Detailed Syllabus for Computer Science & Engineering with Specialization in Cloud Computing

DEPT. OF COMPUTER SCIENCE & ENGINEERING

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

PREAMBLE

Education plays an enormously significant role in the building of a nation. There are quite a large number of educational institutions, engaged in imparting education in our country. Majority of them have entered recently into semester system to match with international educational pattern. However, our present education system is churning out youth who have to compete locally, regionally, nationally as well as globally. The present alarming situation necessitates transformation and/or redesigning of system, not only by introducing innovations but developing "learner-centric approach.

Majority of Indian higher education institutions have been following marks or percentage-based evaluation system, which obstructs the flexibility for the students to study the subjects/courses of their choice and their mobility to different institutions. There is need to allow the flexibility in education system, so that students depending upon their interests can choose inter-disciplinary, intra-disciplinary and skill-based courses. This can only be possible when choice based credit system (CBCS), an internationally acknowledged system, is adopted. The choice based credit system not only offers opportunities and avenues to learn core subjects but also explore additional avenues of learning beyond the core subjects for holistic development of an individual. The CBCS will undoubtedly facilitate benchmarking of our courses with best international academic practices.

Advantages of the choice based credit system:

• Shift in focus from the teacher-centric to student-centric education.

• Student may undertake as many credits as they can cope with (without repeating all courses in a given semester if they fail in one/more courses).

• CBCS allows students to choose inter-disciplinary, intra-disciplinary courses, skill oriented papers (even from other disciplines according to their learning needs, interests and aptitude) and more flexibility for students.

• CBCS makes education broad-based and at par with global standards. One can take credits by combining unique combinations.

• CBCS offers flexibility for students to study at different times and at different institutions to complete one course (ease mobility of students). Credits earned at one institution can be transferred to another institution.

CHOICE BASED CREDIT SYSTEM

The Indian Higher Education Institutions have been moving from the conventional annual system to semester system. Currently many of the institutions have already introduced the Choice Based Credit System. The semester system accelerates the teaching-learning process and enables vertical and horizontal mobility in learning. The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The Choice Based Credit System provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses to acquire more than the required credits and adopt an interdisciplinary approach to learning.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

It has been a necessity to align higher education with the emerging needs of the economy so as to ensure that the graduates of higher education system have adequate knowledge and skills for employment and entrepreneurship since last few years. The higher education system has to incorporate the requirements of various industries in its curriculum, in an innovative and flexible manner while developing a well-groomed graduate. CSE department aims to encourage research and innovation in the field of Machine Learning, Cyber security, Artificial Intelligence and other allied areas such as Computational Theory, Cloud Computing, Blockchain Technology, Data Science, Big Data Analytics and many more. The objective of the Computer Science & Engineering Programme with Specialization in Cloud Computing is to prepare students to undertake careers involving innovative technologies, develop a problem solving capability, or to opt for advanced studies for research oriented careers.

In order to give due importance to practical applications as well as theoretical aspects of CSE, the curriculum for the Computer Science & Engineering Programme with Specialization in Cloud Computing covers most of the foundational aspects as well as develops engineering skills for problem solving and fundamentals of cloud computing.

JOB OPORTUNITIES

Booming IT sector in India has plenty of jobs for fresh computer science graduates. Candidates with a high percentage of mark and good communication skills as well as sound computer knowledge do not face problem in getting a job. Computer engineers can get jobs in non-IT companies like universities, research, private and public industries, government departments, business organizations, commercial organizations and the manufacturing sector, etc. Besides the Computer Engineers have plenty of options to work in IT companies in departments such as design, development, assembly, manufacture, and maintenance, etc. Software Developers: Software developers are professionals who are concerned with facets of the software development process which involves activities such as design and coding, computer programming, project management, etc. Cloud computing jobs range from architects and developers to data scientists, security pros and more, all of which require a specific focus. Cloud computing offers many opportunities to IT professionals who can leverage their existing expertise while also embracing cloud computing technology.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 01: High Quality Engineering Design and Development Work: Graduates of the program will engage in the effective practice of computer science and engineering to identify and solve important problems in a diverse range of application areas.

PEO 02: Real Life Problem Solving: To educate students with proficiency in core areas of Computer science & Engineering and related engineering so as to comprehend engineering trade-offs, analyse, design, and synthesize data and technical concepts to create novel products and solutions for the real life problems.

PEO 03: Leadership: Graduates of the program will engage in successful careers in industry, academia and attain positions of importance where they have impact on their business, profession and community.

PEO 04: Lifelong Learning: Graduates of the program will adapt to contemporary technologies, tools and methodologies to remain at the frontier of computer science and engineering practice with the ability to respond to the need of a challenging environment.

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PROGRAM OUTCOME (PO)

PO	Summary	Description
PO1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis	Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design /development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities

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		relevant to the professional engineering practice.
PO7	**Environment and sustainability**	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**	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.
PO12	**Life-Long Learning**	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

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TYPES OF COURSES

1. Courses are the subjects that comprise the Computer Science & Engineering Programme with Specialization in Cloud Computing.

2. A course may be designed to comprise lectures, tutorials, laboratory work, fieldwork, outreach activities, project work, vocational training, viva, seminars, term papers, assignments, presentations, self-study etc. or a combination of some of these components.

3. The learning outcomes of each course will be defined before the start of a semester.

4. Following are the course types:

   i. **Core Course (CC):** This is a course, which is to be compulsorily studied by a student as a core requirement to complete the requirement of B.Tech in Computer Science & Engineering with Specialization in Cloud Computing.

   ii. **Elective Course:** An elective course is a course, which can be chosen from a pool of courses. It is intended to support the discipline of study by providing an expanded scope, enabling exposure to another discipline/domain and nurturing a student's proficiency and skill. An elective may be of following types:

   a) **Discipline Elective Courses (DE):** It is an elective course that adds proficiency to the students in the discipline.

   b) **Open Elective Courses (OE):** It is an open elective course taken from other engineering disciplines and enhances the generic proficiency and interdisciplinary perspective of students.

   c) **Specialization Elective Courses (SE):** This is a course, which is to be compulsorily studied by a student as a core requirement to complete the requirement of B.Tech in Computer Science & Engineering with Specialization in Cloud Computing.

   iii. **Obligatory Courses:**

   a) **Mandatory Courses (MC):** It can be taken from among a pool of foundation courses, which aim at value-based education. They may provide hands-on training to improve competencies and skills or provide education on human, societal, environmental and national values.

   b) **Internship/Training/Project/Dissertation (PTI):** Course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project

   c) **Humanities, Social Sciences & Management (HSM):** It is an elective course taken from non-engineering disciplines (humanities, social sciences and management) that broadens the perspective of an engineering student.

   d) **Basic Science Courses (BSC):** "Essential Studies for Professionals Skill & Skill Development for Professionals" courses designed to encourage and enrich the students for the technical and professional exams.

   e) **Engineering Science Courses (ESC):** It is based upon content that leads to fundamental knowledge enhancement in basic Engineering Principles.

   f) **NPTEL (NPT):** National Programme on Technology Enhanced Learning/Massive Open Online Courses (MOOCs) courses are based on the respective year's offered courses.

