision; showed little if any interest in meeting standards; did not seek out additional work and f	Worked without extensive supervision; in some cases, found problems to solve and sometimes asked for additional work assignments;	Was a self-starter; consistently sought new challenges and asked for additional work assignments; regularly approached and solved problems	SI 3 <i>Aman Esq. A</i> Head of the Department (CSE) Apex Institute of Technology Chandigarh University, Gharuan, Mohali, Punjab	

	recently procrastinated in completing assignments; suggested no new ideas or options	normal ly set his/her own goals and, in a few cases, tried to exceed requirements; offered some creative ideas	independently; frequently proposed innovative creative solutions, and ideas, and/or options	
	<b>Comments:</b>			
Character Traits	Regularly exhibited a negative attitude; was dishonest and/or showed a lack of integrity on several occasions; was unable to recognize and/or was insensitive to ethical and diversity issues; displayed significant lapses in ethical and professional behavior	Except in a few minor instances, demonstrated a positive attitude; regularly exhibited honesty and integrity in the workplace; was usually aware of and sensitive to ethical and diversity issues on the job; normally behaved in an ethical and professional manner	Demonstrated an exceptionally positive attitude; consistently exhibited honesty and integrity in the workplace; was keenly aware of and deeply sensitive to ethical and diversity issues on the job; always behaved in an ethical and professional manner	SI4
	<b>Comments:</b>			
Dependability	Was generally unreliable in completing work assignments; did not follow instructions and procedures promptly or accurately; was careless, and work needed constant follow-up; required close supervision	Was generally reliable in completing tasks; normally followed instructions and procedures; was usually attentive to detail, but work had to be reviewed occasionally; functioned with only moderate supervision	Was consistently reliable in completing work assignments; always followed instructions and procedures well; was careful and extremely attentive to detail; required little or minimum supervision	SI5
	<b>Comments:</b>			
Attendance and Punctuality	Was absent excessively and/or was almost late for work	Was never absent and almost always on time; or usually reported to work as scheduled, but was always on time; or usually reported to work as scheduled and was almost always on-time	Always reported to work as scheduled with no absences and was always on-time	SI6
	<b>Comments:</b>			
Organizational Fit	Was unwilling or unable to understand and support the organization's mission, vision, and goals; exhibited difficulty in adapting	Adequately understood and supported the organization's mission, vision, and goals; satisfactorily adapted	Completely understood and fully supported the organization's mission, vision, and goals; readily and successfully adapted	SI7

	to organizational norms, expectations, and culture; frequently seemed to disregard appropriate authority and decision-making channels	organizational norms, expectations, and culture; generally functioned within appropriate authority and decision-making channels	to organizational norms, expectations, and culture; consistently functioned within appropriate authority and decision-making channels
<b>Comments:</b>			
Response to Supervision	Rarely sought supervision when necessary; was unwilling to accept constructive criticism and advice; seldom if ever implemented supervisor suggestions; was usually unwilling to explore personal strengths and areas for improvement	On occasion, sought supervision when necessary; was generally receptive to constructive criticism and advice; implemented supervisor suggestions in most cases; was usually willing to explore personal strengths and areas for improvement	Actively sought supervision when necessary; was always receptive to constructive criticism and advice; successfully implemented supervisor suggestions when offered; was always willing to explore personal strengths and areas for improvement
<b>Comments:</b>			

Summary of Performance Evaluation by Industry Supervisor			
Evaluation Criteria	Score (from above)	Weightage	Final Score
Quality of Work	SI1	10	FI1 = (SI1/100)*10
Ability to Learn	SI2	5	FI2 = (SI2/100)*5
Initiative and Creativity	SI3	5	FI3 = (SI3/100)*5
Character Traits	SI4	10	FI4 = (SI4/100)*10
Dependability	SI5	5	FI5 = (SI5/100)*5
Attendance and Punctuality	SI6	5	FI6 = (SI6/100)*5
Organizational Fit	SI7	5	FI7 = (SI7/100)*5
Response to Supervision	SI8	5	FI8 = (SI8/100)*5
Total Score	50		PEI = FI1 + FI2 + FI3 + FI4 + FI5 + FI6 + FI7 + FI8

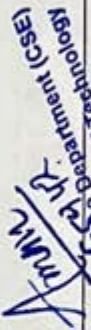
Evaluation through presentation/viva-voce at the Institute – Grading Rubric			
Evaluation	Performance Rating		
	Needs Improvement	Meets Expectations	Excellent
			Score of the Institute (CSE) Chandigarh University, Gharuan, Mohali, Punjab

Dimensions	40% - 60%	60% - 80%	80% - 100%	
	Internship Evaluation Dimensions – Grading			
Presentation Skills	Hard to follow sequence of information, no or just occasional eye contact, reads most slides.	Information presented in logical sequence; easy to follow, occasional eye contact	Varied rate of delivery, Changed pitch for emphasis, No distracting mannerisms, good eye contact, Confident body language, Connected with audience	SU1
Timing and Pace of Talk	Comments: Short 30 min OR long >35	Adequate (25-30 min)	Right length and well-paced Appropriate (30-35 min)	SU2
Audibility and Comprehensibility	Poor audibility	Not Very clear and moderately precise	Very clear and very precise	SU3
Technical Content Delivery	Explained the Technical Terms and Task Learnt During Internship but not Clear.	Not Very clear and moderately explained the Technical Terms and Task Learnt during Internship	Very clear and very precisely explained the Technical Terms and Task Learnt During Internship	SU4
INTERNSHIP Report	Comments: Some of the guidelines are followed to prepare report	Most of the guidelines are followed to prepare report	INTERNSHIP report is submitted as per the guidelines.	SU5

Summary of Performance Evaluation by Institute/Department			
Evaluation Criteria	Score (from)	Weightage	Final Score
Presentation Skills	SU 1	5	$FU1 = (SU1/100)*5$
Timing and Pace of Talk	SU 2	5	$FU2 = (SU2/100)*5$
Audibility and Comprehensibility	SU 3	5	$FU3 = (SU3/100)*5$
Technical Content Delivery	SU 4	10	$FU4 = (SU4/100)*10$
INTERNSHIP Report	SU 5	25	$FU5 = (SU5/100)*25$
Total Score		50	$PED = FU1 + FU2 + FU3 + FU4 + FU5$

### Optional Direct Evaluation Instruments

S.No	Technique	Activity Type	Solves the Problem of	Learning Taxonomic Dimensions	Description
1	3-2-1 Technique / minute paper / Exit slips	Active/Engaged Learning, Graphic Organizing, Reflecting	Low Motivation/Engagement, Surface Learning	Application: Analysis and Critical Thinking, Learning How to Learn	students write about 3 things they learned in the lecture, 2 things they found particularly interesting from the lecture, and 1 question they still have about the lecture content.
2	3-Minute Message	Learning Assessment, Presentation, Reciprocal Teaching	Lack of Participation, Low Motivation/Engagement, Surface Learning	Application: Creative Thinking, Application: mSolving, Caring	modeled on the Three-Minute Thesis (3MT) competition, students have three minutes to present a compelling argument and to support it with convincing details and examples.
3	Active Reading Document s(ARDs)	Active/Engaged Learning, Learning Assessment, Reading	Insufficient Class Preparation, Surface Learning	Foundational Knowledge, Application: Analysis and Critical Thinking, Learning How to Learn	ARDs are incomplete documents that students have to complete on their own before a lecture. In order to finish the document, students must locate and comprehend the new data. Different degrees of understanding and critical analysis may be reached by ARDs since they support tasks which foster readers at many levels.
4	Advance Organizer s	Active/Engaged Learning, Graphic Organizing	Insufficient Class Preparation, Low Motivation/Engagement, Poor Attention/Listening	Foundational Knowledge, Caring, Learning How to Learn	An advance organizer is a tool used to introduce the lesson topic and illustrate the relationship between what the students are about to learn and the information they have already learned. This tool helps students understand, retain & remember information even with overload.
5	Affinity Groupin g	Graphic Organizing, Reciprocal Teaching	Lack of Participation, Low Motivation/Engagement	Application: Analysis and Critical Thinking, Human Dimension	In Affinity Grouping, individual students generate ideas and identify common themes. Then, students form groups to sort and organize the ideas accordingly.
6	Applicatio n Article	Active/Engaged Learning, Learning Assessment, Writing	Poor Attention/Listening	Foundational Knowledge, Application: Analysis and Critical Thinking, Application: Creative Thinking, Application: Problem Solving, Learning How to Learn	During last 15 minutes of class, ask students to write a short news article about how a major point applies to a real-world situation. An alternative is to have students write a short article about how the point applies to their major.

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7	Analytic Teams	Reciprocal Teaching	Poor Attention/Listening	Foundational Knowledge: Analysis and Critical Thinking, Application: Creative Thinking, Application: Problem Solving, Learning How to Learn
8	Background Knowledge Probe	Active/Engaged Learning, Learning Assessment, Writing	Insufficient Class Preparation, Low Motivation/Engagement	Foundational Knowledge, Caring
9	Briefing Paper	Active/Engaged Learning, Writing	Low Motivation/Engagement, Surface Learning	Application: Analysis and Critical Thinking, Caring

S.No .	Technique	Activity Type	Solves the Problem of	Learning Taxonomic Dimensions	Description
10	Chain Notes	Active/Engaged Learning, Writing	Low Motivation/Engagement, Surface Learning	Application: Analysis and Critical Thinking, Caring	a strategy that begins with a question printed at the top of a paper. The paper is circulated from student to student. Each student responds with one or two sentences related to the question and passes it on to the next student. Upon receiving the previous "chain of responses," a student adds a new thought or builds on a prior statement.
11	Class Book	Active/Engaged Learning, Writing	Low Motivation/Engagement	Foundational Knowledge, Application: Creative Thinking, Integration and Synthesis, Caring	individual students work together to plan and ultimately submit a scholarly essay or research paper. Then all students' papers are published together.
12	Contemporary Issues Journal	Active/Engaged Learning, Group Work, Learning Assessment, Project Learning, Writing	Lack of Participation, Low Motivation/Engagement, Surface Learning	Application: Analysis and Critical Thinking, Application: Problem Solving, Integration and Synthesis, Human Dimension, Caring	Students look for recent events or developments in the real world that are related to their coursework, then analyze these current affairs to identify the connections to course material in entries that they write in a journal.
13	Crib Cards	Active/Engaged Learning, Surface Learning	Application: Analysis and Critical	<del>Head of the Department (CSE)</del> <del>Apex Institute of Technology</del> <del>Chandigarh University,</del> <del>McHalli, Punjab</del>	three-by-five inch index cards that students create to use during preparation for exams, on which they write whatever information they believe will be useful to them from a

Thinking    particular lecture.

S.No	Technique	Activity Type	Solves the Problem of Learning Taxonomic Dimensions	Description
14	Digital Storytelling	Active/Engaged Learning, Learning Assessment, Presentation, Project Learning, Reflecting	Low Motivation/Engagement	Foundational Knowledge, Application: eThinking, Caring
15	Dyadic Essays	Active/Engaged Learning, Writing	Surface Learning	Foundational Knowledge e, Integration and Synthesis, Learning How to Learn
16	Dyadic Interviews	Active/Engaged Learning, Reciprocal Teaching	Low Motivation/Engagement	Foundational Knowledge e, Integration and Synthesis, Human Dimension, Caring
17	Frame	Active/Engaged Learning, Group Work, Writing	Cheating, Insufficient Class Preparation, Surface Learning	Application: Analysis and Critical Thinking, Integration and Synthesis, Learning How to Learn
18	Group Grid	Graphic Organizing, Group Work, Learning Assessment	Insufficient Class Preparation, Lack of Participation, Surface Learning	Foundational Knowledge e, Integration and Synthesis, Learning How to Learn
19	Guided Notes	Active/Engaged Learning, Note Taking	Poor Attention/Listening, Poor Note-Taking	Foundational Knowledge, Learning How to Learn

~~Department (CSE)~~

Learning Taxonomic Dimensions

				Foundational	Knowledge
				e, Application: Analysis and Critical Thinking, Caring, Learning How to Learn	e, Application: Analysis and Critical Thinking, Caring, Learning How to Learn
20	Invent theQuiz	Active/Engaged Learning, Problem Solving	Cheating, Surface Learning	students write a limited number of test questions related to a recent learning module and then create an answer sheet, or alternately a model answer and scoring sheet, to accompany the test questions.	students write a limited number of test questions related to a recent learning module and then create an answer sheet, or alternately a model answer and scoring sheet, to accompany the test questions.
23	IRAs	Active/Engaged Learning, Writing	Surface Learning	students complete a written response to a reading assignment that includes three components: 1) Insights, 2) Resources, and 3) Application.	students complete a written response to a reading assignment that includes three components: 1) Insights, 2) Resources, and 3) Application.
23	Jigsaw	Active/Engaged Learning, Group Work, Reciprocal Teaching	Lack of Participation, Low Motivation/Engagement	students work in small groups to develop knowledge about a given topic before teaching what they have learned to another group.	students work in small groups to develop knowledge about a given topic before teaching what they have learned to another group.
23	Online Resource Scavenger Hunt	Active/Engaged Learning, Games	Low Motivation/Engagement	students use the Internet to engage in fact-finding and information processing exercises using instructor-specified library and Internet sources.	students use the Internet to engage in fact-finding and information processing exercises using instructor-specified library and Internet sources.
24	Personal Learning Environment	Active/Engaged Learning, Graphic Organizing, Learning Assessment, Project Learning, Reflecting	Low Motivation/Engagement, Surface Learning	set of people and digital resources an individual can access for the specific intent of learning something. Students illustrate the potential connections through a visible network of the set.	set of people and digital resources an individual can access for the specific intent of learning something. Students illustrate the potential connections through a visible network of the set.
25	Punctuate dLecture	Active/Engaged Learning, Reflecting	Poor Attention/Listening	Learning How to Learn	students listen to the lecture for approximately 15 to 20 minutes. At the end of the lecture segment, the teacher pauses and asks students to answer a question about what they are doing at that particular moment.
26	Role Play	Group Work, Learning Assessment, Presentation, Project Learning, Reciprocal Teaching	Lack of Participation, Low Motivation/Engagement, Surface Learning	Application: Creative Thinking, Application: Problem Solving, Integration and Synthesis, Human Dimension, Caring	A created situation in which students deliberately act out or assume characters or identities they would not normally assume to explain /interpret things

27	Sentence Stem Predictions (SSP)	Active/Engaged Learning, Reflecting	Low Motivation/Engagement, Poor Attention/Listening, Surface Learning	Application: Analysis and Critical Thinking, Integration and Synthesis	the professor presents a partial sentence that isstructured to prompt students to predict select aspects of the upcoming lecture.
28	Sketch Notes	Graphic Organizing, Learning Assessment, Note Taking	Poor Note-Taking, Surface Learning	Application: Analysis and Critical Thinking, Application: Creative Thinking, Integration and Synthesis	students use handwritten words and visual elements such as drawings, boxes, lines, and arrows to illustrate the main concepts from a lecture, as well as their interrelations.
29	Support a Statement	Active/Engaged Learning, Writing	Poor Attention/Listening, Poor Note-Taking, Surface Learning	Foundational Knowledge, e, Application: Analysis and Critical Thinking, Learning How to Learn	The instructor provides students with a provocative statement and prompts them to locate details, examples, or data in their lecture notes to support the statement.
30	Student-generated test questions	Active/Engaged Problem Solving	Cheating, Surface Learning	Foundational Knowledge, Application: Analysis and Critical Thinking, Caring, Learning How to Learn	Divide the class into groups and assign each group a topic on which they are each to create a question they would expect to be on exam and answer.
S.No	Technique	Activity Type	Solves the Problem of Learning Taxonomic Dimensions	Description	
31	Team Jeopardy	Games, Group Work, Learning Assessment, Reciprocal Teaching	Insufficient Class Preparation, Lack of Participation, Low Motivation/Engagement	Foundational Knowledge, Caring	A game in which student teams take turns selecting a square from a grid that is organized vertically by category and horizontally by difficulty. Each square shows the number of points the team can earn if they answer a question correctly, and more challenging questions have the potential to earn more points.
32	Test-Taking Teams	Active/Engaged Problem Solving	Low Motivation/Engagement, Surface Learning	Foundational Knowledge, e, Application: Analysis and Critical Thinking, Application: ProblemSolving, Integration and Synthesis, Human Dimension, Caring, Learning How to Learn	Students work in groups to prepare for a test. They then take the test, first individually and next as a group.

S.No	Technique	Activity Type	Solves the Problem of Learning Taxonomic Dimensions	Description
33	Think-Aloud- Pair Problem Solving	Active/Engaged Learning, Group Work, Problem Solving	Lack of Participation, Low Motivation/Engagement, Surface Learning	Application: Problem Solving, Learning How to Learn students take turns solving problems aloud while a peer listens and provides feedback.
34	Think-Pair-Share	Active/Engaged Learning, Discussion, Group Work	Lack of Participation, Low Motivation/Engagement, Surface Learning	Application: Analysis and Critical Thinking, Application: Problem Solving, Integration and Synthesis the instructor poses a question, gives students a few minutes to think about a response, and then asks students to share their ideas with a partner. Hence Think-Pair-Share.
35	Translate That!	Active/Engaged Learning, Reciprocal Teaching	Poor Attention/Listening, Surface Learning	Application: Analysis and Critical Thinking, Application: Creative Thinking pause your lecture and call on a student at random to "translate" the information you just provided into plain English for an imagined audience that you specify.
36	Triple Jump	Group Work, Learning Assessment, Presentation, Project Learning	Low Motivation/Engagement, Poor Attention/Listening, Surface Learning	Application: Analysis and Critical Thinking, Application: Problem Solving, Integration and Synthesis, Caring The Triple Jump is a problem-solving technique that is particularly effective in courses that are practical in nature and are well-suited to real-world problems. The three basic steps of the Triple Jump are: Step 1: Students individually review the case/problem and give a preliminary assessment(e.g. what I know, what I need to know, how I can find it out). Step 2: Students individually conduct research to find the information they need to offer a solution. Step 3: Students present a final analysis (e.g. here are the key issues of the case and here is how I would solve it or here is the answer).
37	Update your classmate	Active/Engaged Learning, Writing	Insufficient Class Preparation	Foundational Knowledge e, Application: Analysis and Critical Thinking, Caring, Learning How to Learn Update Your Classmate is a short writing activity where students explain what they learned in a previous class session to set the stage for new learning.

38	Variations	Group Work, Learning Assessment, Project Learning	Cheating, Surface Learning	Application: Analysis and Critical Thinking, Application: Creative Thinking, Application: Problem Solving	In Variations, students create an altered version of the original, such as rewriting the ending of a story or imagining the consequences of a changed event in history.
39	What? So What? Now What? Journals	Active/Engaged Learning, Reflecting, Writing	Surface Learning	Caring, Learning How to Learn	In What? So What? Now What? Journals, students reflect on their recent course-related activities as they respond to each prompt in a journal entry.

  
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20CSA-231	Cloud Computing and Virtualization and	L	T	P	C	S	CH	Course type
Version 1.0		3	0	0	3	0	3	Elective
	20CSA-231							
Pre-requisite	The student must be familiar with the basic knowledge of computer systems, with strong competency in at least one language (such as Java/Python)							
Co-requisite	20CST290							
Anti-requisites								

## COURSE DESCRIPTION

The course will introduce this domain and cover the topics of cloud infrastructures, virtualization, software defined networks and storage, cloud storage, and programming models. As an introduction, we will discuss the motivating factors, benefits and challenges of the cloud, as well as service models, service level agreements (SLAs), security, example cloud service providers and use cases. Next, we will focus on virtualization as a key cloud technique for offering software, computation and storage services. We will study how CPU, memory and I/O resources are virtualized, with examples from Xen and VMWare, and present real use cases such as Amazon EC2. Subsequently, students will learn about different cloud storage concepts including data distribution, durability, consistency and redundancy.

## COURSE OBJECTIVES

This course will enable you to:

Understand cloud concepts such as types of cloud computing and popular cloud deployment models

Describe types of virtualization used for data centers and understand how individuals and businesses benefit from virtualization

Access embedded videos and labs to help you along the way

## COURSE OUTCOMES

On completion of this course, the students shall be able to

CO1	Know concepts and features related to Virtualization, datacenter in cloud computing, Information storage, security
CO2	Evaluate the management of complex virtual environments.
CO3	Critically analyze key performance factors in virtualized systems.

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## SYLLABUS

<b>Unit-1</b>	<b>Introduction</b>	Contact Hours:12 hours
<b>Introduction:</b>	Definition and evolution of Cloud Computing, Enabling Technologies, Service and Deployment Models, Popular Cloud Stacks and Use Cases, Benefits, Risks, and Challenges of Cloud Computing, Economic Models and SLAs, Topics in Cloud Security	
<b>Unit-2</b>	<b>Infrastructure and Virtualization</b>	Contact Hours:12 hours
<b>Cloud Infrastructure:</b>	Historical Perspective of Data Centers, Datacenter Components: IT Equipment and Facilities, Design Considerations: Requirements, Power, Efficiency, & Redundancy, Power Calculations, PUE and Challenges in Cloud Data Centers, Cloud Management and Cloud Software Deployment Considerations	
<b>Virtualization:</b>	Virtualization (CPU, Memory, I/O), Software Defined Networks (SDN), Software Defined Storage (SDS), Case Study: Amazon EC2	
<b>Unit-3</b>	<b>Cloud Storage</b>	Contact Hours:12 hours
<b>Cloud Storage:</b>	Introduction to Storage Systems, Cloud Storage Concepts, Distributed File Systems (HDFS, Ceph FS), Cloud Databases (HBase, MongoDB, Cassandra, DynamoDB), Cloud Object Storage (Amazon S3, OpenStack Swift, Ceph	

### TEXT BOOKS

- T1. Gautam Shroff, "Enterprise Cloud Computing Technology Architecture Applications", Cambridge University Press; 1 edition, [ISBN: 978-0522137355].
- T2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach" McGraw- Hill Osborne Media; 1 edition [ISBN: 0071626948].
- T3. Dimitris N. Chorafas, "Cloud Computing Strategies" CRC Press; 1 edition [ISBN: 1439834539]

### REFERENCE BOOKS

- R1. Greg Schulz, "Cloud and Virtual Data Storage Networking", Auerbach Publications [ISBN: 978- 1439851739].
- R2. Marty Poniatowski, "Foundations of Green IT" Prentice Hall; 1 edition [ISBN: 978- 0137043750].
- R3. EMC, "Information Storage and Management" Wiley; 2 edition [ISBN: 978- 0470294225].

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**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks		100

**Internal Evaluation Component:**

**g. CO-PO MAPPING:**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	2	-	-	2	-	-	-	2	-	1	-	2	1	1	1
CO2	2	2	2	-	2	-	-	-	2	-	3	-	2	3	3	3
CO3	2	2	2	-	2	-	-	-	2	-	3	-	2	2	3	3

  
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# **SEMESTER-4**

<b>20CST-281</b>	<b>Computer Organization &amp; Architecture</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>CH</b>
Version 1.00		3	0	0	0	3	36
Pre-requisites/ Exposure	Basic concepts of digital circuits and logic design						
Co-requisites	Nil						

#### **COURSE OBJECTIVES:**

1. To have a Detailed Understanding of Various Functional Units of Computer.
2. To familiarize Students with the detailed Architectures of a Central Processing Unit.
3. To learn Memory Organization, I/O Organization, Parallel Processors.

#### **COURSE OUTCOMES:**

1. Students will be able to understand the Design, Organization and Functionality Various Functional Units of Computer like CPU (CU, ALU and Registers), Memory Organization, I/O Organization and Parallel Processors.
2. Students will be able get in-depth Knowledge of Central Processing Unit after learning Hardwired and Microprogrammed Architecture of CU.
3. Students will be able Apply their Learning to Design a Basic Computer System.

#### **COURSE DESCRIPTION**

The computer organization is concerned with the structure and behaviour of digital computers. The main objective of this subject to understand the overall basic computer hardware structure, including the peripheral devices. In this course student will broadly cover various concepts naming revision of digital components, central processing unit, control unit, memory organization, I/O organization and parallel processing.

- **Computer Organization** is concerned with the way hardware components operate and the way they are connected together to form the computer system.
- **Computer design** concerned with the hardware design of the computer.
- **Computer architecture** is concerned with the structure and behaviour of the computer as seen by user.

#### **TEXT BOOKS**

**T1:** Computer System Architecture M. M. Mano: 3rd ed., Prentice Hall of India, New Delhi, 1993.

**T2:** Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy.

**T3:** Computer Organization and Embedded Systems, Carl Hamacher.

**REFERENCE BOOKS**

**R1:** Computer Architecture and Organization, John P. Hayes.

**R2:** Computer Organization and Architecture: Designing for Performance, William Stallings.

**R3:** Computer System Design and Architecture, Vincent P. Heuring and Harry F. Jordan.

**COURSE CONTENT**

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<b>Unit I: Basic Organization of Computer</b>	<b>12 Contact hours</b>
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**Revision of basics in Boolean logic and Combinational/Sequential Circuits.**

**Data representation:** Signed number representation, fixed and floating-point representations, character representation.