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g) **General Studies Courses (GSC):** Course designed to encourage and enrich the students for the technical and professional exams

h) **Mandatory Additional Requirements (MAR):** A student has to do the following things to achieve the MAR points: The student should engage herself / himself in activities outside the curriculum. Join different types of Clubs of NSCBIP, write something for the wall magazine, remain active in outer society, participate in Tech Fests activities, etc.

5. Each credit course contributes certain credits to the programme. A course can be offered either as a full course (4 credits) or as a half course (2 credits). A full course is conducted with 3 hours of lectures and either 1 hour of tutorial or 2 hours of practical work per week. A half course is conducted with 2 hours of lectures. There are also some exceptional electives with 3 credits and 1 credit.

Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week Or 2 Hr. Practical (Lab)/week	0.5 Credits Or 1 Credit

6. A project work/dissertation is considered as a special course involving application of the knowledge gained during the course of study in exploring, analyzing and solving complex problems in real life applications. A candidate completes such a course with an advisory support by a faculty member.

7. **Mandatory Courses** may be offered. They do not carry credits but aim at expanding knowledge or bridging deficiency in knowledge or skill.

8. A course may have pre-requisite course(s) that are given in the Semester-wise Course Allocation scheme.

9. A student can opt for a course only if he/she has successfully passed its pre- requisite(s).

10. A student has to register for all courses before the start of a semester.

11. **Program codes:** The codes for various undergraduate programmes are as follows:

   i. Civil Engineering: CE

   ii. Computer Science & Engineering: CS

   (Specialization in Cloud Computing (CSCC))

   iii. Electronics and Communication Engineering: EC

   iv. Electrical Engineering: EE

   v. Mechanical Engineering: ME

12. **Departmental Course Codes:** The codes for departmental core courses and discipline-specific electives are specific to each discipline. The first two characters are derived from departmental codes listed above. The third character is 'C' for core courses and 'D' for discipline-specific courses and 'INT' for Dissertation/Project/Training/Internship. This is followed by a digit sequence number:

   i. CSCyyy: Core Course

   ii. CSDyyy: Discipline Elective Courses

   iii. CCyyy: Specialization Elective Courses

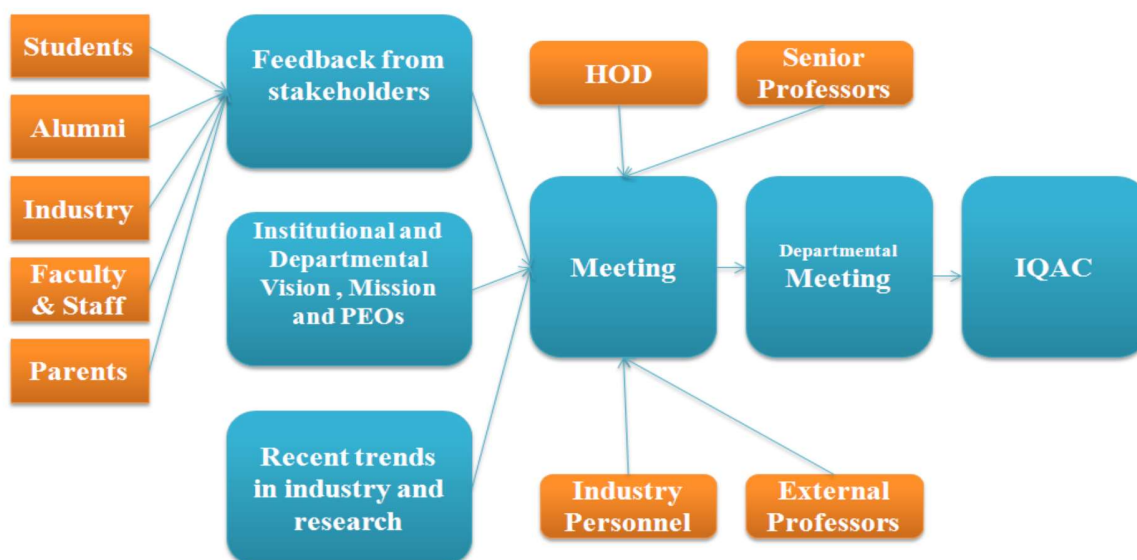   Detailed Syllabus for Computer Science & Engineering with Specialization in Cloud Computing

    iv.   XXXyyy: Open Elective Courses (Depends on the respective Dept.)

    v.   INTyyy: Project/Training/Internship/ Dissertation

13. **Common Elective Course Codes:** All disciplines will follow a common code as shown below. The 3-digit sequence number 'yyy' is taken from the respective tables of different types of courses.

    i.   HSMyyy: Humanities, Social Sciences & Management Course

    ii.   BSCyyy: Basic Science Course

    iii.   MCyyy: Mandatory Course

    iv.   GSCyyy: General Studies Courses

    v.   MARyyy: Mandatory Additional Requirements

        Here, yyy will be follow by a sequence of digit.

14. **General Electives:** A student may take a course under the category of General Elective (GE) offered by any other Department of the Institute under the categories of Core Course (CC) and Discipline Specific Electives (DE). However, such options shall be offered to a student as per prescribed guidelines of the Institute.

15. The opting of a course by the student will depend upon the requisites for that course and with the consent of the course advisor.