**Functional blocks of a computer:** CPU, memory, input-output subsystems, control unit.

**Instruction set architecture of a CPU:** Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs.

**Computer arithmetic:** Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic, IEEE 754 format.

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<b>Unit II: Control Unit and Memory Organization</b>	<b>12 Contact Hours</b>
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**CPU control unit design:** Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU.

**Memory system design:** Semiconductor memory technologies, memory organization.

**Memory organization:** Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

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<b>Unit III: I/O Organization and Parallel Processors</b>	<b>12 Contact Hours</b>
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Chandigarh University,  
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**Peripheral devices and their characteristics:** Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB

**Pipelining:** Basic concepts of pipelining, throughput and speedup, pipeline hazards.

**Parallel Processors:** Introduction to parallel processors, Concurrent access to memory and cache coherency.

**Mode of Evaluation:** The performance of students is evaluated as follows:

Components	Theory	
Marks	Continuous Internal Assessment (CIA)	Semester End Examination (SEE)
Total Marks	40	60

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Students will be able to Understand the Design, Organization and Functionality Various Functional Units of Computer like CPU (CU, ALU, Registers), Memory Organization, I/O Organization and Parallel Processors.	1, 2, 4
2	Students will be able get in-depth Knowledge of Central Processing Unit after learning Hardwired and Microprogrammed Architecture of CU.	1, 2, 4
3	Students will be able Apply their Learning to Design a Basic Computer System.	1, 2, 4, 12

*AMAN  
ES-242*  
Head of the Department (CSE)  
Apex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

		D e s i g n / d e v e l o p e r e r o b i n g K n o w l e d g e s	P p m e r o n t o f s o n a l u t i o p r o b l e m	Con duc t inv est ati on s of co mpl ex pro ble m	M o d e r e r a n t o o l u s a g e y	E n v i r o n m e n t a n d s u s t a i n a b i t y	T h e e n g i n e r a n d s u s t a i n a b i t y	I n d i v i d u a l o r t e a m u c i c h i c r o k	N i v i d u a l o r t e a m u c i c h i c r o k	P r o j e c t m a n a g e m e n t a n d f i n a n n e g	L i f e - l o n g L e a r n i n g		
		1	2	3	4	5	6	7	8	9	10	11	12
20CST- 281	Computer Organization & Architecture	3	1	2	2	0	1	0	0	1	0	0	2

1=addressed to small extent

2= addressed significantly

3=major part of course

*Aman  
ES/4*  
Head of the Department (CSE)  
IApex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

20CST-283	ADVANCED PROBABILITY AND STATISTICS	L	T	P	S	C	CH	Course type
Version 1.00		3	1	0		4	4	core
								22CST-290
Pre-requisites/ Exposure	20CST-225							
Co-requisites	-							
Anti-requisites								

## COURSE DESCRIPTION

The course begins with the introduction of random variables and probability distributions, Multiple Correlation and Regression which is widely utilized in all engineering applications. The students are then introduced to two dimensional random variables. The course further emphasizes on the concept of method of estimation. Then the students are introduced algorithms using regression which is highly used in machine learning and Data Sciences.

### COURSE OBJECTIVES

The Course aims to:

Identify and apply basic and advance concepts of probability, Regression, Correlation and discrete and continuous probability distributions.

Apply the knowledge and skills obtained to investigate and solve a variety of data science and machine learning problems.

Identify and apply the basic concepts of estimation, weak law of large numbers and central limit theorem.

### COURSE OUTCOMES

On completion of this course, the students shall be able to

CO1	Understand the concept of probability, Random Variable and Knowledge about probability distribution
CO2	Understand the important bi-variate random variable, functions of random variable
CO3	Understand how to apply regression and correlation in data sciences.

### SYLLABUS:

*Arvind  
ES142*  
 Head of the Department (CSE)  
 Apex Institute of Technology  
 Chandigarh University  
 Gharuan, Mohali, Punjab

<b>Unit-1</b>		Contact Hours:16 HOURS
<b>Random Variable and probability distributions</b>	Basics of one dimensional random variable- Introduction, Discrete and continuous random variable, Expectation of random variable, Moments, Geometric distribution, Negative Binomial, Exponential and uniform distribution	
<b>Curve fitting and multiple correlation and regression:</b>	Partial and multiple Correlation, curvilinear regression, polynomial fit of Non-linear regression, fitting of power curves and fitting of exponential and normal curves	
<b>Unit-2</b>		Contact Hours:16 hours
<b>Two-dimensional Random variable and distribution function</b>	2d-joint P.M.F, Marginal prob. Functions, Conditional Prob. Function, two dimensional distribution function, joint density function, Marginal density function, Conditional distribution function and conditional probability density function	
<b>Moments and Expectation:</b>	Elementary knowledge of double integrals and Jacobian, Transformation of 2-d random variable, distribution of difference, Product, quotient of two R.V, moments of bivariate probability distribution, conditional expectation and conditional variance for discrete and continuous case.	
<b>Unit-3</b>		Contact Hours:16 Hours
<b>Methods of estimation:</b>	Difference between likelihood and probability, Characteristics of estimators, Method of maximum likelihood estimation, Method of minimum variance, Method of moments, Method of least squares.	
<b>Algorithm using regression:</b>	Gradient descent algorithm, locally weighted regression, logistic regression. Weak law of large numbers and Central limit theorem.	

#### TEXT BOOKS

**T1** Ross S. M., Introduction to Probability Models, Edition 6<sup>th</sup> 1997, Academic Press.

**T2** Spiegel Murray R., Schiller John J., R. Alu Srinivasan, 3<sup>rd</sup> edition, Schaum Series.

**T3** Fundamental of mathematical Statistics. SC Gupta and VK Kapoor 6<sup>th</sup> edition, Sultan Chand.

## REFERENCE BOOKS

R1 Blake I., An Introduction to Applied Probability, John Wiley & Sons.

R2 Yagolam A. M. and Yagolam I. M.: Probability and Information, Hindustan Publishing

Corporation, Delhi, 1983.

MODE OF EVALUATION: The performance of students is evaluated as follows:

Components	Theory	
	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	

Internal Evaluation Component:

### g. CO-PO MAPPING:

Course Outcome	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O1	PS O2	PS O3	PS O4
CO1	1	1	1	2	1	2	3	2	1	2	1	1	3	3	3	3
CO2	1	1	1	1	1	2	3	2	1	2	1	1	3	3	3	3
CO3	1	2	1	1	1	2	3	2	1	2	1	1	3	3	3	3

*Amrit  
ES/12*  
Head of the Department (CSE)  
Apex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

<b>20CST-282</b>	<b>DESIGN AND ANALYSIS OF ALGORITHM</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
		3	0	0	0	3	36
<b>Version 1.00</b>							
<b>Pre-requisites/ Exposure</b>		Data Structures and C/C++					
<b>Co-requisites</b>		20CSP261					

## COURSE OBJECTIVES

The Course aims to:

1. Develop understanding among the students about meaning and characteristics of algorithms.
2. Demonstrate methods to study different algorithm design techniques
3. Teach use and application of advance data structure and understanding of deterministic and non deterministic algorithms.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Design algorithms for various computing problems and analyze the time-space complexity of algorithms
2. Critically analyse the different algorithm design techniques for a given problem.
3. Working with advance data structure and understanding of deterministic and non-deterministic algorithms

## COURSE DESCRIPTION

Design and Analysis of Algorithm is a core engineering subject in computer science and related fields. It is used by practitioners to design and develop efficient algorithms to solve various real-time problems. This course assumes that a student has taken the Data Structures course. In this course, the students will be introduced to the design principles of algorithms, analyze the algorithms, and choosing the best performer (algorithm) in solving problems. There will be an emphasis on useful methods in practice.

## TEXT BOOKS

**T1** "Introduction to Algorithms", 3<sup>rd</sup> Edition, Thomas H Cormen, Charles E Lieserson, Ronald, Prentice Hall of India.

**T2** "Fundamentals of Computer Algorithms", Horowitz, Sahni and Rajasekaran, 2<sup>nd</sup> Edition, University Press

## REFERENCE BOOKS

**R1** "Data Structures using C and C++", Tanenbaum, Augenstein and Langsam, 2<sup>nd</sup> Edition , Prentice Hall of India

Head of the Department (CSE)  
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Chandigarh University,  
Gharuan, Mohali, Punjab

## COURSE CONTENT

### Unit I:

12 Contact Hours

**Algorithm performance analysis:** Worst, Average and Best case analysis. Asymptotic notations: Big-Oh, Big-Omega, Big-Theta. Time and Space complexity calculations. Analysis of iterative and recursive algorithms. Recurrence equations and their solution; substitution method & master theorem.

**Divide and Conquer:** Understanding of divide and conquer approach, Algorithms for Find Min and Max, Quick Sort, 2 Way Merge Sort

### Unit II:

12 Contact Hours

**Greedy Method:** Understanding of greedy approach, Greedy algorithms for Knapsack Fractional Problem, Job Sequencing Problem, Huffman Coding.

**Dynamic Programming:** Understanding of dynamic programming approach, Algorithms for 0/1 Knapsack problem, Longest Common Subsequence problem, Travelling Salesman Problem. All-Pair shortest path problem: Floyd-Warshall algorithm.

### Unit III:

12 Contact Hours

**Advance Data Structure:** Red-Black Tree: Rotation, insertion and deletion. B-Trees: insertion and deletion.

**String Matching:** The native string matching algorithm and Rabin-Karp algorithm.

**Computational Complexity:** Introduction to P, NP, NP-Hard and NP-Complete; Deterministic

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Components	Theory
Continuous Internal Head of the Department (CSE) Apex Institute of Technology Chandigarh University, Gharuan, Mohali, Punjab	Semester End

Marks	Assessment (CAE)	Examination (SEE)
Total Marks	40	60
		100

### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

SN	Mapping Between COs and Pos		Mapped Programme Outcome (PO)
	Course Outcome (CO)		
1	Design algorithms for various computing problems and analyze the time-space complexity of algorithms		1 to 4
2	Critically analyse the different algorithm design techniques for a given problem.		1 to 4
3	Working with advance data structure and understanding of deterministic and non-deterministic algorithms.		1 to 4, 12

 <b>Head of the Department (CSE)</b> Apex Institute of Technology Chandigarh University, Gharuan, Mohali, Punjab	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>E</td><td>n</td><td>D</td><td>E</td><td>T</td><td>E</td><td>I</td><td>P</td><td>L</td></tr> <tr> <td>n</td><td>g</td><td>e</td><td>s</td><td>n</td><td>n</td><td>d</td><td>r</td><td>i</td></tr> <tr> <td>g</td><td>i</td><td>d</td><td>v</td><td>g</td><td>m</td><td>i</td><td>o</td><td>f</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>el</td><td>o</td><td>e</td><td>v</td><td>a</td><td>n</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>o</td><td>d</td><td>g</td><td>i</td><td>g</td><td>g</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>p</td><td>e</td><td>g</td><td>n</td><td>e</td><td>e</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>ro</td><td>o</td><td>g</td><td>g</td><td>m</td><td>e</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>m</td><td>d</td><td>g</td><td>g</td><td>o</td><td>n</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>b</td><td>u</td><td>g</td><td>u</td><td>t</td><td>o</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>e</td><td>n</td><td>e</td><td>u</td><td>w</td><td>o</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>le</td><td>in</td><td>g</td><td>a</td><td>o</td><td>o</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>n</td><td>ve</td><td>g</td><td>u</td><td>r</td><td>o</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>t</td><td>stig</td><td>l</td><td>d</td><td>a</td><td>u</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>o</td><td>ations</td><td>u</td><td>s</td><td>h</td><td>u</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>w</td><td>of</td><td>o</td><td>c</td><td>o</td><td>u</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>le</td><td>com</td><td>a</td><td>et</td><td>r</td><td>u</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>d</td><td>plex</td><td>g</td><td>b</td><td>o</td><td>u</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>g</td><td>prob</td><td>e</td><td>il</td><td>r</td><td>u</td></tr> <tr> <td>g</td><td>e</td><td>e</td><td>e</td><td>lems</td><td></td><td></td><td>k</td><td>u</td></tr> </table>	E	n	D	E	T	E	I	P	L	n	g	e	s	n	n	d	r	i	g	i	d	v	g	m	i	o	f	g	e	e	el	o	e	v	a	n	g	e	e	o	d	g	i	g	g	g	e	e	p	e	g	n	e	e	g	e	e	ro	o	g	g	m	e	g	e	e	m	d	g	g	o	n	g	e	e	b	u	g	u	t	o	g	e	e	e	n	e	u	w	o	g	e	e	le	in	g	a	o	o	g	e	e	n	ve	g	u	r	o	g	e	e	t	stig	l	d	a	u	g	e	e	o	ations	u	s	h	u	g	e	e	w	of	o	c	o	u	g	e	e	le	com	a	et	r	u	g	e	e	d	plex	g	b	o	u	g	e	e	g	prob	e	il	r	u	g	e	e	e	lems			k	u
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20CST- 282	Design and Analysis of Algorithms	1 3	2 3	3 2		4 1	5 1	6 0	7 0	8 0	9 0	10 0	11 0	12 1

1=addressed to small extent

2= addressed significantly

3=major part of course

*Amrit  
ES442*  
Head of the Department (CSE)  
Apex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

20CSR-289 Version 1.00	Minor project -I	L 0	T 0	P 2	S 1	C 2	CH 2	Course Type Project
Pre-requisites/ Exposure	22CSR-288							
Co-requisites								
Anti-Requisites								

### COURSE DESCRIPTION

This course will provide a general introduction to project management. This course will equip the students to various feasibility analyses – Market, Technical, Financial and Economic. To equip them with the knowledge and skills required to be successful in applying Project Management. To make them understand techniques for Project planning, scheduling and Execution Control.

### COURSE OBJECTIVE

The objectives of this course are to:

To make them understand the concepts of Project Management for planning to execution of projects.

To make them understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.

To enable them to comprehend the fundamentals of Contract Administration, Costing and Budgeting.

### Course Outcomes:

CO1	To apply fundamental and disciplinary concepts and methods in ways appropriate to their principal areas of study.
CO2	To demonstrate skill and knowledge of current information and technological tools and techniques specific to the professional field of study.
CO3	To use effectively oral, written and visual communication.

### Syllabus:

The Syllabus for the Subject Code CSR- 288 (Minor Project I)-need not to be drafted as this is a MINOR PROJECT, students need to develop a project.

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20CST-284	PROGRAMMING IN PYTHON	L	T	P	S	C	C H
Version 1.00		0	2	0	0	2	2
Pre-requisites/ Exposure	Basics of Programming paradigms						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. Make students understand the structure, semantics and syntax of Python programming Languages
2. Make students understand and apply various data handling and visualization techniques
3. Enable students to develop and implement the first principles of data science

## COURSE OUTCOMES

On completion of this course, the students shall be able to

- Develop Python programs using Numpy by navigating software documentation
- Load, Visualize and pre-process Data Models.
- Identify and implement simple learning strategies using data science principles

## COURSE DESCRIPTION

The course begins with the introduction the Python documentation which is widely utilized in all engineering applications. The students are then introduced to Numpy. The course further emphasizes on the data visualization and pre-processing techniques. Then the students are introduced simple machine learning strategies.

## TEXT BOOKS

**T1:** Jake Vander Plas, Python Data Science handbook, O'REILLY (2016).

**T2:** Andreas C. Miller, Sarah Guido, Introduction to Machine Learning with Python, O'REILLY (2001).

## REFERENCE BOOKS

**R1** Sebastian Raschka, Vahid Mirjalili, Python Machine Learning, Packt (2014)

## COURSE CONTENT

*Amritpal Singh*  
 Head of the Department (CSE)  
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 Chandigarh University,  
 Gharuan, Mohali, Punjab

## Unit I: Introduction to Python

8 Contact Hours

**Introduction to Python Documentation:** Introduction to Python documentation, Using Library  
**Introduction to Python Programming:** History of Python, Flow chart and Algorithm Designing, Installing Python, Executing Python Programs, Internal Working of Python, Python Implementations.

**Basics of Python Programming:** Python Character Set, Token, Python Core Data Type, print() function, Assigning Value to Variable, input() function, eval() function, Formatting Number and Strings, Operators and Expressions.

**Decision Statements:** Boolean Type, Boolean Operators, Using Number and Strings with Boolean Operators, Decision Making Statements and Conditional Expressions

**Loop Control Statements:** While loop, range() Function, For Loop, Nested Loops, Break Statement, Continue Statement.

**Functions:** Syntax and Basics of a Function, Use of a function, Parameters and Arguments, Local and Global Scope Scope of a Variable, return statement and Recursive Functions.

## Unit II:

8 Contact Hours

**Strings:** str class, Inbuilt functions for String, index[] operator, traversal of String, String operators, String Operations., NumPy- Arrays- 1D Array, 2D Array, Matrices, and Types of operations

**Lists and Dictionaries:** Creating Lists, Basic list operators, Slicing, Inbuilt functions for Lists, List operator, List Methods, Splitting, Need of Dictionary, Creating a Dictionary , Adding and Replacing Values, Retrieving Values ; Deleting Items and Traversing Dictionaries.

**Tuples and Sets:** Creating Tuples; Tuple () Function, Inbuilt Functions for Tuples, Indexing and Slicing; Operations on Tuples; Traverse Tuples from a List, Set operators; Set class.

**Object-Oriented Programming:** Classes and objects, methods, Operator Overloading, Inheritance, super () and Method Overriding. Polymorphism, Encapsulations in Python

## Unit III: Machine Learning Strategies

8 Contact Hours

**File Handling:** Need of File Handling, Reading/Writing Text and Numbers to/from a File; Directories on a disk.

*Anurag  
ESY142*

**Exceptional Handling:-** Errors, Types of Error, Error Detection and Handling. Exceptions versus Syntax Errors, Raising an Exception, The AssertionError Exception, The try and except Block: Handling Exceptions, The else Clause, Cleaning Up After Using finally

**Pandas:** Using Pandas, the python data analysis library and data frames. Visualization/plotting and scatter, Matplotlib, Tkinter,

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Components	Theory	
	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks		100

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Develop Python programs using Numpy by navigating software documentation	1 to 5, 12
2	Load, Visualize and pre-process Data Models	1 to 5, 12
3	Identify and implement simple learning strategies using data science principles	1 to 5, 12

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Assessment Matrix													
		Design / Development			Environment			Individual			Project management		
		Engineering problems			Modelling and simulation			Investigations and analysis			Communication and presentation		
		Practical problems	Theoretical problems	Conduct investigations of complex problems	Modelling and simulation	Modelling and simulation	Modelling and simulation	Investigations and analysis	Investigations and analysis	Investigations and analysis	Communication and presentation	Communication and presentation	
20CST-284	PROGRAMMING IN PYTHON	1	2	3	4	5	6	7	8	9	10	11	12
		3	2	2	1	1	0	0	0	0	0	0	1

1=addressed to small extent

2= addressed significantly

3=major part of course

Amrit  
12/12/12

<b>20CSP-285</b>	<b>DESIGN AND ANALYSIS OF ALGORITHMS</b> <b>LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		0	0	2	0	1	12
Pre-requisites/ Exposure	Data Structures and C/C++						
Co-requisites	20CST-282						

## COURSE OBJECTIVES

The Course aims to:

1. Develop understanding among the students about different algorithms.
2. Demonstrate methods to algorithm design techniques
3. Teach use and application of analyzing the algorithm to select efficient algorithms.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Design algorithms for various computing problems and analyze the time-space complexity of algorithms
2. Critically analyse the different algorithm design techniques for a given problem.
3. Working with advance data structure and understanding of deterministic and non-deterministic algorithms

## COURSE DESCRIPTION

Writing algorithms is inseparable part of the life of a computer professional. It may be the field of networking, security, software and others, the algorithm is used in all the fields. To design an effective and efficient algorithm is always is the need for the industry. The course is directed to cover the important designing techniques like divide and conquer, greedy approach, dynamic programming for effective algorithm writing and implementation to solve real time problems.

## TEXT BOOKS

**T1** "Introduction to Algorithms", 3<sup>rd</sup> Edition, Thomas H Cormen, Charles E Lieserson, Ronald, Prentice Hall of India.

**T2** Horowitz, Sahni and Rajasekaran, "Fundamentals of Computer Algorithms", 2<sup>nd</sup> Edition, University Press

## REFERENCE BOOKS

**R1** Tanenbaum, Augenstein and Langsam, "Data Structures using C and C++", 2<sup>nd</sup> Edition , Prentice Hall of India

## COURSE CONTENT

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Apex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

**Unit I:**

4 Contact Hours

1. To WAP and analyze to compute the greatest common divisor (GCD) of two numbers using Loops and Recursion.
2. To WAP and analyze maximum and minimum problem using divide and conquer strategy.
3. To WAP and analyze to sort an array of integers using Quick sort.
4. To WAP and analyze to sort an array of integers using 2 Way Merge Sort.

**Unit II:**

4 Contact Hours

1. To WAP and analyze the Job Sequencing Problem.
2. To WAP and analyze the 0/1 knapsack problem.
3. To WAP and analyze the All-Pair shortest path problem using Floyd-Warshall algorithm.

**Unit III:**

4 Contact Hours

1. To WAP and analyze to find all occurrences of a pattern P in a given string S.
2. To WAP and analyze to find all occurrences of a pattern P in a given string S using Rabin Karp algorithm.
3. To WAP to implement insertion and deletion on B-Tree.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Practical		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks		100

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and Pos		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Design algorithms for various computing problems and analyze the time-space complexity of algorithms	1 to 4

2	Critically analyse the different algorithm design techniques for a given problem.	1 to 4
3	Working with advance data structure and understanding of deterministic and non-deterministic algorithms.	1 to 4, 12

Design / development Environment and industry Project management Life-long Learning												
Engineering Problems Conduct research on various aspects of engineering and industry												
Cognitively challenging problems												
	1	2	3	4	5	6	7	8	9	10	11	12
20CSP26 1	Design and Analysis of Algorithms Lab	3	3	2	1	1	0	0	0	0	0	1

1=addressed to small extent

2= addressed significantly

3=major part of course

*Anmol  
Grewal*  
Head of the Department (CSE)  
Apex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

20CSP-286	Programming in Python Lab	L	T	P	S	C	C H
Version 1.00		0	0	4	0	2	2 4
Pre-requisites/ Exposure	Data Structures and C/C++						
Co-requisites	20CST-284						

## COURSE OBJECTIVES

The Course aims to:

1. Learn Syntax and Semantics and create Functions in Python and handle Strings and Files in Python.
2. Understand Lists, Dictionaries and Regular expressions in Python and implement Object Oriented Programming concepts in Python
3. Build Web Services and introduction to Network and Database Programming in Python.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions and demonstrate proficiency in handling Strings and File Systems.
2. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
3. Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

## COURSE DESCRIPTION

The course begins with the introduction the Python documentation which is widely utilized in all engineering applications. The students are then introduced to Numpy. The course further emphasizes on the data visualization and pre-processing techniques. Then the students are introduced simple machine learning strategies.

## TEXT BOOKS

**T1:** Jake VanderPlas, Python Data Science handbook, O'REILLY (2016).

**T2:** Andreas C. Miller, Sarah Guido, Introduction to Machine Learning with Python, O'REILLY (2001).

## COURSE CONTENT

Unit I:

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4 Contact Hours

- 1) Write a Python program to find GCD of two numbers.
- 2) Write a Python Program to find the square root of a number by Newton's Method
- 3) Write a Python program to find the exponentiation of a number.
- 4) Write a Python Program to find the maximum from a list of numbers.

**Unit II:**

**4 Contact Hours**

- 5) Write a Python Program to perform Linear Search
- 6) Write a Python Program to perform Binary Search
- 7) Write a Python Program to perform selection sort.
- 8) Write a Python Program to perform insertion sort.

**Unit III:**

**4 Contact Hours**

- 9) Write a Python Program to perform Merge sort.
- 10) Write a Python program to find first n prime numbers.
- 11) Write a Python program to multiply matrices

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

		Practical	
Components		Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40	
Total Marks	100		

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

<b>Mapping Between COs and Pos</b>		
<b>SN</b>	<b>Course Outcome (CO)</b>	<b>Mapped Programme Outcome (PO)</b>
1	Examine Python syntax and semantics and be fluent in the use of Python flow control and functions and demonstrate proficiency in handling Strings and File Systems.	1 to 5, 12
2	Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.	1 to 5, 12
3	Implement exemplary applications related to Network Programming, Web Services and Databases in Python.	1 to 5, 12

		De sig n/d ev elo pm ent obl of em sol an led ge sis	Condu ct investi gation s of compl uti on proble ms	M od ern too l ex us ag e	Th e gin eer an d sus na cie ty	En vir on me nt an d tai na bil ity	In div idu al or tea m hic s			Pr oje ct ma na ge me	Lif e- lon g Le arn ing		
		1	2	3	4	5	6	7	8	9	10	11	12
20CSP- 286	Programming in Python Lab	3	3	2	1	1	0	0	0	0	0	0	1

1=addressed to small extent

2= addressed significantly

3=major part of course

*Anmol  
ES242*

Lead of the Department (CSE)  
Apex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

<b>20CSP-287</b>	<b>PROJECT BASED LEARNING IN JAVA LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		0	0	6	0	3	36
Pre-requisites/ Exposure	Knowledge of Java programming language.						
Co-requisites	-						

### COURSE OBJECTIVES

The Course aims to:

1. To understand how to solve real time problem/application using java
2. To Knowledge of object-oriented paradigm in the Java programming language
3. To use of Java in a variety of features on different Applications (Windows and Web).

### COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
2. Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
3. Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (Evaluation)

### COURSE DESCRIPTION

The course begins with the introduction of object oriented programming language in all programming applications. The students are then introduced to java technology and its applications in real life. The course further emphasizes on the concept of java client - server architecture and graphical interface. Then the students are introduced database connectivity and web application.

### TEXT BOOKS

**T1**      Herbert Schildt (2019), "Java The Complete Reference, Ed. 11,  
McGraw-Hill publishing company Ltd.

**T2**      Object Oriented Programming Using Java – IBM Study Material.

### REFERENCE BOOKS

*Amrit  
Saini*  
Head of the Department (CSE)  
Apex Institute of Technology  
Chandigarh University,  
Charuan, Mohali, Punjab

**R1**

Kathy Sierra & Bert Bates, "Head First Java", O'Reilly Publication

## COURSE CONTENT

Unit I:

12 Contact Hours

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**Experiment 1:** Create an application to save the employee information using arrays having following fields:- empid[], depName[], empDes, empName[], dateJoin[], basic[], hra[], it[], DesCodes[]]. Tasks:- (a) Salary should be calculated as (Basic+HRA+DA-IT) (b) Printing designation and da according to employee designation.

**Experiment 2** Design and implement a simple inventory control system for a small video rental store

**Experiment 3** Create an application to calculate interest for FDs, RDs based on certain conditions using inheritance

Unit II:

12 Contact Hours

---

**Experiment 4** Create a menu based Java application with the following options.1. Add an Employee2. Display All3. Exit If option 1 is selected, the application should gather details of the employee like employee name, employee id, designation, and salary and store it in a file. If option 2 is selected, the application should display all the employee details. If option 3 is selected the application should exit.

**Experiment 5 (a)** Create a program to set view of Keys from the Java Hash table.

(b) Create a program to show the usage of the Sets of Collection interface.

**Experiment 6** Write a Program to perform the basic operations like insert, delete, display, and search in the list. List contains String object items where these operations are to be performed

Unit III:

12 Contact Hours

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**Experiment 7** Write a Java multi-threaded program to implement the tortoise and hare story. Make the hare sleep at the mid of the way and let the tortoise win.

**Experiment 8** Create a console-based application using Java as frontend and Oracle as a backend for their Inventory and Sales maintenance.

**Experiment 9** Create an application for Online Auction using HTML and Servlet. Use a database to store and retrieve records.

**Experiment 10** Create a JSP application with a facility to (1) login to the application (2) Register a new user and (3) Change password for an existing user.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Practical		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks		100

#### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and Pos		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements.	1 to 5,6, 11,12
2	Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem.	1 to 5,6, 12
3	Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems.	1 to 5,6,11 12

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	E n g i n e er in g K n o w le d g e	P r o bl e eve m a nt al of al y si s	De sig n/d duct inve lop me nt of com sol uti ons	Con d er n a tions stiga to ol u s o plex a prob lems	M o n e r n a n d er s tiga to ol u s o plex a prob lems	T h e e n g i n e n d er s tiga to ol u s o plex a prob lems	En vi ron men t e n g i n e n d er s tiga to ol u s o plex a prob lems	I n di vi du al o r te a m w th ic r s k	o u r te m m w o at io n	Project ma n a g e - m e n t o a m d u n i c a n i n g	L if e - l o n g L e a r n i n g		
		1	2	3	4	5	6	7	8	9	10	11	12
20CSP-287	Project Based Learning in Java Lab	3	3	3	3	3	2	2	1	1	1	2	3

1=addressed to small extent

2= addressed significantly

3=major part of course

  
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 Chandigarh University,  
 Gharuan, Mohali, Punjab

<b>20UCY-293</b>	<b>CREATIVITY AND CRITICAL THINKING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		2	0	0	0	2	2
Pre-requisites/ Exposure	Knowledge of Java programming language.						
Co-requisites	-						

### COURSE OBJECTIVES

This subject makes students understand the importance of critical and creative thinking skills. It provides the conceptual framework to identify problems in everyday life to make the right and appropriate decisions.

### COURSE OUTCOMES

On completion of this course, the students shall be able to

1. To understand the importance of thinking skills in everyday life.
2. To develop the attitude and techniques for creative problem solving.
3. To apply the basic skills for working in innovative teams.

### TEXT BOOKS

**T1** Lau, Joe. . An Introduction to Critical Thinking and Creativity: Think More, Think Better. Wiley.

**T2** Bassham, G. et al. (2005). Critical Thinking: A Student's Introduction. (2 nd ed.), McGraw Hill.

### REFERENCE BOOKS

**R1** Walton, D. N. (2005). Fundamentals of Critical Argumentation. Cambridge University Press.

**R2** Walton, D. N. (1989). Informal Logic: A Handbook of Critical Argumentation. Cambridge University Press.

### COURSE CONTENT

Unit I:

8 Contact Hours

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**Thinking as a Skill:** Concept of Thinking; Importance of thinking; Habitual thinking vs. thinking as a deliberate skill that can be controlled; Vertical (critical) vs. (lateral creative) thinking; Attitude and psychological preparations for thinking.

**Critical Thinking:** Introduction Critical thinking; Role of critical thinking and how it can complement creative thinking in problem solving; Logical and critical thinking.

**Unit II:**

8 Contact Hours

---

**Meaning Analysis:** The nature of meaning; Meaning and reference;

**Argument Analysis:** Identifying arguments; Validity and Soundness; Inductive strength and cogency;

**Fallacy Analysis:** Common errors in thinking including inconsistency, irrelevance, insufficiency, and inappropriate assumptions.

**Unit III:**

8 Contact Hours

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**Creative Thinking:** Introduction Creativity as an ability to modify self-imposed constraints; Characteristics of creative people; Basic elements affecting creativity in practice.

**Generating Ideas:** Avoiding blocks to creativity; Stimulating ideas using various techniques and tools

**Creative and Critical Thinking in Teams:** Characteristics of effective teams; Stimulating creativity and problem solving in teams; Communication, trust building and conflict-reduction for teams.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Practical		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks		100

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and Pos		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)

1	To understand the importance of thinking skills in everyday life.	1 to 5,6, 11,12
2	To develop the attitude and techniques for creative problem solving.	1 to 5,6, 12
3	To apply the basic skills for working in innovative teams.	1 to 5,6,11 12

															P r o j e ct  E n vi r o n m e n t T h e n e n t M o n g i a n n d e r e s u n a s t o n d ai s u n a c i b i c r i o k n e g														
															1	2	3	4	5	6	7	8	9	10	11	12			
20UCY- 293	CREATIVI TY AND CRITICAL THINKING	3	3	3	3	3	2	2	1	1	1	1	2	3															

1=addressed to small extent

2= addressed significantly

3=major part of course

<b>20TDT-252</b>	<b>Aptitude</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
	<b>Version 1.0</b>	0	2	0	0	2	24
Pre-requisites/ Exposure	Basic Mathematics and Reasoning						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

To generate problem solving skills, counting techniques, ability to analyze the situation, demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions with logical thinking and applying decision making in all national and international projects.

## COURSE OUTCOMES

On completion of this course, the students are expected to

1. To build up basic knowledge of Numbers, building base of arithmetic via percentage and its applications.
2. To build the approach for logical reasoning.
3. To improve arithmetic concepts of work, time and efficiency, speed and distance & use of proportionality in work problems, to improve counting techniques with concepts of permutations-combinations.

## COURSE DESCRIPTION

1. To speed up mathematical calculations.
2. Enhancing number system in details with application.
3. Concept building up of arithmetic with percentages.
4. Analytical and logical thinking and the habit of drawing conclusions based on quantitative information.
5. Understand the basic rules of logic, including critical thinking
6. Data analyzing techniques
7. Apply mathematical methodologies to open-ended real-world problems
8. mathematical analysis, and formulate mathematical models of such problems

## TEXT BOOKS

T1 CU-DCDP Aptitude Book- Engineering 2<sup>nd</sup> year

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## **REFERENCE BOOKS**

R1 Aptitude by R.S.Agarwal

R2 Verbal & Non-Verbal Reasoning by Dr. R.S.Agarwal

R3 Quantum CAT by Arihant Publications

## **COURSE CONTENT**

### **Unit-I**

**8 CH**

#### **1. Vedic Math:**

- Mental Calculations
- How to find squares and square root.
- Approximations
- How to solve tough calculations

#### **2. Number System:**

- Number Chart: Real numbers, Imaginary numbers, Rational numbers, Irrational numbers, Integers, Whole numbers & Natural numbers, Prime and composite numbers.
- Divisibility Rules (2 to 13)

#### **3. Percentages:**

- Concept of percentages
- Concept of percentage increase and percentage decrease
- Concept of successive percentages

#### **4. Profit & Loss:**

- Concepts of cost price, selling price and marked price
- Fundamentals of profit, loss and discounts
- Fundamental problems based on above concepts.
- Complex problems based on above concepts.

#### **5. Simple & Compound Interest:**

- Concept of simple & compound interest
- Fundamental problems on it.

### **Unit – II**

**8 CH**

#### **6. Syllogism:**

- Concept of Venn Diagram
- How to draw conclusions using the available information.
- Basic problems on above mentioned concepts.

#### **7. Coding- Decoding:**

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E5942*  
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Gharuan, Mohali, Punjab

- Concept of EJOTY to learn alphabet.
- Letter Coding
- Number Coding
- Substitution Coding
- Mixed Letter and Number Coding
- How to solve abstract problems.

**8. Direction Sense:**

- Concept of left & right turn (direction).
- Clock & anticlockwise movement with East, West, North and South direction.
- Basic problems based on above concepts.
- Complex problems based on above concepts.

**9. Data Interpretation:**

Analyze data in:

- Tabular Representation
- Line Graph
- Bar Graph
- Miscellaneous

**Unit – III**

**8 CH**

**10. Average:**

- Concept of Mean.
- Different type of mean – Arithmetic, Geometric and Harmonic
- Application of means while taking averages in different types of questions.

**11. Time & Work:**

- Concept of time and work
- Basic problems based on above using LCM method.
- Basic work problems based on efficiency of manpower.

**12. Time, Speed & Distance:**

- Basic concept and relationship between time, speed and distance
- Questions based on average speed, relative speed.

**13. Permutations & Combinations:**

- Concept of arrangement & selection
- Concept of AND vs. OR
- Basic problems based on the above.

**14. Probability:**

- Concept of sample space and favorable outcomes.
- Finding probability of independent and dependent events.
- Basic problems on probability of coins, dice, cards and balls.

**Mode of Evaluation:** The performance of students is evaluated as follows:

  
 Head of the Department (CSE)  
 Apex Institute of Technology  
 Chandigarh University,  
 Gharuan, Mohali, Punjab

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	

#### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	To build up basic knowledge of Numbers, building base of arithmetic via percentage and its applications.	10
2	To build the approach for logical reasoning.	10
3	To improve arithmetic concepts of work, time and efficiency, speed and distance & use of proportionality in work problems, to improve counting techniques with concepts of permutations-combinations.	10

 Head of the Department (CSE) Apex Institute of Technology Chandigarh University, Gharuan, Mohali, Punjab	E n g i n e e r i n e b l e r e m a n g K n o y w l i e s  D e s i g n / d t e i n / c r e i t n o v e l e s u p m i g n a s n e v n o r e l a s u d h o t d h e i c s  T h e e n v e i n r g i n n e e n r a a n n t d h o t d h e i c s s u o c s s u c s s i a t m o n t g	P r o j e c o c l m t m m a u a g n n L a e g a e r t a t m e i n n n g
--	--	--

	d g e	t o f s o l u t i o n n s	t i o n s o f c o m p l e x p r o b l e m s	i e t y t i b i t y	t a i n a b l i t y	o r k	a n d f i n a n c e
			1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 0 1 1 1 1 1 1 12		
20TDT- 252	Aptitude	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 3	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0

1=addressed to small extent

2= addressed significantly

3=major part of course

*Amrit ESY 12*  
 Head of the Department (CSE)  
 Apex Institute of Technology  
 Chandigarh University,  
 Gharuan, Mohali, Punjab

<b>20UCY-296</b>	<b>Life Skills and Mentoring-4</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>CH</b>
		0	1	0	0	1	12
Pre-requisites/ Exposure	NA						
Co-requisites							

### **COURSE OBJECTIVE**

1. To identify specific needs of student-Academic, Personal, Adjustment related and provide counselling. To help students build strength of character, ethics and values. Counselling students and provide confidence to improve their quality of life. To enable the parents to know about the performance and regularity

### **COURSE OUTCOMES**

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

1. Develop relationship around mentee's specific learning goals.
2. Provide objective feedback – focus on concrete actions and behaviour in order to support mentee growth and development.
3. Share personal experience – openly disclose past and current experiences, successes, challenges, and lessons learned.

### **COURSE DESCRIPTION**

The course will build the capability to help in developing self -awareness and sensitivity, feeling of equality, compassion and oneness.

#### **TEXT BOOKS:**

1. Mentoring Programme Handbook, Chandigarh University, 2019

#### **REFERENCE BOOKS:**

1. Daniel Goleman (2012). Working with Emotional Intelligence. Bloomsbury Publishing India Private Limited

#### **Web Resources:**

1. <http://www.skillsyouneed.com/ips/improving-communication>.
2. <https://www.mindtools.com/>
3. [www.psychologytoday.com](http://www.psychologytoday.com)

### **COURSE CONTENT**

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Chandigarh University,  
Gharuan, Mohali, Punjab

**UNIT-I****4 Contact Hours**

- 1. Positive Attitude:** Understanding positive attitude; List of positive attitudes; Characteristics and Traits of a Positive Mindset; Outcomes of a positive Attitude; Tips on How to Have & Keep a Positive Mindset in Life and at Work; Assessment of Positive Attitude
- 2. Anger Management:** Understanding Anger Management; Unhelpful Angry Behavior; Techniques To Manage Your Feelings.
- 3. Healthy Relationships:** Understanding Healthy Relationships; Keys of Healthy Relations; Building Healthy Relationships

**UNIT-II****4 Contact Hours**

- 4. Character Strength:** Understanding Character Strength; What are major virtues by which we judge a person's actions and character? Focusing on your strengths; Use strength to boost happiness
- 5. Human Aspirations:** Understanding basic human aspirations
- 6. Social Responsibility:** Understanding Social Responsibilities; Contributing and connecting with the society
- 7. Assertiveness:** Understanding assertiveness; Benefits of assertiveness; Learning when to Be Assertive

**UNIT-III****4 Contact Hours**

- 8. Happiness and Gratitude:** Understanding happiness and Gratitude; factors that affect our happiness; Interesting Facts and Findings about happiness; Useful tips for happiness; Benefits of gratitude; Modern Psychological Perspectives on Gratitude; how Happiness and Gratitude is related to well being
- 9. Human Dignity:** Understanding Human Dignity; Fundamental rights of a person
- 10. Earth, Our Home:** Our Role and Relationship with Nature

**Mode of Evaluation:** The performance of students is evaluated as follows:

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ES942

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Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	NA	NA
Total Marks		NA

### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and Pos		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Knowing Happiness and Gratitude, Its Impact and benefits. Understanding Human Dignity and fundamental rights of human beings. Knowing our roles and responsibility towards environment and nature.	1, 2,3,4
2	Knowing your character strength and using it to build a happy life. Understanding basic human aspirations and its different dimensions. Understanding social responsibilities and their effect on individuals and society. Knowing to be more assertive to enhance our communication skills.	1, 2,3,4
3	Understanding to build positive mindset in life. Understanding and managing anger effectively. Understanding the importance of healthy relationships and building healthy relations.	1, 2, 3,4

	E n g i n e e r i m a g K n y o s w	D e si g n / duct le /stiga v el al o prob s e	M o d e n i n t o e r u a n d s	E v ir o m n m e n t a n h ic s	I n d i v i m d u u al o r te s	P r o je ct o m m a u u n a n a g L e a r n i
--	--	---	--	---	---	--

		le	n	g	s	u	w	t	n	
		d	t	o	c	st	o	a	g	
		g	f	s	ci	ai	r	nd		
		e	o	l	et	a	o	fi		
		s	o	u	y	b	w	n		
		n	l	t	il	it	o	a		
		s	u	i	y	l	o	nd		
		1	2	3	4	5	6	7	8	9
		10	11	12						
20UCY-296	Life Skills and Mentoring-4	0	0	0	0	0	0	1	0	0
		0	0	0	0	0	0	0	0	1

1=addressed to small extent

2= addressed significantly

3=major part of course

SN	20CSA-28	Managing Virtual Environment	L	T	P	S	C	CH	Course Type
1			3	0	0	0	3	3	PE
PRE-REQUISITE									
CO-REQUISITE									
ANTI-REQUISITE									

a. Course Description

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This course deals with management of virtual environments specially Amazon Web Services, analysis of key performance factors of virtualized systems, principal issues in virtual environments, evaluation of small-scale virtual environment developed in the lab. This course will equip students with the in-depth knowledge and techniques used to efficiently optimize and effectively trouble-shoot virtual infrastructures.

**b. Course Objectives**

The course aims to:

1. Develop an understanding among students to recognize terminology and concepts confined to the Amazon Web Services (AWS) platform.
2. Demonstrate design patterns utilized by various cloud architects based on type of problem they addressed.
3. Using generic design pattern solutions for making specific architectural decisions.

**c. Course Outcomes**

CO1	Appraise various paradigms related to concepts of cloud computing and Amazon Web Services (AWS) design principles.
CO2	Critically analyze key performance indicators in virtualized systems deployed over AWS environment.
CO3	Identify and formulate judgements for the appropriate management of Amazon Web Services (AWS) related to the application requirements.
CO4	Analyze principal issues in troubleshooting virtual environments.
CO5	Evaluation of appropriate design strategy and control mechanism deployed for a small scale virtual environment developed in lab as per the specific business needs.

**d. Syllabus**

Unit-1	VIRTUALIZATION AND CLOUD PLATFORMS	Contact Hours: 15
Introduction to Virtualization	Exploring virtualization, Load balancing, Hypervisors, Machine imaging, Cloud marketplace overview, Comparison of Cloud providers.	
Introduction to AWS	AWS history, AWS Infrastructure, AWS services, AWS ecosystem.	
Performance management in a virtual environment	Management techniques, methodology and key performance metrics used to identifying CPU, memory, network, virtual machine and application performance bottlenecks in a virtualized environment.	
Unit-2	CONFIGURATION AND CHANGE MANAGEMENT	Contact Hours: 15
Programming, management console and storage on AWS	Basic Understanding APIs - AWS programming interfaces, Web services, AWS URL naming, Matching interfaces and services, Elastic block store - Simple storage service, Glacier - Content delivery platforms.	

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AWS identity and basic security services	Users, groups, and roles - Understanding credentials, Security policies, IAM abilities and limitations, AWS physical security.	
AWS Compliance	AWS compliance initiatives, Understanding public/private keys, Compliance standards.	
Unit-3	PROTECTING AND SECURING AWS ENVIRONMENT	Contact Hours: 15
Secure Virtual Networking	Virtual network security architecture, Network Segmentation, Traffic isolation, Virtual private clouds, Cloud models, Private DNS servers (Route 53),	
Protecting the management environment	Virtual machine security architecture, Security in AWS, Services such as AWS CloudWatch, AWS CloudFormation, AWS CloudTrail, CloudHSM, KMS.	

e. **Textbooks / Reference Books**

T1. Cloud Computing Bible. Barrie Sosinsky. John Wiley & Sons. ISBN-13: 978-0470903568.

T2. Amazon Web Services For Dummies. Bernard Golden. For Dummies. ISBN-13: 978- 1118571835

T3. Rajkumar Buyya, Cloud Computing: Principles and Paradigms, John Wiley & Sons, First Edition

T4. Amazon Security overview whitepaper- <https://aws.amazon.com/whitepapers>

T5. IAM Getting started Guide <http://docs.aws.amazon.com/IAM/latest/UserGuide/getting-started.html>

T6. Amazon.com Mashups by Francis Shanahan, Wrox, Wiley Publishing Inc., ISBN-13: 978-0470097779, ISBN-10: 0470097779

T7. Amazon Web Services in Action by Michael Wittig and Andreas Wittig, Dreamtech Press, ISBN: 9789351198758

T8. Building Applications in the Cloud: Concepts, Patterns and Projects by Christopher M. Moyer, Pearson Addison-Wesley Professional, ISBN-10: 0321720202, ISBN-13: 978-0321720207

T9. Cloud Computing Design Patterns by Thomas Erl, Prentice Hall, ISBN-10: 0133858561, ISBN-13: 978-0133858563

f. **Assessment Pattern - Internal and External:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	

**Internal Evaluation Component**

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g. **CO-PO Mapping**

CO PO correlation matrix of each subject to be mapped with

High correlation (3)

Medium correlation (2)

Low correlation (1)

  
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SN	20CSA- 291	Managing Virtual Environment Lab	L	T	P	S	C	CH	Course Type*
7			0	0	4	0	2	4	PE
<b>PRE-REQUISITE</b>									
<b>CO-REQUISITE</b>									
<b>ANTI- REQUISITE</b>									

**a. Course Description**

This course deals with management of virtual environments specially Amazon Web Services, analysis of key performance factors of virtualized systems, principal issues in virtual environments, evaluation of small-scale virtual environment developed in the lab. This course will equip students with the in-depth knowledge and techniques used to efficiently optimize and effectively trouble-shoot virtual infrastructures.

**b. Course Objectives**

The Course aims to:

1. Understanding the basic terminology and concepts related to the AWS platform.
2. Recognize and selecting appropriate use of AWS service(s).
3. Designing and deploying scalable, highly available and scalable architectures on AWS cloud.

**c. Course Outcomes**

CO1	Familiarizing with the basics of building IT infrastructure on the AWS platform.
CO2	Understanding cloud-based solutions and how AWS services match them.
CO3	Identify and formulate judgements for the appropriate management of Amazon Web Services (AWS) related to the application requirements.
CO4	Analyze principal issues in troubleshooting virtual environments.
CO5	Applying best practices and design patterns to build the best IT solutions on AWS.

**d. Syllabus**

Unit-1	<b>AWS FOUNDATION SERVICES</b>	Contact Hours: 10
Experiment No 1	AWS Account creation, Navigating the AWS console, Creating your first virtual instance on AWS cloud.	
Experiment No 2	Using AWS Resource Access Manager, share your resources (in this case, AWS EC2 resource) with another AWS account.	<i>Arman ES442</i>
Experiment No 3	Working with AWS IAM	<i>Lead of the Department (CSE) Apex Institute of Technology Chandigarh University Gharuan, Mohali, Punjab 141006</i>

<b>Unit-2</b>	<b>VIRTUAL PRIVATE CLOUD</b>	Contact Hours: 10
Experiment No 1	Create a Custom Amazon VPC along with custom subnets.	
Experiment No 2	Using Web Identity Playground for generating temporary credentials.	
Experiment No 3	Create a Load balancer and deploy 4 EC2 instances and test the scenario against increased traffic.	
Experiment No 4	Deploy a static website using S3 bucket.	
<b>Unit-3</b>	<b>AWS SECURITY SERVICES</b>	Contact Hours: 10
Experiment No 1	Using AWS Config create a simple config rule. The rule must ensure that the AWS Systems Manager Service is running on EC2 Instances.	
Experiment No 2	Configuring Amazon SNS Notifications for CloudTrail.	
Experiment No 3	Use AWS WAF to monitor and secure your AWS instances.	

e. **Textbooks / Reference Books**

T1 Michael Wittig and Andreas Wittig, Amazon Web Services in Action, Manning Publication, 2015.

T2 Mark Wilkins, Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS, Addison-Wesley Professional; 1 edition, 2019.

f. **Assessment Pattern - Internal and External**

The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks	100	

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High correlation (3)

Medium correlation (2)

Low correlation (1)

# Semester-5

<b>20CSA-331</b>	<b>Microservices Architecture And Its Implementation Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>CH</b>
<b>Version 1.00</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>2</b>
<b>Pre-requisites/Exposure</b>	Foundation knowledge of programming language such as Java, cloud computing models (SaaS, PaaS, IaaS) and software design principles.						
<b>Co-requisites</b>	Cloud computing fundamentals						

### **COURSE OBJECTIVES**

The Course aims to:

1. Understand the value proposition and technical aspects of microservices.
2. Comprehend the need for microservices and its evolution.
3. To learn containers and microservices for developing and deploying applications with cloud.

### **COURSE OUTCOMES**

On completion of this course, the students shall be able to

1. Understand and differentiate between various Microservices Architectural styles.
2. Know how to make the appropriate Microservice Architecture decision.
3. Develop and test a Microservice.

### **COURSE DESCRIPTION**

Microservice Architecture introduces you to the concept of Microservices that are small, lightweight, process-driven components. So, Microservices are the next important thing in designing scalable, easy-to-maintain applications. This not only makes application development easier but also offers great flexibility and lets you utilize various resources optimally.