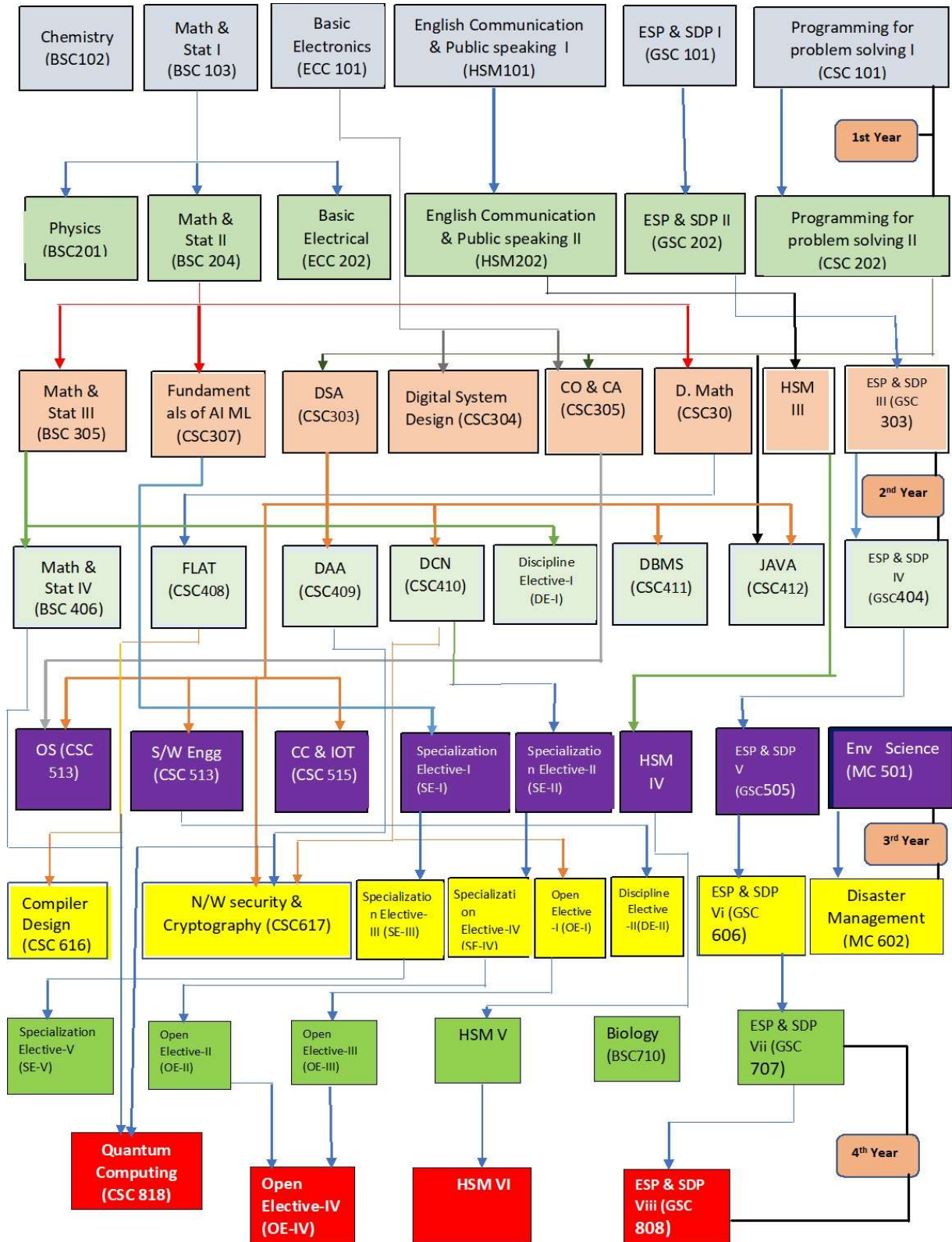## PROCESS FOR DESIGNING THE PROGRAM CURRICULUM

The process for designing the program curriculum involves consideration of the following aspects:
i) Feedback from stakeholders
ii) Institutional and Departmental Vision, Mission and PEOs
iii) Recent trends in industry and research

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Chemistry (BSC102)

Math & Stat I (BSC 103)

Basic Electronics (ECC 101)

English Communication & Public speaking I (HSM101)

ESP & SDP I (GSC 101)

Programming for problem solving I (CSC 101)

1st Year

Physics (BSC201)

Math & Stat II (BSC 204)

Basic Electrical (ECC 202)

English Communication & Public speaking II (HSM202)

ESP & SDP II (GSC 202)

Programming for problem solving II (CSC 202)

Math & Stat III (BSC 305)

Fundamentals of AI ML (CSC307)

DSA (CSC303)

Digital System Design (CSC304)

CO & CA (CSC305)

D. Math (CSC30)

HSM III

ESP & SDP III (GSC 303)

2nd Year

Math & Stat IV (BSC 406)

FLAT (CSC408)

DAA (CSC409)

DCN (CSC410)

Discipline Elective-I (DE-I)

DBMS (CSC411)

JAVA (CSC412)

ESP & SDP IV (GSC404)

OS (CSC 513)

S/W Engg (CSC 513)

CC & IOT (CSC 515)

Specialization Elective-I (SE-I)

Specialization Elective-II (SE-II)

HSM IV

ESP & SDP V (GSC505)

Env Science (MC 501)

3rd Year

Compiler Design (CSC 616)

N/W security & Cryptography (CSC617)

Specialization Elective-III (SE-III)

Specialization Elective-IV (SF-IV)

Open Elective -I (OE-I)

Discipline Elective -II(DE-II)

ESP & SDP Vi (GSC 606)

Disaster Management (MC 602)

Specialization Elective-V (SE-V)

Open Elective-II (OE-II)

Open Elective-III (OE-III)

HSM V

Biology (BSC710)

ESP & SDP Vii (GSC 707)

4th Year

Quantum Computing (CSC 818)

Open Elective-IV (OE-IV)

HSM VI

ESP & SDP Viii (GSC 808)

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SCHEME – SEMESTER WISE COURSE ALLOCATION

First Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	S	Credit Points
1.	BSC	BSC102	Chemistry	3	0	2	0	4
2.	BSC	BSC103	Mathematics and Statistics-I	3	0	0	0	3
3.	ESC	EEC101	Basic Electronics Engineering	2	0	2	0	3
4.	HSM	HSM101	English Communication & Public Speaking Skills-I	2	0	2	0	3
5.	GSC	GSC101	ESP & SDP-I	2	0	0	2	2
6.	ESC	CSC101	Programming for Problem Solving-I	2	0	0	2	3
7.	ESC	MEC192	Engineering Drawing, 3D Design Lab	0	0	2	0	1
8.	HSM	HSM181	Economics, Finance & Entrepreneurship Skills- I	0	0	0	2	1
9.	HSM	HSM182	Design Thinking & Innovation-I	0	0	0	1	0.5
10.	MAR	MAR181	Mandatory Additional Requirements (MAR)	0	0	0	1	0.5
			Total	14	0	8	8	21/30

#Students will undergo a mandatory Induction Program

Second Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	S	Credit Points
1.	BSC	BSC201	Physics	3	0	2	0	4
2.	BSC	BSC204	Mathematics and Statistics-II	3	0	0	0	3
3.	ESC	ECC202	Basic Electrical Engineering	2	0	2	0	3
4.	HSM	HSM202	English Communication & Public Speaking Skills-I	2	0	2	0	3
5.	GSC	GSC202	ESP & SDP-II	2	0	0	2	2
6.	ESC	CSC202	Programming for Problem Solving-II	2	0	0	2	3
7.	ESC	MEC291	Workshop & Manufacturing Practices	0	0	2	0	1
8.	HSM	HSM283	Economics, Finance & Entrepreneurship Skills-II	0	0	0	2	1
9.	HSM	HSM284	Design Thinking & Innovation-II	0	0	0	1	0.5
10.	MAR	MAR282	Mandatory Additional Requirements (MAR)	0	0	0	1	0.5
11.	NPT	NPT201	(NPTEL/MOOCs)	-	-	-	-	2
			Total	14	0	8	8	23/30

#(NPT201)NPTEL/MOOCs are based on the respective year's offered courses (Mandatory for B.Tech(Honours))