### **TEXT BOOKS**

**T1** Sam Newman, Building Microservices:Designing Fine-Grained Systems 1st Edition, O'Reilly, 2015.

**T2** Eberhard Wolff, *Microservices - A Practical Guide Principles, Concepts, and Recipes*, 2018.

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## COURSE CONTENT

**Unit I** **04 Contact Hours**

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1. Design a static web application using html and CSS.
2. Design a program to define variable ,control structure in JavaScript
3. Define Function in JavaScript and understand msg and link.
4. Design a program for window in JavaScript and its objects.

**Unit II** **04 Contact Hours**

---

5. Design application using nodejs and config node-eclipse.
6. Connectivity with mongo DB nodejs app
7. Docker Commands
  - a. Listing Running Containers
  - b. Restarting Stopped Containers
  - c. Retrieving Log Outputs
  - d. Container Isolation
  - e. Creating Docker Images
  - f. Building a Dockerfile
  - g.Copying Build Files
  - h.Container Port Mapping

**Unit III** **04 Contact Hours**

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8. Kubernetes Cluster Demo
9. VM Creation in Google Cloud Platform
10. Minikube on local machine

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**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Lab		
<b>Components</b>	<b>Continuous Internal Assessment (CAE)</b>	<b>Semester End Examination (SEE)</b>
<b>Marks</b>	<b>60</b>	<b>40</b>
<b>Total Marks</b>	<b>100</b>	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

<b>Mapping Between COs and POs</b>		
<b>SN</b>	<b>Course Outcome (CO)</b>	<b>Mapped Programme Outcome (PO)</b>
1	Understand and differentiate between various Microservices Architectural styles.	1 to 5, 9,11,12
2	Know how to make the appropriate Microservice Architecture decision.	1 to 5, 8,9,11,12
3	Develop and test a Microservice.	1 to 5, 9,11,12

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					Design/ develop- ment	Condu- ct investi- gation of compli- ex prob- lems	Moder- n too- l usa- ge	The eng- ineer and soci- ety	Envir- onment and sus- tainabil- ity	Indi- vidual or team work	Communi- cation	Proje- ct mana- gement and finan- ce	Life - long Lea- rnin- g			
					1	2	3	4	5	6	7	8	9	10	11	12
20CSA- 331	Microser- vices Architect- ure And Its Imple- men- tatio- n Lab	2	1	2	2	2	0	0	1	3	0	3	3			

1=addressed to small extent

2= addressed significantly

3=major part of course

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<b>20CSA-332</b>	<b>Cloud Application Development Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		0	0	2	0	1	12
Pre-requisites/ Exposure	20CSP265						
Co-requisites	20CSA-334						

### COURSE OBJECTIVES

The Course aims:

1. To learn practical implementation of the analytics tool environment and how it is transforming the world.
2. Get expertise in managing the applications on cloud environment.
3. To manage the datasets on cloud with Watson services.

### COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Configure IBM Cloud account and managing the application with Mobile Foundation Service, Cloudant Databases and Watson Services.
2. Configure cognitive services and connecting to our applications in App Builder, Mobile Phone Authorization with AUTHY API keys and DevOps concept on IBM Cloud.
3. Understand of microservices concept with implementation and Identity Access Management for Security.

### COURSE DESCRIPTION

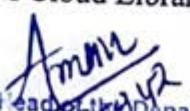
This course focuses on cloud API development. Web API development involved creating applications that internet connected devices can interact with to accomplish certain tasks. The combination will mean that we are creating applications on cloud based computers which we can interact with over the internet.

### TEXT BOOKS

- T1. Anthony T. Velte, CISSP, CISA, "Cloud Computing, A Practical Approach".
- T2. Anubhav Hanjura, "Cloud Application Development".

### REFERENCE BOOKS

- R1. <https://www.ibm.com/developerworks/cloud/library/> - IBM Cloud Library

  
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## COURSE CONTENT

**Unit I:** 4 Contact Hours

1. Configuring IBM Cloud account and create an application using Cloud Foundry Service on IBM Cloud.
2. Creating an application with Mobile Foundation on IBM Cloud.
3. Configuring Cloudant and managing the datasets on IBM Cloud.

**Unit II:** 4 Contact Hours

1. Configuring Visual Recognition Service with IBM Watson.
2. Mobile Phone Authorization with Digital Application Builder.
3. Creating a DevOps Toolchain with Continuous Delivery.
4. Implementation of containerization using Docker

**Unit III:** 4 Contact Hours

1. Configuring Identity Access Management on IBM Cloud.
2. Implementation of container orchestration using Kubernetes
3. Managing the access of Cloud Foundry Applications.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Lab		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks	100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and Pos*		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
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1	Configure IBM Cloud account and managing the application with Mobile Foundation Service, Cloudant Databases and Watson Services.	1 to 5, 12
2	Configure cognitive services and connecting to our applications in App Builder, Mobile Phone Authorization with AUTHY API keys and DevOps concept on IBM Cloud.	1 to 3
3	Understand of microservices concept with implementation and Identity Access Management for Security.	1 to 4, 12

		D e si g n/ d e v el o p m e r o p e n t o n f o s a l al y si n s			E n vi r o n m e n t e n a n d e r a n a s t o n d a s u n a c i g e t y			I n di vi d u al o r te a m w o r k		P r o j e ct m a n a g e m e n t C o m m a n a f i n n e a r ni c n e g	L if e - lo n g L e ar ni c n e g			
		1	2	3	4	5	6	7	8	9	10	11	12	
20CSA-332	Cloud Application Development Lab	3	2	2	1	1	0	0	0	0	0	0	1	

1=addressed to small extent

2= addressed significantly

3=major part of course

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<b>20CSA-333</b>	<b>MICROSERVICES ARCHITECTURE AND ITS IMPLEMENTATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>S</b>	<b>CH</b>
Version 1.0		3	0	0	3	0	36
Pre-requisite	HTML and CSS						
Co-requisite	Cloud application development						

## COURSE OBJECTIVE

The course aims:

1. To explain the importance of Microservices and describe its need as an Architecture Implementation.
2. To strengthen the understanding of basic concepts of Docker and Kubernetes.
3. Be able to Deploy application on Docker and Access the Kubernetes

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Create a page using Html and CSS and implement validation using Java Script
2. Make Docker Account, deploy an application on Docker and install Virtual Docker on local machine and access files from Docker account
3. Cloud implementation and managing Kubernetes and clusters.

## COURSE DESCRIPTION

Microservices Architecture is one of the methods for implementing a service-oriented architecture. This course helps you gain expertise in developing a Microservices Architecture-based solution. Students will be able to apply Microservices principles to specific business requirements to build a scalable & performing solution. After completing this course, you will have gained the knowledge about various Microservices architectural styles, how to select the appropriate architecture design.

## TEXT BOOKS

**T1.** Sam Newman, "Building Microservices".

**T2.** Ajay Sharma, "Microservices Architecture"

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## COURSE CONTENT

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<b>Unit I: HTML and JavaScript Basics</b>	<b>12 Contact Hours</b>
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**Basic Introduction:** - HTML and CSS, Client Server Architecture, JavaScript Basics, Nature of JavaScript language, Understand JavaScript primitive types.

**JavaScript Objects:** - Java Script Array, Date and Error Objects types, Understand Java Script Array Objects, Understand Java Script Date Objects, Understand Java Script Error Objects

**Java Script Variables and Control Statements:** - JavaScript Variables and different Control Statements, understand how to define JavaScript Variables, Work Java Script If statements, Work Java Script switch statements, Work Java Script for and while loop statements

**JavaScript Functions:** -introduces JavaScript Functions, declare a JavaScript function, creating custom objects with functions, adding functions to prototypes, Self-executing functions

**Client-Side Java Script:** -JavaScript is used with HTML and the Document Object Model i.e DOM, Understand Scripts in HTML documents, Describe the document object model (DOM) hierarchy, Overview of the DOM specification levels, Describe the window and document objects, Accessing document elements

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<b>Unit II: Server Side NodeJS</b>	<b>12 Contact Hours</b>
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**Server side NodeJS:-**Key features of NodeJS, Installation and Configuration, NodeJS Command Line, Sample Project using Node Express command prompt, Nodeclipse plugin, Sample Project using Nodeclipse, Performing CRUD Operations, Key features of MongoDB, Connection Pooling using NodeJS Mongo driver, Dockerarchitecture, Virtual machines versus containers, about containers, Docker: A shipping container for code, Benefits of using containers, Docker basic concepts, Docker shared and layered file systems technology

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<b>Unit III: Containers and Kubernetes</b>	<b>12 Contact Hours</b>
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Container ecosystem, Kubernetes, Container, orchestration, Kubernetes architecture, Master Node Components, Worker Node Components, Kubernetes Building Blocks, Images, Immutability, Pod, Config Maps & Secrets, Deploying Applications on Kubernetes, Pod Health Checking, Kubectl Commands, Cloud Application Component Architecture, Benefits of using Kubernetes with IBM Containers, About Microservices ,monolithic application, microservice security, api management and gateways, the future of microservices, microservices governance

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks		100

**Relationship between the Course Outcome (COs) and Program Outcomes (POs)**

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	The students shall be able to create a page using Html and CSS and implement validation using Java Script	1 to 5, 9 to 12
2	The students shall be able to make Docker Account, deploy an application on Docker and install Virtual Docker on local machine and access files from Docker account	1 to 5, 9 to 12
3	The students shall be able to do cloud implementation and managing Kubernetes and clusters.	1 to 5, 9 to 12

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					D e si g n / d e v el o p m e r o b l e m Engin eerin g Kno wled ge			E n v ir on m en t a n d e r t o a n o s u a s o b c i l h o i r k	T h e e n m e n t a n d e r t o a n o s u a s o b c i l h o i r k	I n d i v id u al o r te a m t w o i r n	P r o je ct m a n a g e m e n t o m m u n ic at a n i n c e	L if e - l o n g L e a r n i n g				
					1	2	3	4	5	6	7	8	9	10	11	12
20C SA- 333	Microservices Architecture And Its Implementation	3	2	2	2	2	0	0	0	2	1	2	2			

1=addressed to small extent

2= addressed significantly

3=major part of course

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<b>20CSA-334</b>	<b>CLOUD APPLICATION DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>S</b>	<b>C H</b>
Version 1.0		3	0	0	3	0	36
Pre-requisite	Basic knowledge of cloud environment and services.						
Co-requisite	Microservices architecture and its implementation						

## COURSE OBJECTIVE

The course aims:

1. To understand behind the API economy Phenomena.
2. To understand the functionality of Data Refinery and Information Server tools.
3. To understand the importance of a robust multi-channel strategy.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Understand how deep our industries and societies rely on the cloud computing global infrastructure
2. Explore the alternative ways to manage data in the cloud with evolution of AI
3. Understanding the critical importance of adopting security practice for cloud based systems

## COURSE DESCRIPTION

This course focuses on cloud API development. Web API development involved creating applications that internet connected devices can interact with to accomplish certain tasks. The combination will mean that we are creating applications on cloud based computers which we can interact with over the internet.

## TEXT BOOKS

- T1. Anthony T. Velte, CISSP, CISA, "Cloud Computing, A Practical Approach".  
T2. Anubhav Hanjura, "Cloud Application Development".

## REFERENCE BOOKS

- R1. <https://www.ibm.com/developerworks/cloud/library/> - IBM Cloud Library

## COURSE CONTENT

### **Unit I: Cloud Industry with API Platform Revolution**

**12 Contact Hours**

**Cloud Computing and Industry Adoption:** Cloud Services, Cloud Deployment Models, Cloud Service pattern, Cloud Impact on Education, Cloud Impact on Banking, Cloud Impact on Government, Cloud Impact on Healthcare, Cloud Impact on Travel, Cloud Impact on Media & Entertainment, Cloud Impact on Automotive.

**API Platform Revolution:** Cloud Culture of Change, API Platform Landscape, API's driving the Cloud Platform Revolution, Public Cloud Platform.

### **Unit II: Data in Cloud with AI**

**12 Contact Hours**

**Data in Cloud:** Use of NoSQL, Attributes of NoSQL, Cloudant, Transforming data: (Data

Refinery, Information Server),

**Cloud for Multi-Channel:** AI Evolution, Empowered Cloud Apps with AI, AI Technologies, Need of Multi-Channel Platform, Characteristics of Multi-Channel Platform

### **Unit III: Cloud Security and DevOps Framework**

**12 Contact Hours**

**Cloud Security:** Cloud Security Landscape, OAuth Protocol, JSON Web Token

**DevOps Framework:** DevOps Agile Culture, DevOps Lifecycle, DevOps Practices

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	

**Relationship between the Course Outcome (COs) and Program Outcomes (POs)**

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### Mapping Between COs and POs

S N	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	The students shall be able to understand how deep our industries and societies rely on the cloud computing global infrastructure	1 to 5, 9 to 12
2	The students shall be able to explore the alternative ways to manage data in the cloud with evolution of AI	1 to 5, 9 to 12
3	The students shall be able to understand the critical importance of adopting security practice for cloud based systems	1 to 5, 9 to 12

	P r o b e ng ee ri ng K no wl ed ge	D esi gn /d el ev el op m an en t at of so lut io ns	Condu ct investi gations		The Mo der n er tool proble ms	Envi ron men t and er and usa soci ety	In di v id ual or te a t E m en t ain soci bility	in di v id ual or te a n r w at h o r s	ma ge m e n t o m a n d u m n ic n at i n c k	Life - long Learn ing	P ro je ct m a n a g e m e n t o m a n d u m n ic n at i n c k		
	1	2	3	4	5	6	7	8	9	10	11	12	

20CS A- 334	CLOUD APPLICATION DEVELOPMEN T	3	2	2	2	2	0	0	0	2	1	2	2
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1=addressed to small extent

2= addressed significantly

3= major part of course

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<b>20CSA-335</b>	<b>Computer Networks</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		3	0	0	0	3	3
Pre-requisites/ Exposure	Basic Knowledge of Networking concepts, C or Java programming is required.						
Co-requisites	20CSP-342						

## COURSE OBJECTIVES

The Course aims:

1. To bring together several key of Computer network design and architecture
2. To familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. To allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

## COURSE OUTCOMES

On completion of this course, the students shall be able

1. To develop an understanding of basic networking concepts.
2. To implement the functionality of different Algorithm and Protocols.
3. To learn about different connection establishments techniques.

## COURSE DESCRIPTION

The main emphasis of this course is on the organization and management of local area networks (LANs). The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems. Students are introduced to computer communication network design and its operations, and discuss the following topics: Open Systems Interconnection (OSI) communication model; error detection and recovery; local area networks; bridges, routers and gateways; network naming and addressing; and local and remote procedures. On completion of the course, students should be able, in part to design, implement and maintain a typical computer network (LAN).

## TEXT BOOKS

**T1:** Computer Networks by Andrew S Tanenbaum

**T2:** Computer Networking by James F Kurose & Keith W. Ross

**T3:** Data Communication and Networking by Behrouz A Forouzan

## COURSE CONTENT

### Unit I: Introduction to Computer Network

12 Contact Hours

Network layer design issue, routing algorithms: Distance vector, link state, hierarchical, Broadcast routing.

Congestion control: congestion prevention policies, congestion control in Datagram subnets, load shedding, jitter control, Leaky bucket and token bucket algorithms.

### Unit II: Internetworking

12 Contact Hours

Internetworking: Differences in networks, Tunneling, Internetwork routing, Fragmentation Network layer in the Internet: IPv4 classful and classless addressing, subnetting, Network layer protocols (only working and purpose, packet headers etc. not included), Differences in IPV6 over IPV4. Routing to Mobile Hosts and Mobile IP.

### Unit III: TCP Model and UDP

12 Contact Hours

Elements of transport protocols: addressing, connection establishment and release, flow control and buffering, multiplexing and demultiplexing, crash recovery, introduction to UDP protocol. Principles of Reliable Data Transfer: Reliable data transfer over a perfectly reliable channel, Channel with bit errors and Lossy Channel with bit errors. Transport Layer in the Internet: Introduction to TCP, TCP service Model, TCP Header and segment structure, TCP connection establishment and release, transmission policy, timer management, Transactional TCP. Mobile TCP, TCP Congestion Control: Fairness, TCP delay modeling.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	

### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

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Chandigarh University,  
Gharuan, Mohali, Punjab

Mapping Between COs and Pos		
S N	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	The students shall be able to develop an understanding of basic networking concepts.	1,2,3,5,6,7, 11,12
2	The students shall be able to implement the functionality of different Algorithm and Protocols.	1,2,3,4,5,6,9 ,10,11,12
3	The students shall be able to learn about different connection establishments techniques.	1,2,3,4,5,6,9 ,10,11 and 12

	E	D	T	E	In	Pr		
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	g	ig	ro	vi	vi	ec		
	i	n/	h	vi	d	e		
	e	d	e	m	u	c		
	e	e	e	e	a	o		
	r	v	n	nt	al	m		
	i	el	gi	a	or	m		
	n	o	M	an	te	u		
	g	Pr	Cond	n	a	e		
	K	p	uct	d	st	c		
	o	m	inves	ee	ai	o		
	n	bl	e	r	n	m		
	o	e	nt	su	ai	n		
	w	m	tigati	a	te	u		
	l	of	ons	st	a	d		
	e	so	of	to	m	g		
	n	lu	comp	ol	ni	f		
	d	al	lex	us	ca	n		
	g	ys	probl	a	ti	a		
	e	is	ems	ci	ti	rn		
			Et	bi	or	o		
			w	lit	hi	n		
			cs	y	cs	ce		
		1	2	3	4	5	6	7
					5	6	7	8
						8	9	10
							9	11
								12
20CSA-335	Computer Networks	3	2	1	1	2	2	0
						0	0	1
							1	1
								2

1=addressed to small extent

2= addressed significantly

3=major part of course

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Anna  
ES/12

20CSP-342	Computer Networks Lab	L	T	P	S	C	C H
Version 1.00		0	0	2	0	1	12
Pre-requisites/ Exposure	The student must be familiar with the basics Knowledge of Networking						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. To understand the working principle of various communication protocols.
2. To analyze the various routing algorithms.
3. To know the concept of data transfer between nodes.

## COURSE OUTCOMES

On completion of this course, the students shall be able:

1. To know regarding the working of routers, switches and routing techniques.
2. To successfully design the Campus Network.
3. To learn about different connection establishments techniques.

## COURSE DESCRIPTION

This lab manual on computer network is an attempt in getting some experiences in working of routers, switches and different protocols. It helps students to have more clarification on the theoretical knowledge achieved during the class hours. This reduces the confusion for students about what to do next in the lab. There are a total of ten lab sheets including a practical on designing a network also and final exam designed to be completed within the specified academic period (one semester course) starting from the basic concepts of network hardware/software to advance level configuration up to routing, DNS, DHCP server, analyzing network packets using Wireshark. I tried to cover the new networking technologies, tools, software/hardware on every lab with the objectives to provide sufficient latest knowledge on computer network to my valued readers. Students have to complete the tutorial steps during the lab hours and submit the task and exercise work on the next lab.

## TEXT BOOKS

**T1:** *Computer Networks by Andrew S Tanenbaum*

**T2:** Computer Networking by James F Kurose & Keith W. Ross

**T3:** Data Communication and Networking by Behrouz A Forouzan

## Reference Books

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R1 : <http://www.ace-edu.in/wp-content/uploads/2018/06/CN-Lab-Manual.pdf>

R2 : <https://www.youtube.com/channel/UCK4ji45I-zxeWXAFKmu3p6Q>

R3 : <https://www.youtube.com/watch?v=I39vbF65jOk>

## COURSE CONTENT

Unit I: Basic Structure

4 Contact Hours

Understand the working of following.

- a. IP Address.
  - b. Cisco IOS.
  - c. Straight Cable & Cross Cable, RJ45
  - d. Layer 2 Switch.
  - e. Router.
- b) Implementation of Static Routing using two routers.  
c) Implementation of Static Routing using three or more routers.  
d) Implement Dynamic Routing using RIP (Routing Information Protocol).

Unit II: Basics of Computing

4 Contact Hours

- e) Implement VLAN and VLAN Trunking protocols.
- f) Implement Router as DHCP server that can serve multiple VLAN's.
- g) Capturing & Analyzing network packets using Wireshark.

Unit III: Advanced Theories

4 Contact Hours

Using Socket programming implement the **connection oriented** service using standard Ports in any programming language (C, C++, Java, Python etc).

- h) Using Socket programming implement the **connection less** service using standard Ports in any programming language (C, C++, Java, Python etc).
- i) Design and implement your Campus Network

MODE OF EVALUATION: The performance of students is evaluated as follows:

Lab		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

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### Mapping Between COs and POs

S N	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	To know regarding the working of routers, switches and routing techniques.	1,2,3,4,5,6,9,10, 11 and 12
2	To successfully design the Campus Network.	1 to 12
3	To learn about different connection establishments techniques.	1,2,3,4,5,6,9,10, 11 and 12

	D e si g n/ d e v el o r p m o e bl nt e o m f a s ol al ut y io si n e s	E n vi r o n e m e n gi a n d er s n a u st ol d ai u s o a ci b et li c y ty	T o h e e n e n gi a n d er s n a u st ol d ai u s o a ci b et li c y ty	I n di vi d u al o r te a m ni w c o r ic s k	P r o j e ct m a n a g e m e n t C o m n d u f i n a ar n g L e n n d fi n e ar n i n e g	L if e- lo n n d g L e ar n i n e g
	1	2	3	4	5	6
	7	8	9	10	11	12
20CSP-342	Computer Networks Lab	3	2	3	2	2
					1	2
					1	2
					1	2

1=addressed to small extent

2= addressed significantly

3=major part of course

  
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 Chandigarh University,  
 Gharuan, Mohali, Punjab

SN	Course Code:	ADVANCED PROGRAMMING	L	T	P	S	C	C H	Course Type*
1	20 CST- 337	Name of the Course: Advanced Programming	1	0	0	0	1	1 2	PC
<b>PRE-REQUISITE</b>		Data structure, Algorithms, OOPS, Database, Computer network							
<b>CO-REQUISITE</b>		Programming Language							
<b>ANTI-REQUISITE</b>		None							

## COURSE DESCRIPTION

This course introduces the concept of bringing coding community together to drive technical solution to a business problem. The major emphasis of the course is on creating a learning system through which students can enhance their programming skills in innovative and creative way, while solving business use cases. This course also helps develop the network community for students for future growth of their career.

## COURSE OBJECTIVES

To drive development attitude for solving business problems.

To accelerate the learning by exposing the students to diverse subset of a technology problem, spanning from programming, databases, algorithms, testing to setting up pipelines.

To challenge the student's conventional programming thinking from regular solution provider to be an optimized and scalable solution provider.

## COURSE OUTCOMES

CO1	Students are able to learn the Importance of programming from business use case solution perspective.
CO2	Students are able to learn and explore various use cases of industry applications as a team.
CO3	Students will be able to apply learnings in programming, databases, data structure, algorithms and much more to solve business use cases in innovative and creative way.

## SYLLABUS

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<b>Unit-1</b>	<b>Basic Programming</b>	Contact Hours: 15
Business Case I	Solution identification using OOPS, Data structure and algorithms to solve business use case.	
<b>Unit-2</b>	<b>Advanced Programming</b>	Contact Hours: 15
Business Case II	Optimized solution identification using advanced programming concepts of multi-threading etc for an end to end application, spanning areas of front end as well as backend.	
<b>Unit-3</b>	<b>Business Case - Scalable Solution</b>	Contact Hours: 15
Business Case III	Discuss out business use case with industry experts and drive the solutioning in optimized and scalable manner, utilized advance concepts of programming, data management and even the advance sciences.	

## TEXT BOOKS

Platforms :

<https://www.hackerearth.com/hackathon/>

<https://codesignal.com/>

<https://www.geeksforgeeks.org/>

## REFERENCE BOOKS : NA

Assessment Pattern- internal and External

MODE OF EVALUATION: The performance of students is evaluated as follows:

<b>Project</b>	
<b>Total Marks</b>	100

*Anmol  
ES942*

SN	Course Code:	ADVANCED PROGRAMMING LAB	L	T	P	S	C	C H	Course Type*
1	20CSP 334	Name of the Course: Advanced Programming Lab	0	0	2	0	1	2	PC
<b>PRE-REQUISITE</b>		Data structure, Algorithms, OOPS, Database, Computer network							
<b>CO-REQUISITE</b>		Programming Language							
<b>ANTI-REQUISITE</b>		None							

### COURSE DESCRIPTION

This course introduces the concept of bringing coding community together to drive technical solution to a business problem. The major emphasis of the course is on creating a learning system through which students can enhance their programming skills in innovative and creative way, while solving business use cases. This course also helps develop the network community for students for future growth of their career.

### COURSE OBJECTIVES

To drive development attitude for solving business problems.

To accelerate the learning by exposing the students to diverse subset of a technology problem, spanning from programming, databases, algorithms, testing to setting up pipelines.

To challenge the student's conventional programming thinking from regular solution provider to be an optimized and scalable solution provider.

### COURSE OUTCOMES

Amrit Head of the Department (CSE) Apex Institute of Technology, Chandigarh University, Gharuan, Mohali, Punjab	CO1 Students are able to learn the Importance of programming from business use case solution perspective.
---	--

CO2	Students are able to learn and explore various use cases of industry applications as a team.
CO3	Students will be able to apply learnings in programming, databases, data structure, algorithms and much more to solve business use cases in innovative and creative way.