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Third Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	S	Credit Points
1.	BSC	BSC305	Mathematics and Statistics-III	3	0	0	0	3
2.	CC	CSC303	Data Structure & Algorithms	3	0	2	0	4
3.	CC	CSC304	Digital System Design	3	0	2	0	4
4.	CC	CSC305	Computer Organization & Architecture	3	0	2	0	4
5.	CC	CSC306	Discrete Mathematics	3	0	0	0	3
6.	HSM	HSM---	Humanities-I	2	0	0	0	2
7.	GSC	GSC303	ESP & SDP-III	2	0	0	2	2
8.	CC	CSC307	Fundamentals of Artificial Intelligence & Machine Learning	0	0	0	2	1
9.	PTI	INT301	Project-I	0	0	0	1	1
10.	MAR	MAR383	Mandatory Additional Requirements (MAR)	0	0	0	1	0.5
11.	NPT	NPT302	(NPTEL/MOOCs)	-	-	-	-	2
			Total	19	0	6	6	26.5/31

#(NPT302)NPTEL/MOOCs are based on the respective year's offered courses (Mandatory for B.Tech(Honours))

Suggestive Choice Based Subjects

Sl No	Type	Subject Code	Topic	L	T	P	Credit Points
1.	HSM	**HSM303**	**Constitution & Essence of India and Knowledge Trading**	2	0	0	2
2.	HSM	HSM304	Values and Ethics in Profession	2	0	0	2

Fourth Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	S	Credit Points
1.	BSC	BSC406	Mathematics and Statistics-IV	3	0	0	0	3
2.	CC	CSC408	Formal Language & Automata Theory	3	0	0	0	3
3.	CC	CSC409	Design & Analysis of Algorithms	3	0	2	0	4
4.	CC	CSC410	Data Communication & Networking	3	0	2	0	4
5.	CC	CSC411	Data Base Management System	3	0	2	0	4
6.	DE	CSD---	Discipline Elective-I	3	0	2	0	4
7.	GSC	GSC404	ESP & SDP-IV	2	0	0	2	2
8.	CC	CSC412	Object Oriented Programming Using Java	0	0	0	2	1
9.	PTI	INT402	Project-II	0	0	0	1	1
10.	MAR	MAR484	Mandatory Additional Requirements (MAR)	0	0	0	1	0.5
11.	NPT	NPT403	(NPTEL/MOOCs)	-	-	-	-	2
			Total	20	0	8	6	28.5/34

#(NPT403)NPTEL/MOOCs are based on the respective year's offered courses (Mandatory for B.Tech(Honours))

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1.	DE	**CSD401**	**Artificial Intelligence & Machine Learning**	3	0	2	4
2.	DE	CSD402	Advanced Programming with Python	3	0	2	4
3.	DE	CSD403	Introduction to Android Programming	3	0	2	4
4.	DE	CSD404	Programming with Ruby on Rails	3	0	2	4

Fifth Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	S	Credit Points
1.	CC	CSC513	Operating System	3	0	2	0	4
2.	CC	CSC514	Software Engineering	3	0	2	0	4
3.	CC	CSC515	Cloud Computing & IOT	2	0	2	0	3
4.	SE	---	Specialization Elective-I	2	0	2	0	3
5.	SE	---	Specialization Elective-II	3	0	0	0	3
6.	HSM	HSM---	Humanities-II	2	0	0	0	2
7.	MC	MC501	Environmental Sciences	2	0	0	0	0
8.	GSC	GSC505	ESP & SDP-V	2	0	0	2	2
9.	PTI	INT503	Internship/Project-III	0	0	0	1	1
10.	MAR	MAR585	Mandatory Additional Requirements (MAR)	0	0	0	1	0.5
11.	NPT	NPT504	(NPTEL/MOOCs)	-	-	-	-	2
			Total	19	0	8	4	24.5/31

#(NPT504)NPTEL/MOOCs are based on the respective year's offered courses (Mandatory for B.Tech(Honours))

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1.	SE	**CC501**	**Virtualization & Networks in Cloud Computing**	3	0	0	3
2.	SE	**CC502**	**Fundamentals of Cloud Security**	3	0	0	3
3.	HSM	HSM505	Industrial Psychology	2	0	0	2
4.	HSM	**HSM506**	**Principle of Management**	2	0	0	2
5.	HSM	HSM507	Total Quality Management	2	0	0	2

Students must take the Specialization Subject from the following table:
Specialization Course:

Subject Code	Cloud Computing
CC501	Virtualization & Networks in Cloud Computing
CC502	Fundamentals of Cloud Security
CC603	Cloud Adaptation and Migration
CC604	Cloud Architecture & Development Model
CC705	Google Cloud - Organization & IAM
CC706	Microsoft Azure and Its Services
CC707	AWS Fundamental

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Sixth Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	S	Credit Points
1	CC	CSC616	Compiler Design	3	0	0	0	3
2	CC	CSC617	Network Security & Cryptography	3	0	2	0	4
3	SE	---	Specialization Elective -III	3	0	2	0	4
4	SE	---	Specialization Elective -IV	3	0	0	0	3
5	OE	---	Open Elective-I	2	0	2	0	3
6	DE	CSD---	Discipline Elective-II	2	0	2	0	3
7	MC	MC602	Disaster Management	2	0	0	0	0
8.	GSC	GSC606	ESP & SDP-VI	2	0	0	2	2
9.	PTI	INT604	Internship/Industrial Training/Project-IV	0	0	0	1	1
10.	MAR	MAR686	Mandatory Additional Requirements (MAR)	0	0	0	1	0.5
11.	NPT	NPT605	(NPTEL/MOOCs)	-	-	-	-	2
			Total	20	0	8	4	25.5/32

#(NPT605): NPTEL/MOOCs are based on the respective year's offered courses (Mandatory for B.Tech(Honours))

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1.	SE	**CC603**	**Cloud Adaptation and Migration**	3	0	2	4
2.	SE	**CC604**	**Cloud Architecture & Development Model**	3	0	2	4
3.	OE	BSC607	Numerical Methods & Operation Research	2	0	2	3
4.	OE	BSC608	Operations Research	2	0	2	3
5.	OE	BSC609	Statistics for Data Analysis	2	0	2	3
6.	OE*	**CSD605**	**Blockchain Technology**	2	0	2	3
7.	OE*	**CSD606**	**Big Data Analytics**	2	0	2	3
8.	DE	CSD607	Web Technology	2	0	2	3
9.	DE	CSD608	Computer Graphics	2	0	2	3
10.	DE	**CSD609**	**Software Project Management**	2	0	2	3
11.	DE	CSD610	E-Commerce	2	0	2	3

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Seventh Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	SE	---	Specialization Elective-V	3	0	0	3
2	OE	---	Open Elective-II	3	0	0	3
3.	OE	---	Open Elective-III	3	0	0	3
4.	HSM	HSM---	Humanities-III	2	0	0	2
5.	BSC	BSC710	Biology	2	0	0	2
6.	GSC	GSC707	ESP & SDP-VII	2	0	2	2
7.	PTI	INT705	Internship/Industrial Training/Project-V	0	0	6	3
			Total	15	0	8	18/23

#Students will undergo project/training/internship in the industry / research organization / reputed Institute during the vacation

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1.	SE	CC705	Google Cloud - Organization & IAM	3	0	0	3
2.	SE	CC706	Microsoft Azure and Its Services	3	0	0	3
3.	SE	**CC707**	**AWS Fundamental**	3	0	0	3
4.	OE	CSD711	Cyber Security	3	0	0	3
5.	OE	**CSD712**	**Deep Learning**	3	0	0	3
6.	OE	**CSD713**	**Cyber Law, IPR & Ethics**	3	0	0	3
7.	OE	CSD714	Natural Language Processing	3	0	0	3
8.	OE	CSD715	Wireless Sensor Network & Network Security	3	0	0	3
9.	OE	CSD716	Neural Network and Application	3	0	0	3
8.	OE	CSD717	Real Time Operating System	3	0	0	3
9.	OE	CSD718	Distributed System	3	0	0	3
10.	HSM	**HSM708**	**Economics & Financial Accounting**	2	0	0	2
11.	HSM	HSM709	Economics for Engineers	2	0	0	2

Eighth Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1.	CC	CSC818	Quantum Computing	3	0	0	3
2.	OE	---	Open Elective-IV	3	0	0	3
3.	HSM	HSM---	Humanities-III	2	0	0	0
4.	GSC	GSC808	ESP & SDP - VIII	2	0	2	2
5.	PTI	INT806	Internship Industrial Training/Project-VI	0	0	8	4
6.	CC	CSC881	Grand Viva	0	0	0	2
			Total	10	0	10	14/20

#Students will undergo project/training/internship in the industry / research organization / reputed Institute during the vacation.

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1.	OE	CSD819	Digital Forensics	3	0	0	3
2.	OE	**CSD820**	**Computer Vision**	3	0	0	3
3.	OE	CSD821	Data Mining & Data Ware Housing	3	0	0	3
4.	OE	CSD822	Information Theory & Coding	3	0	0	3
5.	OE	CSD823	Advanced Algorithms	3	0	0	3
6.	OE	CSD824	Digital Image Processing	3	0	0	3
7.	HSM	HSM810	Organizational Behavior	2	0	0	2
8.	HSM	**HSM811**	**Human Resource Development and Organizational Behavior**	2	0	0	2

Specialization Course:

Subject Code	Cloud Computing
CC501	Virtualization & Networks in Cloud Computing
CC502	Fundamentals of Cloud Security
CC603	Cloud Adaptation and Migration
CC604	Cloud Architecture & Development Model
CC705	Google Cloud - Organization & IAM
CC706	Microsoft Azure and Its Services
CC707	AWS Fundamental

TITLE OF COURSE: VIRTUALIZATION & NETWORK IN CLOUD COMPUTING
COURSE CODE: CC501
L-T-P: 3-0-0
CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts of Virtualization utilization in big data handling.

Introduction:

The course enables students to understand the virtualization technology, Applications along with cloud computing concepts and services.

Course Outcomes (CO):

The students will be able to know the basics of virtualization technology, hypervisors and cloud computing concepts
CO1: Understand what is Cloud Computing.
CO2: Understand What is Virtualization.
CO3: Understand Cloud Types and Cloud Service Deployment Models (IaaS*, PaaS*, SaaS*).
CO4: Learn How to Create Virtual Machines (VM) using Hypervisors (type-2).
CO5: Understand Computer Networks and IP Addressing.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓							✓
CO2	✓			✓	✓							✓
CO3	✓	✓	✓		✓							✓
CO4	✓	✓	✓		✓							✓
CO5			✓					✓				✓

Course Contents:

Module-1: Overview: introduction to cloud computing, OS and Virtualization, VM, advantage of Virtualization, Virtualization and cloud and its overlapping, service driven model, advantage of cloud computing: marketing point of view, types of services, business value, business impact of cloud, technological value of cloud, end user benefits, change for provider and administrator, pros and cons of cloud model, anatomy of cloud, solution component, service catalog, user self-service portal, service request management, provisioning, optimized infrastructure, chargeback, benefit of cloud, delivery and deployment model, different cloud architecture: public, private and hybrid and its pros and cons, delivery models. Cloud transformation roadmap, history of cloud, Clint-server, cluster, grid

models, cloud vs grid and their relationship, cluster and cloud, utility computing and evolution of cloud computing, cloud computing.

Module-2: Introduction to Virtualization. Overview of Virtualization: Need of Virtualization, traditional IT Infrastructure, shortcoming of physical infrastructure, benefit of Virtualization, comparison of traditional IT infrastructure with virtualized infrastructure.

Module-3: Virtualization: Implementing Virtualization, typical hardware / software server stack and its logical equivalence, pre/post virtualization server stack ,types of virtualization, area and technology based classification, history of virtualization, time sharing system, IBM mainframe and Power virtualization, Extending Virtualization to x86 and its hardware support, impact of Virtualization: cost and manageability impact.

Module-4: Server and Storage Virtualization. Types of Server Virtualization, simulation, Hardware Assisted Virtualization, Hypervisors, Ring levels on x86 processors, types of Hypervisors, IBM PowerVM Hypervisors, common consideration in server Virtualization, Desktop Virtualization: Benefits Constraints and Types. Anatomy of server Virtualization, three major layers in Xen server, storage Virtualization overview: benefit and types, features of logical layers, Host level storage Virtualization, host based mirroring, storage level Virtualization, network based storage Virtualization.

Module-5: Network and Application Virtualization. Network Virtualization overview: VPN, VLAN, challenges in using application in traditional install, use and update model, solution for challenges, Architecture, benefits of Application Virtualization.

Module-6: Cloud Implementation, Deployment and Delivery Models. Cloud Deployment models: Public, Private, Hybrid, pros and cons of each architecture, cloud deployment decision factors, Business IT Control, Business critical application, data and transaction security, compliance and audit, balance of CAPEX and OPEX, workload characteristics, workload lifespan preferences, Industry segment- SME and Large enterprises, Data Freedom, software characteristics, time to deploy, Public Cloud: factor matrix, advantage, disadvantage, Public Cloud: Factor Matrix, advantage and disadvantage, Hybrid Cloud: factor matrix, advantage, disadvantage, Overview of Cloud delivery models, infrastructure, IT Layers, IaaS Overview, features, cloud bursting, multi tenancy, resource pooling, PaaS: overview, component, example, SaaS: advantage, example.

Module-7: Case Study on Virtualization and Cloud workloads. Case study overview, customer IT landscape, function of data center, trigger for virtualization, preparation for virtualization, server selection, server sizing, server criticality, provisioning, proximity and locality, transition tool for virtualization, cost savings, cloud workload overview, workload characterization, factor s, suitable workload for cloud, private cloud solution, types of workload, advantage, mission. critical workload, mixed workload, production only workload for hybrid cloud, industry specific workload, non-suitable workload: public, private cloud, possible workload by cloud.