## SYLLABUS

Sr. No.	Program Title	CO Mapping
1	Implement AVL Tree with insertion, deletion, and rotation operations.	CO1
2	Design a program to perform Depth First Search (DFS) and Breadth First Search (BFS) on a graph.	CO1
3	Create a min/max heap with insertion and deletion operations.	CO1, CO2
4	Develop a hash table with collision handling using chaining and open addressing.	CO1, CO2
5	Implement Kruskal's and Prim's algorithm to find Minimum Spanning Tree (MST).	CO2
6	Write a program to implement Dijkstra's and Bellman-Ford algorithms for shortest path.	CO2
7	Implement a Trie for efficient string searching and insertion.	CO2, CO3
8	Develop a program to detect and remove cycles in a directed graph using DFS.	CO2, CO3
9	Design a dynamic programming solution for the 0/1 Knapsack Problem.	CO3
10	Implement a segment tree to perform range queries and point updates.	CO3

  
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# **SEMESTER-6**

<b>20CSA-383</b>	<b>AGILE DEVELOPMENT METHODOLOGIES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>S</b>	<b>CH</b>
Version 1.0		3	0	0	3	0	3
Pre-requisite	HTML, CSS and Linux Commands						
Co-requisite	20CSP365						

## COURSE OBJECTIVES

The Course will enable you:

1. To explain the importance of Design Thinking and Use of IBM Design Thinking Framework.
2. To learn the use of Agile Methodology and Agile Frameworks.
3. To be able to use DevOps tools and understand cloud computing concepts.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Explain how IBM Design Thinking works and using loop Model to understand present and envision future
2. Crafting hill and choose sponsored user, introduction to various methodologies, Agile Methodology and its Frameworks
3. Understanding DevOps, use of DevOps Tools

## COURSE DESCRIPTION

Agile methods emphasize flexibility and adaptability, and the Agile framework lends itself well to projects where requirements and solutions evolve with time. Scrum, with its inherent simplicity and lightweight processes, is the most popular way of introducing Agility to a project.

## TEXT BOOKS

**T1.** Emrah Yayici, "Design thinking methodology".

**T2.** Sricharan vadapalli, "Hand-on Devops".

## COURSE CONTENT

**Unit I: Introduction to Design Thinking**

**12 Contact Hours**

**About Design Thinking:** - Introduction to Design Thinking, Importance of Design Thinking, History of Design Thinking, IBM Design Thinking Framework.

**The Principles guide us:** - Introduction, Focus on user outcomes, Relentless invention, Diverse empowered teams.

**The Loops drive us:** -Introduction, Empathy Map, As-Is Scenario, Big Idea Vignettes, Prioritization Grid, Need Statements, Ideation Activity, Story boards.

**The Keys align us:** - Crafting Hill, To be Scenario Map, Sponsor Users.

**Unit II: Agile Methodologies and Scrum**

**12 Contact Hours**

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**Software Development Methodology:-** Definition of Project, Project vs Operations, Relationship between Project, Program and Portfolio, Features of Project, Measuring Project Success, Phases of a Project.

**Project Execution Methodologies:-** Waterfall Model, How does Waterfall work, Advantages -Disadvantages of Waterfall Model, V-Model, How does V-Model work, Advantages , Disadvantages of V-Model, Agile, Advantages-Disadvantages of Agile.

**Agile Deep Dive:-** Agile Methodology Overview, Introduction to Agile Manifesto & Guiding Principles, Agile vs Waterfall, Agile Frameworks, Extreme Programming (XP), Rational Unified Process (RUP), Feature Drive Development(FDD), Test Driven Development(TDD), Scrum, Kanban.

**Scrum – Deep Dive:-** Foundations of Scrum, Scrum Team, Roles in Scrum Team, Sprints, Definition of Ready.

**Scrum Artifacts:-** Product Backlog, Sprint Backlog, Sprint Burndown chart, Impediments List.

**Scrum Ceremonies:-** Sprint Planning, Daily Scrum Meeting, Purpose of daily scrum, Daily Stand-up Characteristics, Product Backlog Refinement (PBR)/Grooming, Sprint Review Meeting, Sprint Retrospective.

**Scrum Sprint Planning:-** Sprint Goal, User Stories, Story Point, Definition of Done.

**Scrum Metrics:-** Sprint Goal Success, Team Velocity, Sprint Burn Down Chart, Defect Density.



**Unit III: DevOps**

Head of the Department (CSE)

**12 Contact Hours**

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Chandigarh University,  
Gharuan, Mohali, Punjab

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			1	2	3	4	5	6	7	8	9	10	11	12																													
20CSA-383	AGILE DEVELOPMEN T METHODOLO GIES	3	2	2	2	2	2	0	0	0	2	1	2	2																													

1=addressed to small extent

2= addressed significantly

3=major part of course

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<b>20CST390</b>	<b>THEORY OF COMPUTATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		3	0	0	0	3	3
Pre-requisites/ Exposure	Knowledge of Discrete mathematics and data structures						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. Demonstrate knowledge of **basic mathematical models of computation** and describe **how they relate to formal languages**.
2. Develop understanding of what are **limitations on what computers can do** and learn **examples of unsolvable problems**.
3. Teach that **certain problems do not admit efficient algorithms** and identify such **problems**.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Demonstrate the **relationship between various formal languages** and learn the **characteristics properties of the languages**.
2. **Understand the powers and limitations of the language**.
3. **Learn the concepts of unsolvable problems**

## COURSE DESCRIPTION

This course covers the theoretical computer science areas of formal languages and automata, computability, and complexity. Topics covered include: regular and context-free languages; finite automata and push down automata; Turing machines; Church's thesis; computability - halting problem, solvable and unsolvable problems; space and time complexity; classes P, NP and P Space; NP-Completeness.

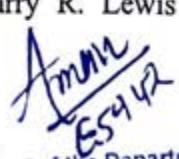
## TEXTBOOKS

**T1:** Introduction to Automata Theory, Languages, and Computation John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman.

## REFERENCE BOOKS

**R1:** Elements of the Theory of Computation, Harry R. Lewis and Christos H. Papadimitriou.

**R2:** Automata and Computability, Dexter C. Kozen.

  
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 Gharuan, \* \* \* nlab

**R3:**Introduction to the Theory of Computation, Michael Sipser.

**R4:**Introduction to Languages and the Theory of Computation, John Martin.

**R5:**Computers and Intractability: A Guide to the Theory of NP Completeness, M. R. Garey and D. S. Johnson.

## COURSE CONTENT

Unit I: Introduction, Regular Languages & Finite Automata      12 Contact Hours

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**Introduction:** Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.

Regular languages and finite automata: Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, Kleene's theorem, pumping lemma for regular languages, Myhill-Nerode theorem and its uses, minimization of finite automata.

Unit II: CFG&PDA, CSL and Turing Machine      12 Contact Hours

---

**Context-free languages and pushdown automata:** Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.

**Context-sensitive languages:** Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.

**Turing machines:** The basic model for Turing machines (TM), Turing recognizable(recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.

Unit III: Undecidability, Basic Introduction of Complexity      12 Contact Hours

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**Undecidability:** Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice's theorem, undecidable problems about languages.

**Basic Introduction to Complexity:** Introductory ideas on Time complexity of deterministic and nondeterministic Turing machines, P and NP, NP-completeness, Cook's Theorem, other NP-Complete problems.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and Pos		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Demonstrate the relationship between various formal languages and learn the characteristics properties of the languages.	1 to 4, 12
2	Understand the powers and limitations of the language.	1 to 5, 12
3	Learn the concepts of unsolvable problems	1 to 5, 12

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		D e s i g n/ d e v el				E n vi r			P r o j e ct	m a n a g e m e	L if e- lo n g	
		E n gi n e er in g K e n o w le d g e	P r o m	Con duct inve stiga tions of com plex prob lems	M o d er er n a to ol u s s a ci g e	T h e n e n d er s a u n s o bi et y	n o n e nt a d er s u st ai a bi li c ty	I n di vi d u al o r te a m w o r s	a n g e m e nt a n d m u n i c a n e	g e m e n a n d m u n i c a n e		
											12	
20CST351	Theory of Computation	3	3	2	3	1	0	0	0	0	0	3

1=addressed to small extent

2= addressed significantly

3=major part of course

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<b>20CST397</b>	<b>Network Operating System</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		3	0	0	0	3	3
Pre-requisites/ Exposure	Basic Understanding of Subject Computer Networks.						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. Make students learn about basics of Networks and Operating system concepts that will help them to understand the requirements of Network Operating System.
2. Make students learn about deployment of Network Operating System's roles and services.
3. Facilitate students in building analytical and creative thinking so that they can move themselves in the field of core server usage for social and technical reasons.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Recall basic concepts of Networks, Operating System and to build up the basic concepts of Network Operating System.
2. Deploy Server 2008/2012 and make use of it as a technical platform.
3. Prepare themselves for placements in Companies focusing on Networking and Server environment and further being research oriented in the field of Computer Networks.

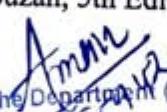
## COURSE DESCRIPTION

The course begins with the introduction of computer networks that are the basic building block of any communication system. The students are then introduced to various concepts of operating system and its applications. The course further emphasizes on installation and configuration of windows server and core server. Then the students are introduced to the concept of active directory, FSMO roles, Hyper-V, Virtual Machines.

## TEXT BOOKS

**T1** Data Communications and Networking, Behrouz A. Forouzan, 5th Edition, Tata McGraw Hill Publication.

**T2** Operating System Concepts, P B Galvin, 9<sup>th</sup> Edition

  
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**T3** Introducing Windows Server 2008, Mitch Tulloch, 2007, Microsoft Press

## REFERENCE BOOKS

**R1** MCTS- Guide to Microsoft Windows Server'2008 Network Infrastructure Configuration, Micheal Bender, Course Technology Cengage Learning.

**R2** MCITP: 5 in-1 Study System, Windows Server 2008 Enterprise Administrator, Steven Johnson, 2009, Wiley Publishing, Inc

## COURSE CONTENT

Unit I	12 Contact Hours
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**Introduction of Computer Networks:** Reference Model: OSI Reference Model, TCP/IP reference model, Core protocols of TCP/IP, IP routing, IP routers, Routing Tables.

**Introduction to DNS:** DNS Architecture, Understanding the DNS Domain Namespace, DNS domain name hierarchy, DNS and Internet domains, DNS delegation

**Introduction to DHCP:** Introduction to DHCP, DHCP Architecture, Benefits to DHCP, DHCP Terminologies and DHCP Server Responsibility.

**Introduction to RPC:** Introduction to RPC, RPC Dependencies and Interaction, RPC Architecture, RPC Component and RPC Processes and Interaction.

**Introduction to Microsoft Network Monitoring Tool:** Introduction to netmon tool, Installation and configuration of Netmon.

Unit II	12 Contact Hours
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**Introduction to operating System:** Introduction to operating system, Types of operating System: Mainframe, Desktop, Multiprocessor, Distributed, Clustered, Multiprogramming, Real time, Embedded and Time Sharing.

**Operating System Components:** Process Management Component, Memory Management component, i/o Management component, File Management component, Protection System, and Networking management component.

**Comparison of Microsoft OS** (Desktop, Server and Client), Hardware Requirement for OS(Desktop, Server and client ),Workgroups and Domains.

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**Installing windows server 2008:** Plan for a server roles and installing windows server core, configure server core, Add and configure server roles, add backup feature and migrate roles from previous versions of windows server.

**Configuring Windows Server 2008:** Windows server registry, Control Panel, Delegate administration, Add and removes feature in window server, initial configuration tasks, server manager console, server manager wizards and windows power shell.

### Unit III

12 Contact Hours

#### Hyper-V: Introducing Hyper-V, Virtual Machines

**Introducing to Active Directory:** role of an AD DS Server, features in AD DS, Common Terminologies and Active Directory Concepts, Active Directory Schema, Active Directory Objects, Active Directory Concepts, Active Directory Data structure and storage architecture, Active Directory Structure and storage components, DNS support for active directory, active directory DNS support components

**Install Active Directory Domains Services in Windows 2008 R2:** Installing a new forest by using the graphical user interface(GUI),Understanding active directory domain Service functional Levels.

**Active Directory Administration:** Active Directory Users and Computers. Managing organizational units using Active Directory Users and Computers, Managing Trusts using Active directory domains and trusts and managing forest trusts using active directory domains and trusts snap-in.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

		Theory	
Components		Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60	
Total Marks	100		

#### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and Pos		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)

1	Recall basic concepts of Networks, Operating System and to build up the basic concepts of Network Operating System	1 to 12
2	Make students learn about deployment of Network Operating System's roles and services	1 to 12
3	Prepare students for placements in Companies focusing on Networking and Server environment and further being research oriented in the field of Computer Networks.	1 to 12

Project Management											
	E	n	g	i	d	D	e	n	v	T	E
	n	e	v	e	l	e	n	i	m	h	n
	e	o	el	o	o	n	e	vi	a	e	vi
	er	P	ro	m	Con	M	n	ro	m	ne	me
	in	p	b	e	duct	n	n	en	a	er	nt
	g	bl	e	nt	inves	d	e	m	u	o	e-
	K	e	nt	inves	er	a	s	st	al	m	lo
	n	m	of	tigati	n	n	ai	or	or	m	n
	o	a	as	ons	to	d	ai	te	u	m	d
	w	n	ol	of	ol	s	n	a	ni	u	g
	le	al	ut	com	u	o	a	E	ni	c	L
	d	y	io	plex	sa	ci	bi	m	a	w	ar
	g	si	n	probl	g	et	lit	ic	or	at	n
	e	s	s	ems	e	y	y	s	k	io	ni
		1	2	3	4	5	6	7	8	9	10
	12										
20CST352	CO1	2	2	1	1	1	1	1	1	3	2
	CO2	3	3	3	3	3	2	2	3	3	3
Network Operating System	CO3	2	3	3	3	3	2	3	3	3	2

1=addressed to small extent

2= addressed significantly

3=major part of course

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<b>20CSA-392</b>	<b>WEB SERVICES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>CH</b>
<b>Version 1.00</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>
<b>Pre-requisites/ Exposure</b>	Fundamentals of Programming, Concepts of Networking						
<b>Co-requisites</b>	20CSP366						

## COURSE OBJECTIVES

The Course aims to:

1. To provide the importance of collective intelligence of web services.
2. Comprehend Web service Description Language and Universal Description and Discover Integration Concepts.
3. Apply methods for constructing and evaluating Web architectures.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Understand XML and programming in XML and to program in SOAP and SOAP protocol.
2. Apply the described concepts, principles and methods to development of complex Web applications.
3. Adopt design pattern based approaches and frameworks which will make students ready for industry.

## COURSE DESCRIPTION

Web services is a technology, process, and software paradigm to extend the web from an infrastructure that provides services for humans to one that supports business integration over the web. This course presents concepts, features, and architectural models of web services from three perspectives: framework, process, and applications. Students will study two emerging standard protocols: Simple Object Access Protocol (SOAP) and Web Services Description Language (WSDL).

## TEXT BOOKS

- T1** Frank. P. Coyle, XML, —Web Services And The Data Revolution!, Pearson Education, 2002.

**T2** Ramesh Nagappan , Robert Skoczylas and Rima Patel Sriganesh, — Developing Java Web Services, Wiley Publishing Inc., 2004.

## REFERENCE BOOKS

**R1** Sandeep Chatterjee, James Webber, —Developing Enterprise Web Services, Pearson Education, 2004.

## COURSE CONTENT

Unit I: Evolution and Emergence of Web Services

12 Contact Hours

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**Evolution and Emergence of Web Services** – Evolution of distributed computing. Core distributed computing technologies – client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA).

**Introduction to Web Services** – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.

Unit II: Web Service Architecture

12 Contact Hours

---

**Web Service Architecture** – Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services.

**Describing Web Services** – WSDL introduction, non-functional service description, WSDL1.1 Vs WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDL tools, WSDL port type, limitations of WSDL.

Unit III: Brief Overview of XML

12 Contact Hours

---

**Brief Over View of XML** – XML Document structure, XML namespaces, Defining structure in XML documents, Reuse of XML schemes, Document navigation and transformation.

**SOAP** : Simple Object Access Protocol, Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP envelope, Encoding, Service Oriented Architectures, SOA revisited, Service roles in a SOA, Reliable messaging, The enterprise Service Bus, SOA Development Lifecycle, SOAP HTTP binding, SOAP communication model, Error handling in SOAP.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Understand XML and programming in XML and to program in SOAP and SOAP protocol.	1 to 5, 9,11,12
2	Apply the described concepts, principles and methods to development of complex Web applications.	1 to 5, 9,11,12
3	Adopt design pattern based approaches and frameworks which will make students ready for industry.	1 to 5, 9,11,12

  
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1=addressed to small extent

2= addressed significantly

3=major part of course

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Gharuan, Mohali, Punjab

<b>20CSA-384</b>	<b>AGILE DEVELOPMENT METHODOLOGIES LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		0	0	2	0	1	1
Pre-requisites/ Exposure	HTML, CSS and Linux Commands						
Co-requisites	20CSA-383						

### COURSE OBJECTIVES

The Course aims:

1. To explain the importance of Design thinking and Use of IBM Design Thinking Framework.
2. To learn the use of Agile Methodology and Agile Frameworks.
3. To be able to use DevOps tools and understand cloud computing concepts.

### COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Implement Design thinking methodology.
2. Knowledge of basic Agile Methodology and Scrum Methodology
3. Using Devops and DevOps on IBM Cloud

### COURSE DESCRIPTION

Agile methods emphasize flexibility and adaptability, and the Agile framework lends itself well to projects where requirements and solutions evolve with time. Scrum, with its inherent simplicity and lightweight processes, is the most popular way of introducing Agility to a project.

### TEXT BOOKS

**T1.** Emrah Yayici,"Design thinking methodology".

**T2.** Sricharan vadapalli, "Hand-on Devops".

### COURSE CONTENT

Unit I:

8 Contact Hours

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1. For designing a better way for cab booking from start to finish. Create a List of Stakeholders, Empathy Map and As-is Scenario Map
2. In Above case discussed in practical 1, create Big Idea Vignettes, Prioritization grid and Need statements.
3. For the same case create story board, Hills
4. Create a To-be Scenario for the case discussed in Practical 1.

**Unit II:** 8 Contact Hours

---

1. Create a 2-3 Sprint with entire team.

**Unit III:** 8 Contact Hours

---

1. Installation of Ubuntu on virtual machine.
2. (i) Installation of GIT and Creating GIT Repository.  
(ii) Creating a Maven Project
3. (i) Installation and setting up puppet.  
(ii) Installing Docker and Creating Docker Image
4. (i) Testing Using Junit  
(ii) Nagios for Monitoring  
(iii) Graphite and Graphana for Monitoring
5. Setting up DevOps on IBM Cloud

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

<b>Practical</b>		
<b>Components</b>	<b>Continuous Internal Assessment (CAE)</b>	<b>Semester End Examination (SEE)</b>
<b>Marks</b>	60	40
<b>Total Marks</b>	100	

#### **Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

	<b>Mapping Between COs and Pos</b>
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SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Implement Design thinking methodology.	1 to 5, 12
2	Knowledge of basic Agile Methodology and Scrum Methodology	1 to 3
3	Using Devops and DevOps on IBM Cloud	1 to 4, 12

		D es ig n/ e n gi n e er in g K n o w le d g e	e n v el e v o r o bl e nt m of a n ol al ut io si n ss	T h e n e n gi n o duct inves tigati ons of com plex probl ems	E n vi ro n e n gi n e d er a u st d ai s a ci bi lit y	In di vi d u al or te a m w at n or k	P ro je ct m a n a g e m e nt a lo m d fi n e ar n ni c at n io c n e g						
		1	2	3	4	5	6	7	8	9	10	11	12
20CSP365	Agile Development Methodologies Lab	3	2	2	1	1	0	0	0	0	0	0	1

1=addressed to small extent

2= addressed significantly

3=major part of course

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<b>20CSA387</b>	<b>WEB SERVICES LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>CH</b>
<b>Version 1.00</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>12</b>
<b>Pre-requisites/ Exposure</b>	Fundamentals of Programming						
<b>Co-requisites</b>	20CST363						

### **COURSE OBJECTIVES**

The Course aims to:

1. Understand the principles of creating an effective web page, including an in-depth consideration of information architecture.
2. To procure the knowledge of information interchange formats like XML.
3. Develop skills to implement and understand how to interpret basic web analytics using Java.

### **COURSE OUTCOMES**

On completion of this course, the students shall be able to

1. Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's.
2. Apply the described concepts, principles and methods to development of complex Web applications.
3. Understand, analyze and apply the role of languages like HTML, CSS, XML, Java and protocols in the workings of the web and web applications

### **COURSE DESCRIPTION**

Web services is a technology, process, and software paradigm to extend the web from an infrastructure that provides services for humans to one that supports business integration over the web. This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web, and a general grounding introduction to more advanced topics such as programming and scripting. This will also expose students to the basic tools and applications used in Web publishing.

*[Signature]*  
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## **TEXT BOOKS**

T1 Frank. P. Coyle, XML, —Web Services And The Data Revolution, Pearson Education, 2002.

T2 Achyut Godbole, Atul Kahate "Web Technologies: TCP/IP, Web/Java Programming, and Cloud Computing", Third Edition, McGraw Hill Education.

## **REFERENCE BOOKS**

R1 Sandeep Chatterjee, James Webber, —Developing Enterprise Web Services, Pearson Education, 2004.

## **COURSE CONTENT**

**Unit I** 04 Contact Hours

1. Create an XML document to store an address book.
2. Create an XML document to store information about books and create the DTD files.
3. Create an XML schema for the book's XML document from Exp. 2
4. Create an XML document to store resumes for a job web site and create the DTD file.

**Unit II** 04 Contact Hours

5. Present the book's XML document using Cascading Style Sheet(CSS)
6. Write an XSLT program to extract book titles, authors, publications, book rating from the book's XML document and use formatting.
7. Create a web service for temperature conversion with appropriate client program.

**Unit III** 04 Contact Hours

8. Development of a Java Web service for squaring an integer.
9. Development of a Java client application for consuming the Java Web service.
10. Create an Online Registration form for individual user of an website using Servlet.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

<b>Practical</b>		
<b>Components</b>	<b>Continuous Internal Assessment (CAE)</b>	<b>Semester End Examination (SEE)</b>

<b>Marks</b>	60	40
<b>Total Marks</b>	100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

<b>Mapping Between COs and POs</b>		
<b>SN</b>	<b>Course Outcome (CO)</b>	<b>Mapped Programme Outcome (PO)</b>
1	Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's.	1 to 5, 9,11,12
2	Apply the described concepts, principles and methods to development of complex Web applications.	1 to 5, 9,11,12
3	Understand, analyze and apply the role of languages like HTML, CSS, XML, Java and protocols in the workings of the web and web applications	1 to 5, 9,11,12

	E n g i n e e r i n e r i n g K n o w l e d g e c o l o p r o b l e m s	P r o g r a m m e s t r u c t / e s t i c a n v o f e c o l o p r o b l e m s	D e s i n g / e s t i c a n v o f e c o l o p r o b l e m s	Co ndu ct inv /est ati ons of e co l o lex pro ble ms	M o d e r e n i n r i n t o n a n s a d g s e o	T h e n e n r i n t i n m e e n a n h d i s u	I n d i v i m d i u a l i t r a t h t e c a s u i c a t e i m a n g	P r o j e c t - i m t a n a n a g e a r e n i	L i f e - c e - l o m a n a n a L e a r e n i		
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Head of the Department (CSE)

Apex Institute of Technology

Chandigarh University,

Gharuan, Mohali, Punjab

		e	d	g	e	n	t	o	f	s	o	l	u	t	i	o	n	s	c	i	e	t	y	s	t	a	i	n	b	i	l	i	t	y	w	o	r	k	t	a	n	d	f	i	n	a	n	c	e	g
		1	2	3	4	5	6	7	8	9	10	11	12																																					
20CSP366	Web Services Lab	2	1	2	2	2	0	0	0	3	0	3	3																																					

1=addressed to small extent

2= addressed significantly

3=major part of course

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<b>20CSP396</b>	<b>Network Operating System Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>H</b>
Version 1.00		0	0	2	0	1	1
Pre-requisites/ Exposure	Basic Understanding of Subject Computer Networks.						
Co-requisites	Understanding of Windows Server and Active directory Concepts						

## COURSE OBJECTIVES

The Course aims to:

1. Make students learn about basics of Networks and Operating system concepts that will help them to understand the requirements of Network Operating System.
2. Make students learn about deployment of Network Operating System's roles and services.
3. Facilitate students in building analytical and creative thinking so that they can move themselves in the field of core server usage for social and technical reasons.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Recall basic concepts of Networks, Operating System and to build up the basic concepts of Network Operating System.
2. Deploy Server 2008/2012 and make use of it as a technical platform.
3. Prepare themselves for placements in Companies focusing on Networking and Server environment and further being research oriented in the field of Computer Networks.