Text Books:

1. Introduction to Virtualization and Cloud Computing (IBM ICE Publication)

Reference Books:

1. " Distributed and Cloud Computing " By Kai Hawang , GeofreyC.Fox, Jack J. Dongarra Pub: Elservier

2. Cloud Computing, Principal and Paradigms, Edited By RajkumarBuyya, JemesBroberg, A. Goscinski, Pub.- Wiley

3. Kumar Saurabh, "Cloud Computing", Wiley Pub

4. Krutz , Vines, "Cloud Security " , Wiley Pub

5. Velte, "Cloud Computing- A Practical Approach", TMH Pub

TITLE OF COURSE: FUNDAMENTALS OF CLOUD SECURITY
COURSE CODE: CC502
L-T-P: 3-0-0
CREDITS: 3

Pre requisites:

1. Knowledge of a programming language such as Python, Java or C/C++

2. Students are expected to have broad understanding of different aspects of how computer systems work.

3. It is strongly recommended that the student have a working knowledge of computer networks.

4. The students should also feel comfortable with algorithmic concepts and modular arithmetic.

Introduction:

Information is an important strategic and operational corporate asset. These days computers and computer networks, are increasingly being used for storing and retrieving information. Some of these information may be of a sensitive nature. Consequently they need to have adequate security measures that can safeguard sensitive information. In this course, we will begin by investigating some of the security measures that can be employed to safeguard information. For the most part we will look into the theory that goes into designing these measures rather than studying security tools and techniques. This is because there are too many of those tools out there and they are changing frequently. The course examines how system designs, network protocols, and software engineering practices can result in vulnerabilities. The course explores how to better design and implement future systems in order to mitigate vulnerabilities. In addition, the course explores how to detect and mitigate vulnerabilities in existing systems

Course Outcomes (CO):
CO1: Understand the fundamental principles of access control models and techniques, authentication, and secure system design
CO2: Have a strong understanding of different cryptographic protocols and techniques and be able to use them
CO3: Apply methods for authentication, access control, intrusion detection and prevention
CO4: Identify and mitigate software security vulnerabilities in existing systems.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓			✓				✓
CO2	✓			✓								✓
CO3	✓	✓	✓									✓
CO4	✓	✓	✓		✓						✓	✓

Detailed Syllabus for Computer Science & Engineering with
Specialization in Cloud Computing

Course Contents:

Module-1: Introduction to Cloud Security. Introduction- Architectural and Technological Influences of Cloud Computing -the Cloud deployment models security concepts- Cloud Computing Roles- threats- risk modeling and security services-Proactive activity monitoring, Incident Response - Monitoring for unauthorized access, malicious traffic, abuse of system privileges, intrusion detection, events and alerts - Auditing – Record generation, Reporting and Management- Tamper-proofing audit logs - Quality of Services - Secure Management -Identity management - Security Information and Event Management.

Module-2: Access control models: Policy, Compliance and Risk Management in Cloud Computing- Discretionary and mandatory access control- Covert channels and Chinese Wall-Clark-Wilson, RBAC, ABAC.

Module-3: Introduction to cryptography, Secret key cryptosystems- Key escrow-Modular Arithmetic and Public key cryptosystems-Public key cryptosystems- Diffie-Hellman, RSA, El-Gammal- Pairing based cryptosystems, IBE and attribute-based encryption.

Module-4: Message digests, Merkle hashes, digital signatures-Identification and authentication, Passwords, Biometrics- One-time passwords and challenge response schemes, Kerberos- SSL, SSH

Module-5: Wireless Security. Wireless Security- Privacy- Cloud Compliance Assessment and Reporting - Case Study- PCI DSS 3.0 Compliant Cloud Tenant- Protecting PHI in Cloud.

Text Books:
1. Charles P. Pfleeger, "Security in Computing", Prentice Hall.
2. William Stallings, "Cryptography and Network Security: Principles and Practice.", Prentice-Hall.

Reference Books:
1. William R. Cheswick and Steven M. Bellovin, "Firewalls and Internet Security: Repelling the Wily Hacker", Addison-Wesley.
2. Charlie Kaufman, Radia Perlman and Mike Spencer, "Network Security: Private Communication in a Public World", Prentice Hall.
3. Marshall D. Adams, Sushil Jajodia and Harold J. Podell, eds., "Information Security: An Integrated Collection of Essays". IEEE Computer Society Press.
4. Edward Amoroso, "Fundamentals of Computer Security Technology", Prentice-Hall.

TITLE OF COURSE: CLOUD ADAPTATION AND MIGRATION
COURSE CODE: CC603
L-T-P SCHEME: 3-0-2
COURSE CREDITS: 4

Pre requisites: For this course it's assumed that you have a working knowledge of Cloud Computing and Cloud principles

Introduction:

In this course we will study the important terminology and familiar with cloud adaptation, cloud migrations, some of the constraints that cloud avoid cloud migration, legacy hardware and software architecture.

Course Outcomes (CO):

From this course students will be able to learn about intra cloud data adaptation and inter cloud data migration. Students will also get some sense to implement data migration techniques from this course.

CO1: Have a greater visibility of some of the key points of a Cloud Migration.
CO2: Be able to confidently assess the requirements for your migration.

CO3: Get Knowledge about data migration techniques

CO4: Understand about Intra cloud data adaptation.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓							✓
CO2	✓	✓	✓	✓								✓
CO3	✓	✓	✓					✓				✓
CO4	✓	✓	✓								✓	✓

Course Contents:

Module-1(Cloud computing definition and use cases): Introduction – Component of CC – Comparing CC with Virtualization, Grids, Utility Computing, client- server model, P-to-P Computing - Key Drivers for Cloud Computing - Cloud computing Service delivery model, Cloud Types – Private, Public and Hybrid. Introduction to cloud computing &it's application. Goal of cloud adaptation and migration. Various use cases of cloud computing.

Module-2 (Adopting the cloud): Instantaneous provisioning of computing resources, tapping into an infinite storage capacity, cost-effective pay-as-you-use billing models. Handling sensitive data, aspects of cloud security, assessing governance solutions. Adoption of Public cloud by SMBs- Public Cloud Adoption phase for SMBs- Vendor liability and Management Adoption process of Public clouds by Enterprises – Managed Private clouds Migrating Application to the cloud – Impact of Shared Resources and Multi-Tenancy on cloud Applications – Phases during Migration an Application to An IaaS Cloud

Module-3: Introduction, definition, cloud adaptation architecture, adaptation techniques, decision engine architecture, adaptation in cloud resource configuration, VM- adaptation

Module-4 (Migration Framework): Re-architecting applications for the cloud, integrating the cloud with existing applications, avoiding vendor lock-in, planning the migration and selecting a vendor.

Module-5 (Migration Planning & Discovery): Identifying and mitigating risk, The 6 R's of cloud migration, asset and application discovery, licensing, data sovereignty, and governance.

Module-6 (Mobile Cloud computing): Introduction, Definition, Architecture, Benefits, challenges in mobile and at cloud shield.

Text Books

1. Cloud Migration from on-premise data center to AWS by Charista Keiko

2. Cloud Computing: Concepts, Technology & Architecture by Richardo Puttini, Thomas Erl, and Zaigham Mahmood

TITLE OF COURSE: CLOUD ARCHITECTURE & DEVELOPMENT MODEL
COURSE CODE: CC604
L-T-P: 3-0-2
CREDITS: 4

Pre-requisite: Knowledge is also assumed of basic concepts of grid computing and cloud computing introduction.