## COURSE DESCRIPTION

The course begins with implementation of DNS, DHCP and various routing protocols of computer networks. The students are then introduced to installation and configuration of windows server, add and remove server roles and features. Then the students are introduced to ADDS,FSMO roles, backup server.

## TEXT BOOKS

**T1** Data Communications and Networking, Behrouz A. Forouzan, 5th Edition, Tata Mcgraw Hill Publication.

**T2** Operating System Concepts, P B Galvin, 9<sup>th</sup> Edition.

**T3** Introducing Windows Server 2008, Mitch Tulloch, 2007, Microsoft Press

## REFERENCE BOOKS

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**R1** MCTS- Guide to Microsoft Windows Server'2008 Network Infrastructure Configuration, Micheal Bender, Course Technology Cengage Learning.

**R2** MCITP: 5 in-1 Study System, Windows Server 2008 Enterprise Administrator, Steven Johnson, 2009, Wiley Publishing, Inc

## COURSE CONTENT

Unit I 4 Contact Hours

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1. To know the basics of Packet Tracer functionality.
2. To make a complex network and applying EIGRP and OSPF routing protocols
3. To Implement DHCP in Complex Network developed in Practical 2.
4. To Implement DNS in Complex Network developed in Practical 2 and 3.

Unit II 4 Contact Hours

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5. Installing windows server 2008.
6. Add and configure server roles (ADDS without DNS delegation/certificate/DHCP/DNS).
7. Add backup feature and migrate roles from previous versions of windows server.
8. Add and removes feature in window server

Unit III 4 Contact Hours

---

9. Installation and Exploring basic features of Hyper-V.
10. Install Active Directory Domains Services in Windows 2008: Installing a new forest by using the graphical user interface (GUI)

MODE OF EVALUATION: The performance of students is evaluated as follows:

Practical		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40

<b>Total Marks</b>	100
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### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and Pos		
<b>SN</b>	<b>Course Outcome (CO)</b>	<b>Mapped Programme Outcome (PO)</b>
1	Recall basic concepts of Networks, Operating System and to build up the basic concepts of Network Operating System	1 to 12
2	Make students learn about deployment of Network Operating System's roles and services	1 to 12
3	Prepare students for placements in Companies focusing on Networking and Server environment and further being research oriented in the field of Computer Networks.	1 to 12

					D es ig n/ d e v el o P ro bl e nt m Engi neeri ng Kno wled ge			E n vi ro n e e e n gi n o duct inves tigati ons ol of ut com plex si n s			T h e e n gi n o er a er n to ol u sa ci g et y			In di vi d u al or te a m th lit ic y			P ro je ct m a n a g e m e m e C o a m m d u n i n c a n i o k n		
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FSI/12

		1	2	3	4	5	6	7	8	9	10	11	12
20CSP357	CO1	2	2	1	1	1	1	1	1	3	2	2	2
Network Operating System Lab	CO2	3	3	3	3	3	2	2	3	3	3	3	3
	CO3	2	3	3	3	3	3	2	3	3	3	2	3

1=addressed to small extent

2= addressed significantly

3=major part of course

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<b>20TDY351</b>	<b>Soft Skills</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		0	0	4	0	2	2
Pre-requisites/ Exposure	Soft Skills Sem 3						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. impart soft skills practical knowledge to enable students enhance their communication skills and employability.
2. Work upon the students' accent, pronunciation and MTI.
3. Make students confident and presentable.

## COURSE OUTCOMES

On completion of this course, the students are expected-

1. Have enhanced Creative Thinking and effective Presentation Skills.
2. Have developed a learning attitude and enhanced general awareness about various categories to become globally smart and proficient in performing in group discussions
3. become self-aware and interview ready.

## COURSE DESCRIPTION

The course focuses on the building and enhancing the basic soft skills required by the students to become employable and augment their chances of securing a job while sharpening their communication skills. The course will focus on sharpening the spontaneity in the students and build their confidence by effectively handling various situations related to individual and team performances. Various activities planned in the course will also focus on augmenting fluency and listening skills of the students while deliberating on essential grammar, vocabulary, and pronunciation.

## TEXT BOOKS

- T1** CU-DCDP Verbal Ability Book- Comprehending Verbal Ability for Success.

## REFERENCE BOOKS

- R1** Edward de. Bono., Serious Creativity, Paperback

- R2** James Webb Young, A Technique for Producing Ideas, Mc. Graw Hill

**R3 Rashmi Bansal, Connecting the Dots, Westland Limit COURSE  
CONTENT**

- |   |                 |
|---|-----------------|
| Unit I:   | 8 Contact Hours |
| <ul style="list-style-type: none"> <li>• Soft Skills Recast</li> <li>• Contriving Lateral Thinking</li> <li>• Grammar Recap</li> <li>• Abstract Topic Based GD</li> <li>• Prepositions, Conjunctions and Presentation Skills</li> </ul>               |                 |
| Unit II:  | 8 Contact Hours |
| <ul style="list-style-type: none"> <li>• Mastering Writex</li> <li>• Presentation Skills Know How -1</li> <li>• Presentation Skills Know How -2</li> <li>• Resume Writing</li> <li>• Interview Sneak Peek</li> </ul>                                  |                 |
| Unit III:   | 8 Contact Hours |
| <ul style="list-style-type: none"> <li>• Current Topic Based GD</li> <li>• Reading Comprehension and Para jumbles</li> <li>• Enhancing Political and Social Knowledge</li> <li>• Pitching Right</li> <li>• Building A Positive Perspective</li> </ul> |                 |

Mode of Evaluation: The performance of students is evaluated as follows:

<b>Practical</b>		
<b>Components</b>	<b>Continuous Internal Assessment (CAE)</b>	<b>Semester End Examination (SEE)</b>
<b>Marks</b>	60	40
<b>Total Marks</b>		100

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

<b>Mapping Between COs and POs</b>		
<b>SN</b>	<b>Course Outcome (CO)</b>	<b>Mapped Programme Outcome (PO)</b>
1	To enhance the Creative Thinking and effective Presentation Skills of the students.	<i>Amrit ES942</i>



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

		e m s											
		1	2	3	4	5	6	7	8	9	1 0	1 1	12
20TDP301	Soft Skills	0	0	0	0	0	0	0	0	0	0	0	0

1=addressed to small extent

2= addressed significantly

3= major part of course

*Amrit  
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Apex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

<b>20TDY352</b>	<b>Aptitude</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
<b>Version 1.0</b>		<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>
Pre-requisites/ Exposure	Aptitude 2nd year						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

To generate problem solving skills, counting techniques, ability to analyze the situation, demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions with logical thinking and applying decision making in all national and international projects.

## COURSE OUTCOMES

On completion of this course, the students are expected to

1. To enhance the calculation speed with the help of short cut tricks & detailed knowledge of numbers, factors, multiples.
2. Detailed knowledge of percentage & profit/loss and their applications. To build the approach for logical reasoning.
3. To improve data interpretation skill of the student, demonstrate a basic understanding of displays of data such as bar graphs, histograms, dot plots. Able to read between the lines and understand various language structures.

## COURSE DESCRIPTION

1. To speed up mathematical calculations.
2. Enhancing number system in details with application.
3. Concept building up of arithmetic with percentages.
4. Analytical and logical thinking and the habit of drawing conclusions based on quantitative information.
5. Understand the basic rules of logic, including critical thinking
6. Data analyzing techniques
7. Apply mathematical methodologies to open-ended real-world problems
8. mathematical analysis, and formulate mathematical models of such problems

## TEXT BOOKS

T1 CU-DCDP – Aptitude Book- TDY-302

T2 CU-DCPD – Logical Reasoning Ability for Campus placements

T3 CU-DCPD – Interpreting Data for Success

T4 CU-DCPD – Data Sufficiency

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## REFERENCE BOOKS

R1 Guha Abhijit Quantitative Aptitude for Competitive Examinations 2011 Tata McGraw Hill Publication 7 West Patel Nagar, New Delhi 110008.

R2 Aggarwal R.S A Modern Approach to Verbal and Non Verbal Reasoning 2012 S.Chand Publishing Kuttab Road, New Delhi. 011-23672080

## COURSE CONTENT

### Unit-I

8 CH

#### 1. Vedic Maths :

- Mental Calculations
- How to find square root, cube root, squares, cubes
- Approximations
- How to solve tough calculations in less time

#### 2. Classification of Numbers:

- Number Chart: Real numbers, Imaginary numbers, Rational numbers, Irrational numbers, Integers,

Whole numbers & Natural numbers

- Odd and Even numbers
- Prime and composite numbers
- Concept of co-prime pairs

#### 3. LCM & HCF and Factors:

- Concept of factor & multiple
- Concept of LCM and HCF (GCD)
- Word problems based on HCF & LCM.
- To find the number of factors of a given number.
- To find the sum and product of factors of a given number.

#### 4. Division and BODMAS:

- Concept of quotient, remainder, divisor and dividend
- Rule of BODMAS.
- Basic problems on above

#### 5. Remainders & Factorials:

- Concept of finding remainder of complicated index based quotients
- Concepts of factorials
- Highest power of prime number and composite number in a given factorial

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## **6. Unit's digit and Ten's digit of higher powers:**

- To find unit digit of higher powers of natural numbers
- To find tens digit of higher powers of natural numbers
- To calculate last two digits of higher powers of natural numbers

## **Unit-II**

**8 CH**

### **7. Percentages:**

- Concept of percentages
- Concept of percentage increasing and percentage decreasing
- Concept of successive percentage

### **8. Profit & Loss:**

- Concepts of cost price, selling price and marked price
- Fundamentals of profit, loss and discounts
- Fundamental problems based on above concepts.
- Complex problems based on above concepts.

### **9. Letter and Symbol Series:**

- How to find the missing term in the jumbled series
- How to find the next term in the jumbled series.

### **10. Blood relations:**

- Concept of symbol representation of blood relations
- Family tree based concepts
- Basic problems on above mentioned concepts.

## **Unit-III**

**8 CH**

### **11. Seating Arrangements:**

- Problems on Linear arrangements
- Problems on Circular arrangements

### **12. Analytical Reasoning:**

- To analyze the given figure
- Find the mirror images and water images
- Finding missing term after analyzing the given data.

### **13. Non Verbal Reasoning:**

- Finding the pattern for next figure
- Finding missing figure
- Finding the missing images
- Problems on cutting and folding paper.

### **14. Input Output:**

- Understanding the logic of given steps of input to get required output.

### **15. Data Interpretation:**

Analyze data in

- Tabular representation
- 2-D graphs
- 3-D graphs
- Venn diagram based DI questions
- Miscellaneous

**16. Symbol operations:**

- Concept of inequalities
- Concept of using either the real symbols or substituted symbols.

**17. Eligibility Test:**

- To decide among the given alternatives after assessing the given data for eligibility of candidate.

**18. Average and Weighted Average:**

- Concept of Mean.
- Different type of mean – Arithmetic, Geometric and Harmonic
- Application of means while taking averages in different types of questions

**19. Ratio, Proportion and Variation**

- Concept of ratio
- Concept of proportion
- Combining ratios
- Word problems on ratios
- Concept of Direct & Indirect variation between two variable
- Equating the constant of variation

**20. Partnership**

- Dividing profit into ratio of investments
- Partial time related problems

**21. Mixture and Alligation**

- Concept of Alligation
- Concept of mixing two or more things
- Continuous replacement problem

**22. Simple and Compound Interest**

- Concept of simple & compound interest
- Fundamental problems on it.

**23. Set Theory**

- Introduction to Venn diagrams
- Application of Venn diagrams in different problems
- Properties of sets and different operators.

**24. Problem on Ages**

- Application of concept of ratio on problems of ages related to past and future
- Understanding of linear equations

Application of shortcut tricks

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Mode of Evaluation: The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	

#### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	To enhance the calculation speed with the help of short cut tricks & detailed knowledge of numbers, factors, multiples.	10
2	Detailed knowledge of percentage & profit/loss and their applications. To build the approach for logical reasoning.	10
3	To improve data interpretation skill of the student, demonstrate a basic understanding of displays of data such as bar graphs, histograms, dot plots. Able to read between the lines and understand various language structures.	10

 Head of the Department (CSE) Apex Institute of Technology Chandigarh University, Gharuan, Mohali, Punjab	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>E</td><td>P</td><td>D</td><td>C</td><td>M</td><td>T</td><td>E</td><td>I</td><td>C</td><td>P</td><td>L</td></tr> <tr><td>n</td><td>r</td><td>e</td><td>o</td><td>o</td><td>h</td><td>n</td><td>d</td><td>o</td><td>r</td><td>if</td></tr> <tr><td>g</td><td>s</td><td>s</td><td>n</td><td>d</td><td>e</td><td>v</td><td>i</td><td>m</td><td>o</td><td>e</td></tr> <tr><td>i</td><td>o</td><td>i</td><td>n</td><td>d</td><td>e</td><td>i</td><td>v</td><td>m</td><td>j</td><td>-</td></tr> <tr><td>n</td><td>b</td><td>g</td><td>d</td><td>e</td><td>n</td><td>r</td><td>i</td><td>m</td><td>e</td><td>l</td></tr> <tr><td>e</td><td>l</td><td>n</td><td>u</td><td>r</td><td>g</td><td>o</td><td>u</td><td>c</td><td>t</td><td>o</td></tr> <tr><td>e</td><td>e</td><td>/</td><td>c</td><td>n</td><td>i</td><td>n</td><td>d</td><td>n</td><td>t</td><td>n</td></tr> <tr><td>r</td><td>m</td><td>d</td><td>t</td><td>t</td><td>n</td><td>m</td><td>u</td><td>i</td><td>m</td><td>g</td></tr> <tr><td>i</td><td>a</td><td>e</td><td>i</td><td>o</td><td>e</td><td>e</td><td>E</td><td>a</td><td>c</td><td>A</td></tr> <tr><td>n</td><td>n</td><td>v</td><td>n</td><td>o</td><td>e</td><td>n</td><td>t</td><td>l</td><td>a</td><td>N</td></tr> <tr><td>g</td><td>a</td><td>e</td><td>v</td><td>l</td><td>r</td><td>t</td><td>h</td><td>o</td><td>t</td><td>A</td></tr> <tr><td>K</td><td>l</td><td>l</td><td>e</td><td>u</td><td>a</td><td>a</td><td>i</td><td>r</td><td>i</td><td>R</td></tr> <tr><td>n</td><td>y</td><td>o</td><td>s</td><td>s</td><td>n</td><td>n</td><td>c</td><td>t</td><td>o</td><td>N</td></tr> <tr><td>o</td><td>s</td><td>p</td><td>t</td><td>a</td><td>d</td><td>d</td><td>s</td><td>e</td><td>n</td><td>i</td></tr> </table>	E	P	D	C	M	T	E	I	C	P	L	n	r	e	o	o	h	n	d	o	r	if	g	s	s	n	d	e	v	i	m	o	e	i	o	i	n	d	e	i	v	m	j	-	n	b	g	d	e	n	r	i	m	e	l	e	l	n	u	r	g	o	u	c	t	o	e	e	/	c	n	i	n	d	n	t	n	r	m	d	t	t	n	m	u	i	m	g	i	a	e	i	o	e	e	E	a	c	A	n	n	v	n	o	e	n	t	l	a	N	g	a	e	v	l	r	t	h	o	t	A	K	l	l	e	u	a	a	i	r	i	R	n	y	o	s	s	n	n	c	t	o	N	o	s	p	t	a	d	d	s	e	n	i
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- additional to usual areas
  - additional significantly longer part of course

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<b>20CSR-389</b>	Minor project -III	L	T	P	S	C	CH	Course Type
Version 1.00		0	0	8	1	4	8	Project
	22CSR-395							
Pre-requisites/ Exposure								
Co-requisites								
Anti-Requisites								

## COURSE DESCRIPTION

This course will provide a general introduction to project management. This course will equip the students to various feasibility analyses – Market, Technical, Financial and Economic. To equip them with the knowledge and skills required to be successful in applying Project Management. To make them understand techniques for Project planning, scheduling and Execution Control.

## COURSE OBJECTIVE

The objectives of this course are to:

To make them understand the concepts of Project Management for planning to execution of projects.

To make them understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.

To enable them to comprehend the fundamentals of Contract Administration, Costing and Budgeting.

### Course Outcomes:

CO1	To apply fundamental and disciplinary concepts and methods in ways appropriate to their principal areas of study.
CO2	To demonstrate skill and knowledge of current information and technological tools and techniques specific to the professional field of study.
CO3	To use effectively oral, written and visual communication.

### Syllabus:

The Syllabus for the Subject Code CSR- 395 (Minor Project III)-need not to be drafted as this is a MINOR PROJECT, students need to develop a project.

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S N	Course Code	TECHNICAL TARINING	L	T	P	S	C	C H	Course Type*
3	20CSP-382		0	0	2	0	1	2	PC
								Course Code(s)	
								22CST-388	
PRE-REQUISITE		Basics of Programming							
CO-REQUISITE									
ANTI-REQUISITE									

#### a. Course Description

During the course the student will learn everything needed to participate in real competitions. Along the way the students also gain useful skills for which competitive programmers are so highly valued by employers: ability to write efficient, reliable, and compact code, manage your time well when it's limited, apply basic algorithmic ideas to real problems, etc.

#### b. Course Objectives

To give students the ability to write reliable codes.

To provide skills to the students to write compact and efficient code in a quick manner

To provide logic building capability to the student.

#### c. Course Outcomes

CO1	To Provide real time problems to students for coding
CO2	To enhance the logic building capability of students
CO3	To give students a quick understanding of new codes

#### d. Syllabus

Unit-1	Data Structures	Contact Hours:15
Arrays, Stacks & Queues	<a href="https://www.hackerrank.com/challenges/arrays-ds/problem">https://www.hackerrank.com/challenges/arrays-ds/problem</a> <a href="https://www.hackerrank.com/challenges/2d-array/problem">https://www.hackerrank.com/challenges/2d-array/problem</a>	<i>Annu ES14</i>

	<a href="https://www.hackerrank.com/challenges/dynamic-array/problem">https://www.hackerrank.com/challenges/dynamic-array/problem</a> <a href="https://www.hackerrank.com/challenges/array-left-rotation/problem">https://www.hackerrank.com/challenges/array-left-rotation/problem</a> <a href="https://www.hackerearth.com/fr/practice/data-structures/arrays/multi-dimensional/practice-problems/algorithm/add-alternate-elements-of-2-dimensional-array/">https://www.hackerearth.com/fr/practice/data-structures/arrays/multi-dimensional/practice-problems/algorithm/add-alternate-elements-of-2-dimensional-array/</a> <a href="https://www.hackerrank.com/challenges/equal-stacks/problem">https://www.hackerrank.com/challenges/equal-stacks/problem</a> <a href="https://www.hackerrank.com/challenges/maximum-element/problem">https://www.hackerrank.com/challenges/maximum-element/problem</a> <a href="https://www.hackerearth.com/fr/practice/data-structures/queues/basics-of-queues/practice-problems/algorithm/disk-tower-b7cc7a50/">https://www.hackerearth.com/fr/practice/data-structures/queues/basics-of-queues/practice-problems/algorithm/disk-tower-b7cc7a50/</a> <a href="https://www.hackerrank.com/challenges/queue-using-two-stacks/problem">https://www.hackerrank.com/challenges/queue-using-two-stacks/problem</a>
<b>Linked List</b>	<a href="https://www.hackerrank.com/challenges/print-the-elements-of-a-linked-list/problem">https://www.hackerrank.com/challenges/print-the-elements-of-a-linked-list/problem</a> <a href="https://www.hackerrank.com/challenges/insert-a-node-at-the-tail-of-a-linked-list/problem">https://www.hackerrank.com/challenges/insert-a-node-at-the-tail-of-a-linked-list/problem</a> <a href="https://www.hackerrank.com/challenges/compare-two-linked-lists/problem">https://www.hackerrank.com/challenges/compare-two-linked-lists/problem</a> <a href="https://www.hackerrank.com/challenges/reverse-a-linked-list/problem">https://www.hackerrank.com/challenges/reverse-a-linked-list/problem</a> <a href="https://www.hackerrank.com/challenges/insert-a-node-into-a-sorted-doubly-linked-list/problem">https://www.hackerrank.com/challenges/insert-a-node-into-a-sorted-doubly-linked-list/problem</a> <a href="https://www.hackerrank.com/challenges/reverse-a-doubly-linked-list/problem">https://www.hackerrank.com/challenges/reverse-a-doubly-linked-list/problem</a>
<b>Graphs</b>	<a href="https://www.hackerrank.com/challenges/insertionsort1/problem">https://www.hackerrank.com/challenges/insertionsort1/problem</a> <a href="https://www.hackerearth.com/practice/algorithms/graphs/breadth-first-search/practice-problems/algorithm/monk-and-the-islands/">https://www.hackerearth.com/practice/algorithms/graphs/breadth-first-search/practice-problems/algorithm/monk-and-the-islands/</a> <a href="https://www.hackerearth.com/practice/algorithms/graphs/depth-first-search/practice-problems/algorithm/anupam-graph/">https://www.hackerearth.com/practice/algorithms/graphs/depth-first-search/practice-problems/algorithm/anupam-graph/</a> <a href="https://www.hackerrank.com/challenges/kruskalmstrsub/problem">https://www.hackerrank.com/challenges/kruskalmstrsub/problem</a> <a href="https://www.hackerrank.com/challenges/primsmstsub/problem">https://www.hackerrank.com/challenges/primsmstsub/problem</a> <a href="https://www.hackerrank.com/challenges/dijkstrashortreach/problem">https://www.hackerrank.com/challenges/dijkstrashortreach/problem</a> <a href="https://www.hackerrank.com/challenges/minimum-mst-graph/problem">https://www.hackerrank.com/challenges/minimum-mst-graph/problem</a> <a href="https://www.hackerrank.com/challenges/clique/problem">https://www.hackerrank.com/challenges/clique/problem</a> <a href="https://www.hackerrank.com/challenges/crab-graphs/problem">https://www.hackerrank.com/challenges/crab-graphs/problem</a> <a href="https://www.hackerrank.com/challenges/the-quickest-way-up/problem">https://www.hackerrank.com/challenges/the-quickest-way-up/problem</a>

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<b>Trees</b>	<a href="https://www.hackerrank.com/challenges/tree-preorder-traversal/problem">https://www.hackerrank.com/challenges/tree-preorder-traversal/problem</a> <a href="https://www.hackerrank.com/challenges/tree-postorder-traversal/problem">https://www.hackerrank.com/challenges/tree-postorder-traversal/problem</a> <a href="https://www.hackerrank.com/challenges/tree-inorder-traversal/problem">https://www.hackerrank.com/challenges/tree-inorder-traversal/problem</a> <a href="https://www.hackerrank.com/challenges/tree-height-of-a-binary-tree/problem">https://www.hackerrank.com/challenges/tree-height-of-a-binary-tree/problem</a> <a href="https://www.hackerrank.com/challenges/tree-level-order-traversal/problem">https://www.hackerrank.com/challenges/tree-level-order-traversal/problem</a> <a href="https://www.hackerrank.com/challenges/binary-search-tree-insertion/problem">https://www.hackerrank.com/challenges/binary-search-tree-insertion/problem</a> <a href="https://www.hackerrank.com/challenges/binary-search-tree-lowest-common-ancestor/problem">https://www.hackerrank.com/challenges/binary-search-tree-lowest-common-ancestor/problem</a> <a href="https://www.hackerrank.com/challenges/self-balancing-tree/problem">https://www.hackerrank.com/challenges/self-balancing-tree/problem</a> <a href="https://www.hackerrank.com/contests/hourrank-19/challenges/maximal-tree-diameter/problem">https://www.hackerrank.com/contests/hourrank-19/challenges/maximal-tree-diameter/problem</a> <a href="https://www.hackerrank.com/contests/101hack33/challenges/longest-path">https://www.hackerrank.com/contests/101hack33/challenges/longest-path</a>	
<b>Unit-2</b>	<b>Algorithms</b>	<b>Contact Hours:15</b>
<b>String Algorithms</b>	<a href="https://www.hackerearth.com/practice/algorithms/string-algorithm/string-searching/practice-problems/algorithm/string-4-d1093b86/">https://www.hackerearth.com/practice/algorithms/string-algorithm/string-searching/practice-problems/algorithm/string-4-d1093b86/</a> <a href="https://www.hackerearth.com/practice/algorithms/string-algorithm/string-searching/practice-problems/algorithm/palindrome-string-22/">https://www.hackerearth.com/practice/algorithms/string-algorithm/string-searching/practice-problems/algorithm/palindrome-string-22/</a> <a href="https://www.hackerearth.com/practice/algorithms/string-algorithm/basics-of-string-manipulation/practice-problems/algorithm/palindrome-124/">https://www.hackerearth.com/practice/algorithms/string-algorithm/basics-of-string-manipulation/practice-problems/algorithm/palindrome-124/</a> <a href="https://www.hackerearth.com/practice/algorithms/string-algorithm/basics-of-string-manipulation/practice-problems/algorithm/conversion-11/">https://www.hackerearth.com/practice/algorithms/string-algorithm/basics-of-string-manipulation/practice-problems/algorithm/conversion-11/</a> <a href="https://www.hackerearth.com/practice/algorithms/string-algorithm/basics-of-string-manipulation/practice-problems/algorithm/print-first-occurence/">https://www.hackerearth.com/practice/algorithms/string-algorithm/basics-of-string-manipulation/practice-problems/algorithm/print-first-occurence/</a> <a href="https://www.hackerrank.com/challenges/camelcase/problem">https://www.hackerrank.com/challenges/camelcase/problem</a> <a href="https://www.hackerrank.com/challenges/strong-password/problem">https://www.hackerrank.com/challenges/strong-password/problem</a>	
<b>Dynamic Programming</b>	<a href="https://www.hackerrank.com/challenges/dynamic-programming-classics-the-longest-common-subsequence/problem">https://www.hackerrank.com/challenges/dynamic-programming-classics-the-longest-common-subsequence/problem</a> <a href="https://www.hackerrank.com/challenges/unbounded-knapsack/problem">https://www.hackerrank.com/challenges/unbounded-knapsack/problem</a> <a href="https://www.hackerrank.com/challenges/longest-increasing-subsequent/problem">https://www.hackerrank.com/challenges/longest-increasing-subsequent/problem</a> <a href="https://www.hackerrank.com/challenges/travel-around-the-world/problem">https://www.hackerrank.com/challenges/travel-around-the-world/problem</a>	

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<b>Branch and Bound</b>	<a href="https://www.hackerrank.com/contests/srin-aadc03/challenges/classic-01-knapsack">https://www.hackerrank.com/contests/srin-aadc03/challenges/classic-01-knapsack</a> <a href="https://www.hackerrank.com/contests/bitsg-ai-lab-2/challenges/travelling-salesman-problem">https://www.hackerrank.com/contests/bitsg-ai-lab-2/challenges/travelling-salesman-problem</a> <a href="https://www.hackerrank.com/challenges/assignment/problem">https://www.hackerrank.com/challenges/assignment/problem</a>
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e. **Assessment Pattern - Internal and External**

The performance of students is evaluated as follows:

	<b>Theory</b>
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ES242*

Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks	100	

**f. Internal Evaluation Component**

Sr. No.	Type of Assessment	Weightage of actual conduct	Frequency of Task	Final Weightage in Internal Assessment	Remarks
1	Conduct	10 Marks per Practical	1 per practical	60 Marks per course	
2	Report	10 Marks per Practical	1 per practical		
3	Viva-Voce	20 Marks per Course	1 per Course		

**CO-PO MAPPING:**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1		3	3										3	
CO2		3	3										3	
CO3		3	3										3	

  
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# **SEMESTER-7**

<b>20CSA-431</b>	<b>Deployment of Private Cloud Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		0	0	2	0	1	2
Pre-requisites/ Exposure	Basics of Linux, Docker & Kubernetes						
Co-requisites	-						

### COURSE OBJECTIVES

The Course aims to:

1. Understanding the basic terminology and concepts related to DOCKER
2. Recognize appropriate use of KUBENETES and using it to implement Container Orchestration.
3. Applying the knowledge of DOCKER & KUBENETES to deploy applications on OpenShift.