Introduction:

The objective is to study the architecture and deployment models to develop a private cloud using the open standards tools such as open stack. Cloud is the future of computing. It is about outsourcing of IT services and infrastructure to make them accessible remotely via the Internet. Utilizing cloud-computing models boosts not only productivity but also provide a competitive edge to organizations. The growing popularity of cloud computing has given rise to different types of cloud service deployment models and strategies. Therefore, today there exists a variety of enterprise cloud solutions depending on the degree of desired outsourcing needs.

Course Outcomes (CO):

After successful completion of this course, the students will be able to:
CO1: Understand the architecture and deployment model of cloud computing.
CO2: Understand the architecture and components related to open stack.
CO3: Understand other open standards tools for deploying a private cloud such as Eucalyptus.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓							✓
CO2	✓			✓								✓
CO3	✓		✓						✓			✓

Course Contents:

Module-1: Definition of cloud computing, Delivery Models, Conceptual reference model, Cloud Computing solution components.

Module-2: Cloud computing Architecture:The conceptual reference model, Service Deployment, Cloud service management, cloud taxonomy, IBM CC RA, Common cloud management platform.

Case Study:IBM Smart Cloud Entry, VMware vClouddirector.

Module-3: Cloud vendor selection:SLA, Security and privacy, periodic update and maintenance, data location and Jurisdiction, Measurability, Pricing, Interoperability and lock in, Exit process, track record.

Module-4: Open Stack:Definition, Advantages, Releases, Architectural overview, Different components of Open Stack, Open stack- Hypervisors, Network Services, Storage- Block Storage, Object Storage, Choosing Storage Backends , Commodity Storage Backend Technologies: swift, Ceph, Gluster, LVM, ZFS.

Module-5: Advance concepts in Openstack: MultiserverOpenstack, Tenant model architecture, Cloud orchestration using OpenStack using OpenStack Heat and Ubuntu Juju. Eucalyptus:

Introduction, Features and Functionality, Architecture, Basic and Advanced Components. Eucalyptus vs Openstack. OpenNebula: Introduction, Features and Functionality, Architecture, Basic and Advanced Components. OpenNebula vs Openstack

Text Books:
1. Raj Kumar Buyya, James Broberg, Andrezei M. Goscinski (2011), Cloud Computing: Principles and paradigms.
2. Rittinghouse, John, W, Cloud computing: Implementation, management and security

Reference Book:
1. Barrie Sosinsky (2011), Cloud Computing Bible, Wiley.
2. Bumgardner, V. C. (2016). OpenStack in action. Manning Publications Company.

TITLE OF COURSE: GOOGLE CLOUD - ORGANIZATION & IAM
COURSE CODE: CC705
L-T-P: 3-0-0
CREDITS: 3

Pre-requisite: Understand the basic concepts of Cloud IAM, in particular the Google Cloud resource hierarchy.

Introduction:

This course introduces you to important concepts and terminology for working with Google Cloud Platform (GCP). You learn about, and compare, many of the computing and storage services available in Google Cloud Platform, including Google App Engine, Google Compute Engine, Google Kubernetes Engine, Google Cloud Storage, Google Cloud SQL, and BigQuery. You learn about important resource and policy management tools, such as the Google Cloud Resource Manager hierarchy and Google Cloud Identity and Access Management. Hands-on labs give you foundational skills for working with GCP.

Course Outcomes (CO):

CO1: Understand how cloud security differs from on-premises security
CO2: Configure identities and access levels in Google Cloud Platform using Cloud IAM
CO3: Create, manage, and assign service accounts to GCP VMs
CO4: View audit logs in the GCP console

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓									✓
CO2	✓	✓	✓									✓
CO3	✓	✓	✓		✓							✓

CO4	√	√	√	√				√				√

Course Contents:

Module-1: Introducing Google Cloud Platform. Advantages of Google Cloud Platform. Components of Google's network infrastructure, including: Points of presence, data centers, regions, and zones. Understand the difference between Infrastructure-as-a- Service (IaaS) and Platform-as-a-Service (PaaS).

Module-2: Getting Started with Google Cloud Platform. Identify the purpose of projects on Google Cloud Platform. Understand the purpose of and use cases for Identity and Access Management .List the methods of interacting with Google Cloud Platform. Getting Started with Google Cloud Platform.

Module-3: Virtual Machines and Networks in the Cloud. Identify the purpose of and use cases for Google Compute Engine. Understand the various Google Cloud Platform networking and operational tools and services.

Module-4: Storage in the Cloud. Understand the purpose of and use cases for: Google Cloud Storage, Google Cloud SQL, Google Cloud Bigtable, and Google Cloud Datastore. Learn how to choose between. Various storage options on Google Cloud Platform.Cloud Storage and Cloud SQL.

Module-5: Containers in the Cloud. Concept of a container and identify uses for containers. Identify the purpose of and use cases for Google Kubernetes Engine and Kubernetes.Kubernetes Engine

Module-6: Applications in the Cloud. Understand the purpose of and use cases for Google App Engine. Contrast the App Engine Standard environment with the App Engine Flexible environment. Understand the purpose of and use cases for Google Cloud Endpoints, App Engine.

Module-7: Developing, Deploying, and Monitoring in the Cloud. Understand options for software developers to host their source code. Understand the purpose of template-based creation and management of resources. Understand the purpose of integrated monitoring, alerting, and debugging. Deployment Manager and Stack driver.

Module-8: Big Data and Machine Learning in the Cloud, Understand the purpose of and use cases for the products and services in the Google Cloud big data and machine learning platforms.

Text Books:
1. Google Cloud Platform for Developers by Steven Porter
2. Google Cloud Platform in Action 1st Edition by JJ Geewax
3. Google Professional Cloud Architect Study Guide 1st Edition by Dan Sullivan

Reference Book:

1. Professional Cloud Architect- Google Cloud Certification Guide : A complete GCP Cloud Architect certification guide filled with exam objectives and mock tests Kindle Edition by Konrad Clapa (Author), Brian Gerrard

2. Google Cloud Platform Cookbook: Implement, deploy, maintain, and migrate applications on Google Cloud Platform Kindle Edition by Legorie Rajan PS
3. Introducing Google Cloud Platform: Enabling a whole new possibilities Kindle Edition by Soumen Chatterjee

TITLE OF COURSE: MICROSOFT AZURE AND ITS SERVICES
COURSE CODE: CC706
L-T-P: 3-0-0
CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts of cloud computing.

Introduction:

The objective is to study the Microsoft Azure and its Services to understand cloud-computing models boosts not only productivity but also provide a competitive edge to organizations. Main aim to know the different services of Microsoft Azure. Therefore, today there exists a variety of enterprise cloud solutions depending on the degree of desired outsourcing needs.