### COURSE OUTCOMES

On completion of this course,

1. Learners will be able to build Docker images
2. Learners will be able to implement Container Orchestration using Kubernetes.
3. Learner will be able to Deploy containerized application on an OpenShift cluster

### COURSE DESCRIPTION

OpenShift is a cloud development Platform as a Service (PaaS) developed by Red Hat. It is an open source development platform, which enables the developers to develop and deploy their applications on cloud infrastructure. It is very helpful in developing cloud-enabled services. This subject will help you understand OpenShift and how it can be used in the existing infrastructure.

### TEXT BOOKS

**T1** Learn OpenShift: Deploy, build, manage, and migrate applications with OpenShift, Origin Artemii Kropachev Manning Publications Co 2018.

### REFERENCE BOOKS

**R1** OpenShift in Action Jamie Duncan; John Osborne Manning Publications Co 2018.

### COURSE CONTENT

Unit I:

4 Contact Hours

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1. Installation of Centos & its configuration, set up & Install Docker, Pulling Docker Images and creating your first container, checking connectivity between Containers, Stopping & Removing Containers
2. Installation of Ubuntu & its configuration, set up & Install Docker, Pulling Docker Images and creating your first container, checking connectivity between Containers, Stopping & Removing Containers & Removing Docker images
3. Container Orchestration & Setting Up Docker Swarm

**Unit II:**

**4 Contact Hours**

1. Setting up Kubernetes, and learn Container Orchestration
2. Setting up PODs | Replica Sets | Deployment | Services
3. Network Configuration in Kubernetes

**Unit III:**

**4 Contact Hours**

1. Installation & Configuration of Minishift.
2. Managing Web and Command line Interface
3. Managing OpenShift resources and storage

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

		<b>Lab</b>	
<b>Components</b>		<b>Continuous Internal Assessment (CAE)</b>	<b>Semester End Examination (SEE)</b>
<b>Marks</b>		60	40
<b>Total Marks</b>		100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

<b>Mapping Between COs and Pos</b>		
<b>SN</b>	<b>Course Outcome (CO)</b>	<b>Mapped Programme Outcome (PO)</b>
1	Learners will be able to build Docker images	1 to 5, 12
2	Learners will be able to implement Container Orchestration using Kubernetes.	1 to 3

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**Apex Institute of Technology**

**Chandigarh University,**

**Mr. S. S. Dhillon**

3	Learner will be able to Deploy containerized application on an OpenShift cluster	1 to 4, 11,12
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20CSP41 8	Deployment of Private Cloud Lab	3 2 2 1 1 0 0 0 0 0 1 1									

1=addressed to small extent

2= addressed significantly

3=major part of course

  
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<b>20CSP-438</b>	<b>CLOUD DESIGN PATTERN LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>CH</b>
<b>Version 1.00</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>12</b>
<b>Pre-requisites/ Exposure</b>	The candidate must have Basic Knowledge about Cloud Computing concepts, Routing, OSI and TCP/IP Models.						
<b>Co-requisites</b>	Nil						

## COURSE OBJECTIVES

The Course aims to:

1. Understanding the basic terminology and concepts related to the AWS platform.
2. Recognize and selecting appropriate use of AWS service based on data, compute, database, or security requirements.
3. Designing and deploying scalable, highly available, and fault tolerant systems on AWS.

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Learners will understand the basics of building IT infrastructure on the AWS platform.
2. By fully understanding cloud-based solutions and how AWS services match them, learners will be able to optimize AWS Cloud.
3. Understand best practices and design patterns to build the best IT solutions on AWS.

## COURSE DESCRIPTION

AWS is nothing more than Amazon's cloud service provider. This is a revolutionary change because it allows you to develop applications without worrying about the hardware, networks, databases, and other physical infrastructure required to run the applications. For example, if you want to develop online applications for your business, you need a lot of servers, databases, and other infrastructure. You need to rent a data center, buy servers, routers, databases and other things to get started. This is a painful thing and a big obstacle for many entrepreneurs. AWS solves this problem by renting its own infrastructure and servers at an iconic fee, which is only a fee for your own setup.

## TEXT BOOKS

- T1** Michael Wittig and Andreas Wittig, Amazon Web Services in Action, Manning Publication, 2015.

**T2** Mark Wilkins, Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS, Addison-Wesley Professional; 1 edition, 2019.

## COURSE CONTENT

Unit I	04 Contact Hours
<hr/>	
1. AWS Basics – Account creation, Navigating AWS console, Creating a project.	
2. Identity and Access management – Setup and configuration, Users, Groups and Policies.	
3. AWS EC2 – Basics, Instance creation, Security Groups, IP Addressing, Launching EC2 instance.	
Unit II	04 Contact Hours
<hr/>	
4. AWS Networking and Connectivity – VPC, Gateways, Route tables, NACs.	
5. AWS S3 – Basics, Use of buckets, Object lifecycle, Permissions and Versioning.	
6. AWS Database services – RDS and DynamoDB.	
7. AWS Monitoring – SNS , CloudWatch.	
Unit III	04 Contact Hours
<hr/>	
8. Load balancing, Elasticity and Scalability in AWS -- Basics, Autoscaling, Route53.	
9. AWS Lambda	
10. Project Work -- Deploying a website on AWS.	

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

	Lab	
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40

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<b>Total Marks</b>	<b>100</b>
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**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

<b>Mapping Between COs and POs</b>		
<b>SN</b>	<b>Course Outcome (CO)</b>	<b>Mapped Programme Outcome (PO)</b>
1	Learners will understand the basics of building IT infrastructure on the AWS platform.	1 to 5, 9 to 12
2	By fully understanding cloud-based solutions and how AWS services match them, learners will be able to optimize AWS Cloud.	1 to 5, 9 to 12
3	Understand best practices and design patterns to build the best IT solutions on AWS.	1 to 5, 9 to 12

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*Anmol*  
Head of the Department (CSE)  
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Chandigarh University,  
Gharuan, Mohali, Punjab

ES-42

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		s											
		1	2	3	4	5	6	7	8	9	10	11	12
<b>20CSP-438</b>	<b>Cloud Design Pattern Lab</b>	3	2	2	2	2	0	0	0	2	1	2	2

1=addressed to small extent

2= addressed significantly

3=major part of course

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<b>20CST-437</b>	<b>Cloud Design Patterns</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>S</b>	<b>CH</b>
<b>Version 1.0</b>		3	0	0	3	0	36
<b>Pre-requisite</b>	The candidate must have Basic Knowledge about Cloud Computing concepts, Routing types, OSI and TCP/IP Models.						
<b>Co-requisite</b>	Cloud architecture and design						

## **COURSE OBJECTIVES**

The course aims to:

1. Develop an understanding among students to recognize terminology and concepts confined to the Amazon Web Services (AWS) platform.
2. Demonstrate design patterns utilized by various cloud architects based on type of problem they addressed.
3. Using generic design pattern solutions for making specific architectural decisions.

## **COURSE OUTCOMES**

On completion of this course, the students shall be able to

1. Discuss various paradigms related to concepts of cloud computing and Amazon Web Services (AWS) design principles.
2. The students shall become equipped to identify appropriate Amazon Web Services (AWS) based on application requirements.
3. The students shall be able to explain appropriate design strategy and deal with their controlling mechanisms as per the specific business needs.

## **COURSE DESCRIPTION**

Cloud design patterns provide reproducible processes, practices, and blueprints to deliver secure, scalable cloud-native products. This course will guide you to use AWS's rich products to solve the common problems. You will be introduced to cloud service models and discover how to apply them when building cloud-oriented solutions and highly robust systems using cloud infrastructure. You will also learn how to use containers and serverless architectures to improve scalability and security, so as to explore and apply services provided by Amazon in a unique way to solve common design problems.

## **TEXT BOOKS**

T1. Thomas Erl, May 2013, "Cloud Computing: Concepts, Technology & Architecture", PHI Publications

T2. Marcus Young 2015, "Implementing Cloud Design Patterns for AWS", Packt Publications.

## **REFERENCE BOOKS**

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R1. Michael J. Kavis. 2014, "Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, & IaaS)", Wiley Publications.

R2. Michael Wittig, Andreas Wittig 2019, "AWS in action", Manning Publications.

R3. Alex Homer, John Sharp, Larry Brader, Masashi Narumoto, Trent Swanson 2014, "Cloud design Patterns", Microsoft publications

## COURSE CONTENT

<b>Unit I: Cloud Computing and AWS Basics</b>	<b>12 Contact Hours</b>
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**Cloud Computing basics:** Cloud Computing definition, Comparison of cloud computing with grid, utility and client/server computing, Private, public, hybrid clouds, NIST definition of Cloud, Characteristics of Cloud, Virtualization Technology in Cloud, Difference between Virtualization and containerization.

**Basic Design Principles:** Stateless, Loose Coupling, Elasticity, Automated.

**AWS Basic Patterns:** Snapshot Pattern (Data Backups), Stamp Pattern (Server Replication), Scale Up Pattern (Dynamic Server Spec Up/Down), Scale Out Pattern (Dynamically Increasing the Number of Servers), On-demand Disk Pattern (Dynamically Increasing/Decreasing Disk Capacity), Infrastructure Patterns: Physical platform patterns, Virtualization patterns, data and Storage Patterns.

<b>Unit II: AWS Design Patterns based on resource</b>	<b>12 Contact Hours</b>
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**AWS Patterns for Processing Static Content:** Web Storage Pattern (Use of High-Availability Internet Storage), Direct Hosting Pattern (Direct Hosting Using Internet Storage), Private Distribution Pattern (Data Delivery to Specified Users), Cache Distribution Pattern (Locating Data in a Location That Is Physically Near to the User), Rename Distribution Pattern (Delivery Without Update Delay).

**AWS Patterns for Batch Processing:** Queuing Chain Pattern (Loose-Coupling of Systems), Priority Queue pattern (Changing Priorities), Job Observer Pattern (Job Monitoring and Adding/Deleting Servers), Scheduled Autoscaling Pattern (Turning Batch Servers On and Off Automatically).

**AWS Patterns for High Availability:** Multi-Server Pattern (Server Redundancy), Multi-Datacenter Pattern (Redundancy on the Data Center Level), Floating IP Pattern (Floating IP Address), Deep Health Check Pattern (System Health Check).

<b>Unit III: AWS Design Patterns for Database and Operations</b>	<b>12 Contact Hours</b>
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**AWS Patterns for Relational Database:** DB Replication Pattern (Replicating Online Databases), Read Replica Pattern (Load Distribution through Read Replicas), In memory DB Cache Pattern (Caching High-Frequency Data), Sharding Write Pattern (Improving Efficiency in Writing).

**AWS Pattern for Operation and Maintenance:** Stack Deployment Pattern (Creating a Template for Setting up Groups of Servers), Monitoring Integration Pattern (Centralization of Monitoring Tools), Hybrid Backup Pattern (Using the Cloud for Backups).

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks		100

**Relationship between the Course Outcome (COs) and Program Outcomes (POs)**

Mapping Between COs and POs		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Discuss various paradigms related to concepts of cloud computing and Amazon Web Services (AWS) design principles.	1 to 5, 9 to 12
2	The students shall become equipped to identify appropriate Amazon Web Services (AWS) based on application requirements.	1 to 5, 9 to 12
3	The students shall be able to explain appropriate design strategy and deal with their controlling mechanisms as per the specific business needs.	1 to 5, 9 to 12

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			D e s i g n / d e v e l o p m e r e r o n t i b t u c o n f e s s				E n v i r o n m e n t e n g a n d s u s t a a i n d n a b i l h i c r o n e	T h e n g a n d s u s t a a i n d n a b i l h i c r o n e	I n d i v i d u a l o r t e a m a n d f i c i n a n i n g	P r o j e c t m a n a g e m e n t a o m m u n d f i c i n a n i n g	L i f e - l o n g L e a r n i n g			
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20CST-437	Cloud Design Pattern	3	2	2	2	2	0	0	0	2	1	2	2	

1= addressed to small extent

2= addressed significantly

3= major part of course

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<b>20CST-440</b>	<b>Web Framework in Cloud (AngularJS)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>CH</b>
Version 1.00		3	0	0	0	3	36
Pre-requisites/ Exposure	Knowledge of web development						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. Develop understanding among the students about the different web frameworks available in cloud, architecture of cloud and REST API's
2. Demonstrate methods for cloud adoption to business to build business applications using AngularJS
3. Teach use and application of AngularJS tools and techniques in real case scenarios

## COURSE OUTCOMES

On completion of this course,

1. The students will become familiar with the concepts cloud web development, REST API's, use of REST API's in AngularJS
2. The students shall become equipped to build AngularJS applications for helping businesses going into digital transformation
3. The students shall be able to compare within different frameworks available and select best possible framework

## COURSE DESCRIPTION

The course begins with the introduction to cloud which is widely utilized in all business applications. The students are then introduced to REST architecture and REST API's its applications in real life. The course further emphasizes on the basic concept of AngularJS and how to build a real time application with AngularJS. Then the students are introduced to how to deploy the application on cloud.

## TEXT BOOKS

**T1** Moyer, C.M. (2012). Building applications in the cloud : concepts, patterns, and projects. Upper Saddle River, N.J: Addison-Wesley.

**T2** Ambler, T. and Cloud, N. (2015). JavaScript frameworks for modern web dev. New York: Apress.

## REFERENCE BOOKS

**R1** Zaigham Mahmood (2015). Software engineering frameworks for the cloud computing paradigm. Springer.

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**R2** Williamson, K. (2015). Learning AngularJS A Guide to AngularJS Development. Sebastopol O'reilly & Associates.

## COURSE CONTENT

Unit I: Introduction to Cloud environment and web services 12 Contact Hours

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**Introduction and evolution of Cloud computing:** Evolution of cloud computing, Fundamentals of cloud services, Introduction to cloud framework, Cloud service providers

**Representational State Transfer REST** Introduction to REST architecture, Different methods of describing and using resources, Designing REST applications.

Unit II: Web Technologies to work on cloud 12 Contact Hours

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**Front end technologies:** Introduction to HTML, HTML5, CSS and Bootstrap library, Introduction to Javascript and modern Javascript frameworks, Building responsive web interfaces

**Web Browser** Web Browser as an application, Document Object Model, Rendering web pages, Browser Internals, Building web Interfaces, UX perspective

**AngularJS Introduction:** What is AngularJS, Pattern of AngularJS, Architecture of AngularJS, AngularJS Expressions and Syntax, Single Page Applications

Unit III: Modern web applications and Deployment 12 Contact Hours

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**Building modern web Applications in AngularJS** Setting up development environment, Introduction to NodeJS and its modules, NPM, Building UI and testing with AngularJS, AngularJS forms and directives

**Web application Deployment** Introduction to Versioning System – GIT, Clouds and virtualisation, Deployment of web application on cloud

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	<i>Annu 60 ES 42</i>
Total Marks	100	

### Relationship between the Course Outcome of Ho and Progress Outcome (PHo)

SN	Progress Outcome (PHo)										Object Progress Outcome (PHo)
	Course Outcome (CO)										
1	The student will become familiar with the concepts of mean and development. <del>Estimate probability of a given event occurring.</del>										1,2,3,4
2	The student will become acquainted with the application of the binomial distribution to solving binomial problems. <del>Find probabilities of various events occurring.</del>										1,2,3,4
3	The student will be able to compare various different frameworks available for solving binomial problems.										1,2,3,4
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20CST-440	Web Framework in Cloud (AngularJS)	1	2	2	0	3	0	0	0	1	0	0	0

1=addressed to small extent

2= addressed significantly

3=major part of course

  
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<b>20CSP-441</b>	<b>Web Framework in Cloud(AngularJS) Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>H</b>
Version 1.00		0	0	2	0	1	12
Pre-requisites/ Exposure	Knowledge of web development						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims to:

1. Develop understanding among the students about the different web frameworks available in cloud, architecture of cloud and REST API's
2. Demonstrate methods for cloud adoption to business to build business applications using AngularJS
3. Teach use and application of AngularJS tools and techniques in real case scenarios

## COURSE OUTCOMES

On completion of this course,

1. The students will develop a project with the concepts cloud web development, REST API's, use of REST API's and implement the same using AngularJS framework
2. The students shall become equipped to build AngularJS applications for helping businesses going into digital transformation
3. The students shall be able to compare within different frameworks available and select best possible framework

## COURSE DESCRIPTION

The course begins with the introduction to AngularJS framework and its architecture. The students are then introduced to AngularJS libraries, its components and usage in business applications. The course further emphasizes on the development of AngularJS components and how to maintain interaction between different components within AngularJS. Then the students are introduced to how to deploy the application on cloud.

## TEXT BOOKS

**T1** Moyer, C.M. (2012). Building applications in the cloud : concepts, patterns, and projects. Upper Saddle River, N.J: Addison-Wesley.

**T2** Ambler, T. and Cloud, N. (2015). JavaScript frameworks for modern web dev. New York: Apress.

*Amritpal Singh*  
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 Chandigarh University,  
 Gharuan, Mohali, Punjab

## **REFERENCE BOOKS**

**R1** Zaigham Mahmood (2015). Software engineering frameworks for the cloud computing paradigm. Springer.

**R2** Williamson, K. (2015). Learning AngularJS A Guide to AngularJS Development. Sebastopol O'reilly & Associates.

## **COURSE CONTENT**

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**Unit I: Creation of AngularJS project** 4 Contact Hours

**Experiment 1:** Creating a New Project and understanding the Libraries

**Experiment 2:** Running Your Project and pushing it to bitbucket

**Experiment 3:** Styles: Using a CSS Framework and inserting it into the component

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**Unit II: Development of Components** 4 Contact Hours

**Experiment 4:** Creating First Component and testing using different frameworks

**Experiment 5:** Creating Data Structures and implementation in AngularJS

**Experiment 6:** Passing data into a component

**Experiment 7:** Looping Over data into AngularJS components

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**Unit III: Reusable components and formatting data** 4 Contact Hours

**Experiment 8:** Formatting data for display within components and interaction between components

**Experiment 9:** Reusability of different components within the application

**Experiment 10:** Responding to an event within the AngularJS framework

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

<b>Practical</b>		
<b>Components</b>	<b>Continuous Internal Assessment (CAE)</b>	<b>Semester End Examination (SEE)</b>
<b>Marks</b>	40	60
<b>Total Marks</b>	100	

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### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

<b>Mapping Between COs and Pos</b>		
<b>SN</b>	<b>Course Outcome (CO)</b>	<b>Mapped Programme Outcome (PO)</b>
1	The students will develop a project with the concepts cloud web development, REST API's, use of REST API's and implement the same using AngularJS framework	1,2,3,5,9
2	The students shall become equipped to build AngularJS applications for helping businesses going into digital transformation	1,2,3,5,9
3	The students shall be able to compare within different frameworks available and select best possible framework	1,2,3,5,9

		D e s i g n  E n g i n e e e r i n g P p r o m o b n le t inve stiga tions of com plex prob lems	e n v ir on e m e n t a n d i n d i v i d u s u a s b ci et y y	E n v ir on T h e e n o n e n t a n d i n d i v i d u s u a s b ci et y y	P r o je ct m a n a g e e l o m e n g C o m e n t a n a n d f i n i n g
<p><i>Amrit ES942</i></p> <p>Head of the Department (CSE) Apex Institute of Technology Chandigarh University, Gharuan, Mohali, Punjab</p>					

					o n s								c e	
		1	2	3	4	5	6	7	8	9	10	11	12	
20CSP-441	Web framework in Cloud(Angular JS) Lab	1	2	2	0	3	0	0	0	1	0	0	0	

1=addressed to small extent

2= addressed significantly

3=major part of course

*Aman  
EST 142*  
Head of the Department (CSE)  
Apex Institute of Technology  
Chandigarh University,  
Gharuan, Mohali, Punjab

<b>20CSA-432</b>	<b>Deployment of Private Cloud</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		3	0	0	0	3	36
Pre-requisites/ Exposure	Basic of Linux, Cloud Computing, Docker & Kubernetes						
Co-requisites	-						

## COURSE OBJECTIVES

The Course aims:

1. To give skills and knowledge, Cloud Computing can enable transformation, business development and agility with the help of Private Cloud for an Enterprise.
2. To give skills and knowledge on OpenShift and manage its components.
3. To create projects and application on Openshift.

## COURSE OUTCOMES

On completion of this course,

1. The students will be able to deploy private cloud using OpenShift
2. The students will be able to build custom Docker images and implement container orchestration using Kubernetes.
3. The students will be able to Install, configure OpenShift cluster and using this knowledge they can deploy containerized application on an OpenShift cluster.

## COURSE DESCRIPTION

OpenShift is a cloud development Platform as a Service (PaaS) developed by Red Hat. It is an open source development platform, which enables the developers to develop and deploy their applications on cloud infrastructure. It is very helpful in developing cloud-enabled services. This subject will help you understand OpenShift and how it can be used in the existing infrastructure. After learning this subject, readers will be at a moderate level of understanding of OpenShift and its key building block. It will also give a fair idea on how to configure OpenShift in a preconfigured infrastructure and use it.

## TEXT BOOKS

**T1** Learn OpenShift: Deploy, build, manage, and migrate applications with OpenShift,  
Origin ArtemiiKropachev Manning Publications Co 2018.

## REFERENCE BOOKS

**R1** OpenShift in Action Jamie Duncan; John Osborne Manning Publications Co 2018.

## COURSE CONTENT

Unit I: About OpenShift & its core concepts *Aman* *ES442* **Head of the Department (CSE)** **12 Contact Hours**

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**Gharuan, Mohali, Punjab**

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**About OpenShift:** Introduction to OpenShift; Three kinds of Platform; advantages of using OpenShift; OpenShift architecture; OpenShift components benefits of OpenShift

**Core Concepts:** Understand containers and images; pods and services; Builds and streams Routes & Templates; Deployments Storage concepts; OpenShift networking concepts

**Installation of OpenShift platform:** The servers for installation; Steps to install and configure an OpenShift cluster; post-installation step

**Configuration of OpenShift platform:** Change log in identity provider; Create and manage users and accounts; Deploy an OpenShift router; Deploy an internal registry

Unit II: Accessing OpenShift

12 Contact Hours

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**Use of web interface:** Fork a sample repository; Create projects and applications; Verify if the application us running; Configuring automated builds; code change and manually rebuild images

**Use of command line interface:** Create projects and applications using CLI; Verify if the application running; Configuring automated build;code change and manually rebuild image

**Creating custom container images:** Custom docker image creation approaches; basics of a docker file; Design considerations for a custom docker file; Building custom images using a docker file.

Unit III: Managing different components of OpenShift

12 ContactH ours

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Controlling access to OpenShift resources: Access control on OpenShift resources; secrets and their application; security policies and their application

Allocation persistent storage: persistent storage concepts such as PVs and PVCs; Implement persistent storage for use by the application; persistence is configured for internal registry

Managing application deployments: Understand pod replicas and how to scale them; control pod scheduling; Manage image; image streams templates

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

	Theory	
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	

### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and Pos		
SN	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	The students will be able to deploy private cloud using OpenShift	1 to 5, 12
2	The students will be able to build custom Docker images and implement container orchestration using Kubernetes.	1 to 5, 12
3	The students will be able to Install, configure OpenShift cluster and using this knowledge they can deploy containerized application on an OpenShift cluster.	1 to 5, 12

 Anil ES242	E n gi n e er in g K n o w le d g e	D e si g n/ d e v el o P r o m e bl nt o bl e o stiga tions ol of al io si n es	T h e e n M o n Con duct inve n a to n d er er a u st ai s n a ci bi et g le plex prob lems	E n vi r o n e m e nt a n d e s e d r a u te m a n th ic li ty s y ty	I n di vi n d u al o r te a m ni w o c r s k	P r o j e ct m a n a g e m e nt C o n a lo n d g L fi L ar n e g

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Chandigarh University,  
 Gharuan, Mohali, Punjab

20CSA-432	Deployment of Private Cloud	3	1	2	1	2	0	0	0	0	0	0	1
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1=addressed to small extent

2= addressed significantly

3= major part of course

*Amane  
E5942*

Head of the Department (CSE)  
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Gharuan, Mohali, Punjab

20CSR-445	Major Project	L	T	P	S	C	CH	Course Type
Version 1.00		0	0	6	1	4	6	PROJECT
22CSR-449								
Pre-requisites/ Exposure								
Co-requisites								
Anti-Requisites								

### COURSE DESCRIPTION

This course will provide a general introduction to project management. This course will equip the students to various feasibility analyses – Market, Technical, Financial and Economic. To equip them with the knowledge and skills required to be successful in applying Project Management. To make them understand techniques for Project planning, scheduling and Execution Control.

### COURSE OBJECTIVE

The objectives of this course are to:

To make them understand the concepts of Project Management for planning to execution of projects.

To make them understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.

To enable them to comprehend the fundamentals of Contract Administration, Costing and Budgeting.

### Course Outcomes:

CO1	To apply fundamental and disciplinary concepts and methods in ways appropriate to their principal areas of study.
CO2	To demonstrate skill and knowledge of current information and technological tools and techniques specific to the professional field of study.
CO3	To use effectively oral, written and visual communication.

### Syllabus:

The Syllabus for the Subject Code CSR- 449 (Major Project )-need not to be drafted as this is a Major PROJECT, students need to develop a project.

# **SEMESTER-8**

<b>20CST-488</b>	<b>Artificial Intelligence and Natural Language Processing</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		2	0	0	0	2	2
Pre-requisites/ Exposure	20CSP-286						
Co-requisites	20CSP454						

## COURSE OBJECTIVES

The Course aims to:

1. To present an overview of artificial intelligence (AI) principles and approaches.
2. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, and Learning.
3. Understanding nature of problems solved with Machine Learning.

## COURSE OUTCOMES

Upon successful completion of this course, students will be able to:

1. Design a knowledge based system and develop an appreciation for what is involved in learning from data.
2. Understand a wide variety of learning algorithms and apply a variety of learning algorithms to data.
3. Understand how to perform evaluation of learning algorithms and model selection.

## COURSE DESCRIPTION

This course introduces the fundamental concepts and theory of Natural Language Processing (NLP; a.k.a. computational linguistics) and its practical tasks. NLP is a field in Artificial Intelligence (AI) devoted to creating computer systems which understand and produce human languages. How Knowledge will be extracted from unstructured text by identifying references to named entities as well as stated relationships between such entities, will be taught.

## TEXT BOOKS

**T1.** Jurafsky and Martin, "Speech and Language Processing (3rd ed)", 2017

**T2.** Steven Bird, Ewan Klein, and Edward Loper, "Natural Language Processing with Python", 2009.

## REFERENCE BOOKS

**R1:** Russell, Norvig, Artificial Intelligence: A Modern Approach, Third edition, Prentice Hall, 2010

**R2.** Hastie, Tibshirani, Friedman. The elements of statistical learning, Second edition, Springer, 2009

## COURSE CONTENT

Unit I

8 Contact Hours

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Introduction to Artificial Intelligence: Introduction to AI, Early work in AI. AI problems and Techniques Problems, Problem Spaces and Search Covers Production system and search control

Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best First Search, Reduction, Constraint Satisfaction, Mean-Ends Analysis

Introduction to machine learning: Why Machine learning, Examples of Machine Learning Problems, Structure, Characteristics of Machine learning tasks, Features.

Unit II

8 Contact Hours

**Classification and regression:** Classification, Regression, Theory of Generalization: Effective number of hypothesis, bounding the Growth function, VC Dimensions, Regularization theory.

Linear models: Multivariate Linear Regression, Regularized Regression, Using Least Square regression for Classification. Perceptron, Support Vector Machines, Soft Margin SVM, Obtaining probabilities from Linear classifiers, Kernel methods for non-Linearity.

Unit III

8 Contact Hours

**Logic based and algebraic models:** Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification, Distance based clustering-K means Algorithm, Hierarchical clustering, Rule Based Model, Tree Based Models

**Probabilistic models:** Normal Distribution and Its Geometric Interpretations, Discriminative learning with Maximum likelihood, Probabilistic Models with Hidden variables

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40 <i>Aman ES412</i>	60
Total Marks	100	

### Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

<b>Mapping Between COs and POs</b>		
S N	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	The students will be able to design a knowledge based system and develop an appreciation for what is involved in learning from data.	1 to 6, 9, 11, 12
2	The students will be able to understand a wide variety of learning algorithms and apply a variety of learning algorithms to data.	1 to 6, 9, 11, 12
3	The students will be able to understand how to perform evaluation of learning algorithms and model selection.	1 to 6, 9, 11, 12

				D e si g n/ d E n gi n e er in g K n o w	e on du ct in ve sti ga ti p m r o bl e o m f a s n ol al y si n ss	C C on du ct in ve sti ga ti p m r o bl e o m f a s n ol al y si n ss			E n vi r on m e n t gi n e r er a u st ol u le a ci g et y ty			P r oj e ct m a n a g e m e al C o r m a u m ni w o th a s bi et li ic s k			R o j e ct m a n a g e m e al C o r m a u m ni w o th a s bi et li ic s k	
					1	2	3	4	5	6	7	8	9	10	11	12

  
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 Gharuan, Mohali, Punjab

20CST451	Artificial Intelligence and Natural Language Processing	3	3	3	3	3	2	0	0	3	0	1	2
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1=addressed to small extent

2= addressed significantly

3=major part of course

  
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 Head of the Department (CSE)  
 Apex Institute of Technology  
 Chandigarh University,  
 Gharuan, Mohali, Punjab

<b>20CST486</b>	<b>Cloud Security</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		2	0	0	0	2	24
Pre-requisites/ Exposure	Cloud Computing fundamentals						
Co-requisites	20CSP457						

## COURSE OBJECTIVES

The Course aims to:

1. Compare modern security concepts as they are applied to cloud computing and assess the security of virtual systems
2. Evaluate the security issues related to multi-tenancy
3. Appraise compliance issues that arise from cloud computing

## COURSE OUTCOMES

Upon successful completion of this course, students will be able to:

1. Describe cloud security architectures from the perspectives of: providers, brokers, carriers, and auditors.
2. Describe a methodology for orchestrating a cloud ecosystem.
3. Understand how cloud computing changes the traditional enterprise security considerations compared to on-premise.

## COURSE DESCRIPTION

The course on cloud security introduces the basic concepts of security systems and cryptographic protocols, which are widely used in the design of cloud security. The issues related multi tenancy operation, virtualized infrastructure security and methods to improve virtualization security are also dealt with in this course

## TEXT BOOKS

**T1.** Tim Mather, Subra Kumaraswamy, ShahedLatif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance" O'Reilly Media; 1 edition [ISBN: 0596802765], 2009.

**T2.** Ronald L. Krutz, Russell Dean Vines, "Cloud Security" [ISBN: 0470589876], 2010.

## REFERENCE BOOKS

**R1:** John Rittinghouse, James Ransome, "Cloud Computing" CRC Press; 1 edition [ISBN: 1439806802], 2009.

**R2:** J.R. ("Vic") Winkler, "Securing the Cloud" Syngress [ISBN: 1597495921] 2011.

## COURSE CONTENT

**Unit I: Security Fundamentals** 8 Contact Hours

**Security Concepts:** Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege, how these concepts apply in the cloud, what these concepts mean and their importance in PaaS, IaaS and SaaS. e.g. User authentication in the cloud; Cryptographic Systems- Symmetric cryptography, stream ciphers, block ciphers, modes of operation, public-key cryptography, hashing, digital signatures, public-key infrastructures, key management, X.509 certificates, OpenSSL.

**Multi-Tenancy Issues:** Isolation of users/VMs from each other. How the cloud provider can provide this; **Virtualization System Security Issues-** e.g. ESX and ESXi Security, ESX file system security, storage considerations, backup and recovery; **Virtualization System Vulnerabilities-** Management console vulnerabilities, management server vulnerabilities, administrative VM vulnerabilities, guest VM vulnerabilities, hypervisor vulnerabilities, hypervisor escape vulnerabilities, configuration issues, malware (botnets etc).

**Unit II: Virtualization based security** 8 Contact Hours

**Virtualization System-Specific Attacks:** Guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, code or file injection into the virtualized file structure), VM migration attack, hyperjacking.

**Technologies For Virtualization-Based Security Enhancement:** IBM security virtual server protection, virtualization-based sandboxing; **Storage Security-** HIDPS, log management, Data Loss Prevention. Location of the Perimeter.

**Unit III: Legal and Compliance** 8 Contact Hours

**Legal And Compliance Issues:** Responsibility, ownership of data, right to penetration test, local law where data is held, examination of modern Security Standards (eg PCIDSS), how standards deal with cloud services and virtualization, compliance for the cloud provider vs. compliance for the customer.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

Theory		
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	40	60
Total Marks	100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

**Mapping Between COs and POs**

S N	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	The students will be able to describe cloud security architectures from the perspectives of: providers, brokers, carriers, and auditors.	1 to 6, 9, 11, 12
2	The students will be able to describe a methodology for orchestrating a cloud ecosystem.	1 to 6, 9, 11, 12
3	The students will be able to understand how cloud computing changes the traditional enterprise security considerations compared to on-premise.	1 to 6, 9, 11, 12

		D es ig n/ n/ e v el o d p ro bl K n o w le d g e	C on du ct in ve sti ga tio n d m of co nt m of ex pl m ol ut io n si n ss			E n vi ro n m e n gi a n t er n e d er a u n d ai st a s ci et y					P ro je ct m a n a g e m e m e nt C o m m d u al or te a m c w th ic s								
		1	2	3	4	5	6	7	8	9	10	11	12						
20CST456	Cloud Security	3	3	3	3	3	2	0	0	3	0	1	2						

1=addressed to small extent

2= addressed significantly

3=major part of course

*Amrit ES 4/2*  
 Head of the Department (CSE)  
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 Gharuan, Mohali, Punjab

<b>20CSP491</b>	<b>Artificial Intelligence and Natural Language Processing Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		0	0	2	0	1	12
Pre-requisites/ Exposure	20CSP-286						
Co-requisites	20CST451						

### COURSE OBJECTIVES

The Course aims to:

1. To understand basic principles of Artificial Intelligence, learn and design intelligent agents
2. To understand language specific tasks and learning models
3. To explore artificial intelligence in understanding the semantics of text data

### COURSE OUTCOMES

Upon successful completion of this course, students will be able to:

1. Understand formal methods of knowledge representation, logic and reasoning
2. Understand foundational principles, mathematical tools and program paradigms of artificial intelligence
3. Formulate NLP tasks as learning and inference tasks, and address the computational challenges involved

### COURSE DESCRIPTION

This course introduces the fundamental concepts and theory of Natural Language Processing (NLP; a.k.a. computational linguistics) and its practical tasks. NLP is a field in Artificial Intelligence (AI) devoted to creating computer systems which understand and produce human languages. How Knowledge will be extracted from unstructured text by identifying references to named entities as well as stated relationships between such entities, will be taught.

### TEXT BOOKS

**T1.** Jurafsky and Martin, "Speech and Language Processing (3rd ed)", 2017

**T2.** Steven Bird, Ewan Klein, and Edward Loper, "Natural Language Processing with Python", 2009.

### REFERENCE BOOKS

**R1:** Russell, Norvig, Artificial Intelligence: A Modern Approach, Third edition, Prentice Hall, 2010

**R2.** Hastie, Tibshirani, Friedman. The elements of statistical learning, Second edition, Springer, 2009

## COURSE CONTENT

### Unit I

**4 Contact Hours**

#### Word Analysis

1. Word Generation
2. Morphology

### Unit II

**4 Contact Hours**

#### N-Grams

1. N-Grams Smoothing
2. POS Tagging: Hidden Markov Model

### Unit III

**4 Contact Hours**

#### POS Tagging: Viterbi Decoding

1. Building POS Tagger
2. Chunking
3. Building Chunker

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

	Lab	
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60	40
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and POs		
S N	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	The students will be able to understand formal methods of knowledge representation	1 to 6, 9, 11, 12
2	The students will be able to understand foundational principles	1 to 6, 9, 11, 12

3	The students will be able to formulate NLP tasks as learning and inference tasks	1 to 6, 9, 11, 12
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				D es ig n/ d e v el o P ro bl En gin eer ing Kn ow led ge		M o d er n e r t o ns of ut igatio n ol ns ol ut io n si n proble ms		E n vi ro n m e nt a n d e r s t ai n a nd sa soc iet y e y		In di vi d u al or te a m un w or k		Proj ect o m age m en t ic ati on			
				1	2	3	4	5	6	7	8	9	10	11	12

1=addressed to small extent

2= addressed significantly

3=major part of course

*Amrit  
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Gharuan, Mohali, Punjab

<b>20CSP487</b>	<b>Cloud Security Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		0	0	2	0	2	2
Pre-requisites/ Exposure	Cloud Computing fundamentals						
Co-requisites	20CST456						

### **COURSE OBJECTIVES**

The Course aims to:

1. Compare modern security concepts as they are applied to cloud computing and assess the security of virtual systems
2. Evaluate the security issues related to multi-tenancy
3. Appraise compliance issues that arise from cloud computing

### **COURSE OUTCOMES**

Upon successful completion of this course, students will be able to:

1. Describe cloud security architectures from the perspectives of: providers, brokers, carriers, and auditors.
2. Describe a methodology for orchestrating a cloud ecosystem.
3. Understand how cloud computing changes the traditional enterprise security considerations compared to on-premise.

### **COURSE DESCRIPTION**

The course on cloud security introduces the basic concepts of security systems and cryptographic protocols, which are widely used in the design of cloud security. The issues related multi tenancy operation, virtualized infrastructure security and methods to improve virtualization security are also dealt with in this course

### **TEXT BOOKS**

**T1.** Tim Mather, Subra Kumaraswamy, ShahedLatif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance" O'Reilly Media; 1 edition [ISBN: 0596802765], 2009.

**T2.** Ronald L. Krutz, Russell Dean Vines, "Cloud Security" [ISBN: 0470589876], 2010.

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## COURSE CONTENT

### Unit I

4 Contact Hours

#### Experiment 1:

- a) The AWS Shared Responsibility Model
- b) Compliance
- c) Creating an Account
- d) Multiple Accounts
- e) Identity & Access Services

#### Experiment 2:

- a) Network Isolation
- b) Network Isolation with VPC
- c) VPC Endpoint and Private Link
- d) Detective Controls
- e) Auditing

### Unit II

4 Contact Hours

#### Experiment 3:

- a) Monitoring CloudWatch and CloudWatch Logs
- b) Monitoring Guard Duty and Security Hub

#### Experiment 4:

- a) Data Types
- b) Encryption in Transit
- c) Encryption at Rest

### Unit III

4 Contact Hours

#### Experiment 5:

- a) Database Encryption
- b) Amazon S3
- c) EBS Encryption

#### Experiment 6:

- a) Protecting Compute Resources
- b) Protecting the Endpoint
- c) Managing Secrets

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

	Lab	
Components	Continuous Internal Assessment (CAE)	Semester End Examination (SEE)
Marks	60 <i>Anmol</i> <i>ES10</i>	40
Total Marks	100	<i>Head of the Department (CSE)</i> Amrit Institute of Technology Chandigarh University, Gharuan, Mohali, Punjab

## Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping Between COs and POs												
S N	Course Outcome (CO)											Mapped Programme Outcome (PO)
1	The students will be able to describe cloud security architectures from the perspectives of: providers, brokers, carriers, and auditors.											1 to 6, 9, 11, 12
2	The students will be able to describe a methodology for orchestrating a cloud ecosystem.											1 to 6, 9, 11, 12
3	The students will be able to understand how cloud computing changes the traditional enterprise security considerations compared to on-premise.											1 to 6, 9, 11, 12

					Conduct investigations/developments of complex solutions	Modern tools and usage	The engineer and society	Environment and sustainability	Individual or team work	Ethics	Project management	Life-long Learning	
		Engineering Knowledge	Problem solving	Design/development of solutions	Conduct investigation/development of solution	Modern complex problems	The engineer and society	Environment and sustainability	Individual or team work	Ethics	Communication	Learning	
		1	2	3	4	5	6	7	8	9	10	11	12
20CSP4 57	Cloud Security Lab	3	3	3	3	3	2	0	0	3	0	1	2

1=addressed to small extent

2= addressed significantly

3=major part of course

  
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 Head of the Department (CSE)  
 Apex Institute of Technology  
 Chandigarh University,  
 Gharuan, Mohali, Punjab

<b>20CST481</b>	<b>DIGITAL IMAGE PROCESSING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		3	0	0	0	3	36
Pre-requisites/ Exposure	Programming Language Python						
Co-requisites	20CSP458						

## COURSE OBJECTIVES

The Course aims to:

1. To understand the fundamental of digital image processing with python.
2. To acquire the knowledge to apply various image processing techniques and tools.
3. To learn the practical applications of image processing steps to real world problem

## COURSE OUTCOMES

On completion of this course, the students shall be able to

1. Fundaments and techniques implemented in digital image processing technologies.
2. Acquiring knowledge on various compression and segmentation techniques, for image enhancement methods.
3. Understanding the various filters applications, smoothing applications and techniques by image processing implementation by python.

## COURSE DESCRIPTION

Image processing has been used to create weird and beautiful modifications to pictures many of us have seen online. Older black and white photos can be brought to life using colorization techniques. On the other hand, color photos can be made to look like old black and white photos. In addition to distorting images for entertainment, image processing can be used for more serious applications, for example, to enhance medical imaging to screen patients for cancer or other diseases. In this course, students will create application using python ,that which helps to read from a list of images, modifies their size and appearance, and saves the images in another directory.

## TEXT BOOKS

T1: Sandipan Dey " Hands-On Image Processing with Python: Expert techniques for advanced image analysis and effective interpretation of image data",2018.

T2: Anil Jain K, " Fundamentals of Digital Image Processing ", PHI Learning, 2011.

## REFERENCE BOOKS

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ES942*  
Head of the Department (CSE)  
Apex Institute of Technology  
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R1: Rafael C. Gonzales, Richard E. Woods, " Digital Image Processing ", Pearson,2010  
3<sup>rd</sup> edition.

R2: William K Pratt, , " Digital Image Processing", WILEY 2007 4<sup>th</sup> edition.

## COURSE CONTENT

### Unit I: Fundamentals of Image processing

12 Contact Hours

#### Introduction to Image Processing

Images, Pixels, Image resolution, PPI and DPI, Bitmap Images, lossless compressions, lossy compression, Image file formats, color spaces, Advance Image concepts.

#### Basics of Python and Scikit image

Basics of Python, Scikit image, rotating shifting and scaling Image, Determining structural similarity.

### Unit II: Image Technicalities

12 Contact Hours

#### Image processing with Python

Image processing pipelining, Image I/O display using Python, basic manipulations, Image formation based on Sampling and quantization using FFT and DFT, Convolution and frequency domain filtering using HPF, LPF, BPF and notch filter.

#### Image Enhancement

Image enhancement based on pixels transformation and smoothing, Image derivatives using gradient and Laplacian, Image pyramids using gaussian and Laplacian, Morphological Image processing, Image segmentations.

### Unit III: Application of IP in Machine learning

12 Contact Hours

#### Advanced image processing using OpenCV

Blending two Images, changing contrast and brightness, adding text to image, smoothing images using median filter, gaussian filter and bilateral filter, changing shape of image, effecting image thresholding, calculating gradient, performing histogram equalization.

#### Image processing using machine learning

Features mapping using SIFT algorithm, Image registration using RANSAC algorithm, Image classification using machine learning approach, Real time use case.

**MODE OF EVALUATION:** The performance of students is evaluated as follows:

<b>Theory</b>		
<b>Components</b>	<b>Continuous Internal Assessment (CAE)</b>	<b>Semester End Examination (SEE)</b>
<b>Marks</b>	40	60
<b>Total Marks</b>		100

## **Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

Mapping Between COs and POs		
S N	Course Outcome (CO)	Mapped Programme Outcome (PO)
1	Fundaments and techniques implemented in digital image processing technologies.	1 to 6, 9, 11, 12
2	Acquiring knowledge on various compression and segmentation techniques, for image enhancement methods.	1 to 6, 9, 11, 12
3	Understanding the various filters applications, smoothing applications and techniques by image processing implementation by python	1 to 6, 9, 11, 12

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<b>20CST457</b>	<b>Digital Image Processing</b>	3	3	3	3	3	2	0	0	3	0	1	2

1=addressed to small extent

2= addressed significantly

3=major part of course

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<b>20CSP483</b>	<b>DIGITAL IMAGE PROCESSING LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>C</b>	<b>C H</b>
Version 1.00		0	0	2	0	1	2
Pre-requisites/ Exposure	Programming Language Python						
Co-requisites	20CST457						

## COURSE OBJECTIVES

During the course, students will be able:

1. To understand the fundamental of digital image processing with python.
2. To acquire the knowledge to apply various image processing techniques and tools.
3. To learn the practical applications of image processing steps to real world problem

## COURSE OUTCOMES

On the course completion students will have a command on:

1. Fundaments and techniques implemented in digital image processing technologies using python.
2. Understanding the various filters applications, smoothing applications and techniques by image processing implementation by python.
3. Acquiring knowledge on various compression and segmentation techniques, for image enhancement methods.

## COURSE DESCRIPTION

Image processing has been used to create weird and beautiful modifications to pictures many of us have seen online. Older black and white photos can be brought to life using colorization techniques. On the other hand, color photos can be made to look like old black and white photos. In addition to distorting images for entertainment, image processing can be used for more serious applications, for example, to enhance medical imaging to screen patients for cancer or other diseases.

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## COURSE CONTENT

### Unit I:

4 Contact Hours

1. Write a program to Read, save, display images using the following
  - a)PIL
  - b)Matplotlib
  - c)Scikit Image
2. Write a program to convert one file format to other
3. Write a program to convert one space to another

### Unit II:

4 Contact Hours

1. a.To Generate a Gray scale from Colour Image  
b.To generate negative of Gray scale image
2. To demonstrate of Thresholding of an Image by three different values
  - a.100
  - b.150
  - c.225

### Unit III:

4 Contact Hours

1. To demonstrate edit operations like cropping, re-sizing, scaling and flipping.
2. To read, display and show the attribute and histogram of the image
3. Application of special filtering using averaging mask
4. Program for morphological image operations: erosion, dilation, opening and closing
5. Write a program to generate noisy image and implement different filter to remove the noise

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**MODE OF EVALUATION:** The performance of students is evaluated as follows:

		<b>Lab</b>	
<b>Components</b>		<b>Continuous Internal Assessment (CAE)</b>	<b>Semester End Examination (SEE)</b>
<b>Marks</b>		60	40
<b>Total Marks</b>		100	

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

<b>Mapping Between COs and Pos</b>			
<b>SN</b>	<b>Course Outcome (CO)</b>	<b>Mapped Programme Outcome (PO)</b>	
1	Fundaments and techniques implemented in digital image processing technologies using python.	1 to 5, 12	
2	Understanding the various filters applications, smoothing applications and techniques by image processing implementation by python.	1 to 3	
3	Acquiring knowledge on various compression and segmentation techniques, for image enhancement methods.	1 to 4, 12	

 Head of the Department (CSE) Apex Institute of Technology Chandigarh University, Gharuan, Mohali, Punjab	E	D	T	E	P
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		1	2	3	4	5	6	7	8	9	10	11	12
20CSP458	Digital Image Processing Lab	3	2	2	1	1	0	0	0	0	0	0	1

1=addressed to small extent

2= addressed significantly

3= major part of course

*Anmol  
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