Course Outcomes (CO):

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

CO1: Understand the architecture Microsoft Azure
CO2: Understand the different services of Microsoft Azure.
CO3: Understand different types of monitoring services of Microsoft Azure.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓							✓
CO2	✓	✓	✓	✓								✓
CO3	✓	✓	✓								✓	✓

Course Contents:

Module-1: Introduction to Microsoft Azure and Its Services-Azure Subscriptions, Azure Resources, Azure Free Tier Account, Azure Resource Manager, Azure Resource Manager Template, Azure Storage, Types of Azure Storage

Module-2: Azure Virtual Machines and Networking-Azure Resource Manager Virtual Machine, Virtual Machines in ARM Template, Overview of Azure Virtual Machine, Azure Managed Disks, Azure Blob Storage, Networking in Azure, Subnets, NIC, NSG, IP Addresses, DNS

Module-3: Azure VMSS and Availability Zones-Resiliency, Azure Availability Sets, Azure Availability Zone, Autoscaling, Virtual Machine Scale Set, Fault Domain, Update Domain, Load Balancer, Application Gateway, Azure Disk Encryption

Module-4: Azure App Services and Its Features-Azure App Service Web Apps, App Service

Security,Serverless Computing Concepts, Function Apps, Azure Event Grid, Azure Service Bus, Azure App Service Logic App, Using Shell Commands to create Web App, Background Tasks, Swagger tool-

Module-5: Advanced Azure Hybrid Connectivity and Site Recovery-Hybrid Connectivity, VNet S2S VPN, VNet Peering, Service Chaining, Azure VPN Gateway, Policy Based Gateway, Route Based Gateway, Swagger tool, Gateway Connections, Express Route, VNet Routing, User Defined Route, Border Gateway Protocol

Module-6: Azure Storage Solution and Design Patterns-Azure Architecture Center, Cloud design patterns, Cache-aside pattern, Sharding Pattern, Azure SQL DB, Azure Elastic Pool, Azure Data Lakes, Azure Data Factory, Azure Cosmos DB

Module-7: Azure Kubernetes Service-Application Environment Components, Docker, DockerFile,Docker Image, Azure Container Registry, Azure Container Instance, Orchestration, Azure Kubernetes Service, Diagnostics Logs

Module-8: Azure Active Directory and Role Based Access Control-Access Control, Role Based Access Control, Authentication in applications (certificates, Azure AD, Azure AD Connect, token-based), Multi-factor authentication (MFA), Claims-based authorization, Role-based access control (RBAC) authorization, End-to-end encryption, Azure confidential computing, SSL and TLS communications, Azure Key Vault, Configure Fraud alerts, Bypass option, trusted IPs, Managed Service Identity, Service Principal authentication

Module-9: Azure Messaging Service (Events, Hubs, Queue and Bus)-Azure Messaging Service, Azure Service Bus, Azure Events Hub, Azure Events Grid, Azure Notifications Hub, Auto Scale Ruling in Azure, Transient Fault Handling

Module-10: Azure Monitoring and Insights Service-Azure Monitoring, Azure Analytics, Azure Alerts, Azure Resource Metrics, Azure Activity Log, Service Health, Azure Log Analytics, Azure App Insights

Text Books:
1. Azure for Architects: Implementing Cloud Design, DevOps, IoT, and Serverless Solutions on Your Public Cloud, by Ritesh Modi
2. Microsoft Azure Tutorial the Ultimate Beginners Guide, by Dennis Hutten
3. Introducing Windows Azure for IT Professionals, by Mitch Tulloch

Reference Books:
1. Azure: Microsoft Azure Tutorial for Beginners, by Kennan Bismar
2. Implementing Microsoft Azure Infrastructure, by Michael Washam and Rick Rainey
3. Mastering Microsoft Azure Infrastructure Services, by John Savill
4. Azure for Architects: Implementing Cloud Design, DevOps, Containers, IoT, and Serverless Solutions on Your Public Cloud, 2nd Edition, by Ritesh Modi

TITLE OF COURSE: AWS FUNDAMENTAL
COURSE CODE: CC707
L-T-P: 3-0-0
CREDITS: 3

Pre-requisite: Knowledge is also assumed of basic concepts of how the AWS cloud infrastructure is built, walk you through Amazon Elastic Compute Cloud (Amazon EC2) and Amazon Lightsail compute services.

Introduction:

This course gives current or aspiring IT professionals an overview of the features, benefits, and capabilities of Amazon Web Services (AWS). As you proceed through these Module interconnected

courses, you will gain a more vivid understanding of core AWS services, key AWS security concepts, strategies for migrating from on-premises to AWS, and basics of building serverless applications with AWS.

Course Outcomes (CO):

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

CO1: Understand the core AWS services

CO2: Understand the key AWS security concepts

CO3: Understand the strategies for migrating from on-premises to AWS.

CO4: Understand basics building serverless applications with AWS.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓			✓							✓
CO2	✓	✓		✓				✓				✓
CO3	✓	✓						✓				✓
CO4	✓	✓	✓								✓	✓

Course Contents:

Module-1: Aws Fundamentals: Going Cloud-Native, Introduced To The Course And Learn About Aws Services, Infrastructure, And Compute Services, Networking And Storage On Aws, Databases On Aws, Monitoring And Scaling.

Module-2: AWS Fundamentals: Addressing Security Risk, basic concepts such as "least privilege" and the "Shared Responsibility Model, network isolation and endpoint security, Detective controls such as Amazon CloudTrail as well as AWS Security Hub, Amazon Guard Duty and AWS Config, encryption of data at rest, in motion, store data within and between various AWS services, Amazon EC2 and AWS Lambda, AWS Well-Architected Framework.

Module-3: AWS Fundamentals: Migrating to the Cloud, Defining what we mean by Migration, Migration Preparation and Business Planning, Portfolio Discovery and Planning ,Design, Migration and Application Validation ,Operate, Cloud Adoption Framework - Hybrid Environments, Scaling Considerations, High Availability, Considerations with Migrating DB vs Applications, AWS Server Migration Services, VM Import and VM on AWS (Server Migration Service),Introduce AWS Migration Hub, AWS Application Discovery Service, Amazon EFS, Amazon EBS, & Amazon S3,

Module-4: Storage - AWS Snowball & AWS Snowmobile, AWS Storage Gateway Now with AWS Data Sync, Storage - AWS DMS Overview, Storage - AWS DMS Core Features, Storage Schema Conversion ,Storage - Amazon Aurora (Serverless), AWS Direct Connect & Amazon Route 53, Automation - AWS API Centricity, AWS System Manager & AWS Cloud Formation, Overview and TSO Logic, Migration Tools - Cloud Endure.

Module-5: AWS Fundamentals: Building Server less Applications, Amazon Lex, Amazon Lex Walkthrough , Introduction to Amazon Cloud Front, AWS Identity Access Management (IAM),Introduction to Serverless Computing with AWS Lambda

Text Books:

1. Amazon web services in action, written by andreas witting and michael wittig
2. Mastering AWS Development, written by Uchit Vyas

Reference Books:

1. Implementing cloud design patterns for aws, written by marcus young.
2. Aws administration – the definitive guide, written by yohan wadia.