Academic Council
Item No: _____

UNIVERSITY OF MUMBAI

Syllabus for SemV&VI
Program: Bachelor of Science
Course: Computer Science

Credit Based Semester and Grading System with effect from
Academic Year 2018-2019

Preamble

This is the third year curriculum in the subject of Computer Science. The revised structure is designed to transform students into technically competent, socially responsible and ethical Computer Science professionals. In these Semesters we have made the advancements in the subject based on the previous Semesters Knowledge.

In the first year basic foundation of important skills required for software development is laid. Second year of this course is about studying core computer science subjects. The third year is the further advancement which covers developing capabilities to design formulations of computing models and its applications in diverse areas.

The proposed curriculum contains two semesters, each Semester contains two Electives: Elective-I and II. Every Elective contains three papers based on specific areas of Computer Science. It also includes one Skill Enhancement paper per semester, helps the student to evaluate his/her computer science domain specific skills and also to meet industry expectations. This revised curriculum has not only taken the specific areas of computer science into consideration but will also give the opportunity to the student to prove his/her ability in the subject practically through the Project Implementation. In Semester V and Semester VI student has to undertake a Project. It can boost his/her confidence and also can encourage the student to perform innovations in the subject as the choice of the Project topic is kept open covering most of the areas of Computer Science subject as per the students interest and the subject they have learned during the Course.

Proposed Curriculum contains challenging and varied subjects aligned with the current trend with the introduction of Machine Intelligence specific subject such as Artificial Intelligence, Information Retrieval. Data Management related subjects such as Cloud Computing and Data Science. Image processing topics such as Game Programming, Digital Image Processing. Introduction of physical world through Architecting of IoT and Wireless Sensor Networks and Mobile Communication. Security domain is also evolved by the introduction of Ethical Hacking, Cyber Forensic and Information and Network Security. To get the hands on experience Linux Server Administration and Web Services topics are included.

In essence, the objective of this syllabus is to create a pool of technologically savvy, theoretically strong, innovatively skilled and ethically responsible generation of computer science professionals. Hope that the teacher and student community of University of Mumbai will accept and appreciate the efforts.

T.Y.B.Sc. (Semester V and VI)
Computer Science Syllabus
Credit Based Semester and Grading System
To be implemented from the Academic year 2018-2019

SEMESTER V			
Course	**TOPICS**	**Credits**	**L / Week**
	Elective-I (Select Any Two)		
USCS501	Artificial Intelligence	3	3
USCS502	Linux Server Administration	3	3
USCS503	Software Testing and Quality Assurance	3	3
	Elective-II (Select Any Two)		
USCS504	Information and Network Security	3	3
USCS505	Architecting of IoT	3	3
USCS506	Web Services	3	3
	Skill Enhancement		
USCS507	Game Programming	2	3
	Practical		
USCSP501	Practical of Elective-I	2	6
USCSP502	Practical of Elective-II	2	6
USCSP503	Project Implementation	1	3
USCSP504	Practical of Skill Enhancement : USCS507	1	3

SEMESTER VI			
Course	**TOPICS**	**Credits**	**L / Week**
	Elective-I (Select Any Two)		
USCS601	Wireless Sensor Networks and Mobile Communication	3	3
USCS602	Cloud Computing	3	3
USCS603	Cyber Forensics	3	3
	Elective-II (Select Any Two)		

USCS604	Information Retrieval	3	3
USCS605	Digital Image Processing	3	3
USCS606	Data Science	3	3
	Skill Enhancement		
USCS607	Ethical Hacking	2	3
	Practical		
USCSP601	Practical of Elective-I	2	6
USCSP602	Practical of Elective-II	2	6
USCSP603	Project Implementation	1	3
USCSP604	Practical of Skill Enhancement : USCS607	1	3

SEMESTER VI

THEORY

Course: **USCS602**	**TOPICS (Credits : 03 Lectures/Week: 03)** **Cloud Computing**	

Objectives:

To provide learners with the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture, implantations and applications. To expose the learners to frontier areas of Cloud Computing, while providing sufficient foundations to enable further study and research.

Expected Learning Outcomes:

After successfully completion of this course, learner should be able to articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing using open source technology. Learner should be able to identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc. They should explain the core issues of cloud computing such as security, privacy, and interoperability.

Unit I	Introduction to Cloud Computing, Characteristics and benefits of Cloud Computing, Basic concepts of Distributed Systems, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing. Elements of Parallel Computing. Elements of Distributed Computing. Technologies for Distributed Computing. Cloud Computing Architecture. The cloud reference model. Infrastructure as a service. Platform as a service. Software as a service. Types of clouds.	**15L**
Unit II	Characteristics of Virtualized Environments. Taxonomy of Virtualization Techniques. Virtualization and Cloud Computing. Pros and Cons of Virtualization. Virtualization using KVM, Creating virtual machines, oVirt - management tool for virtualization environment. Open challenges of Cloud Computing	**15L**
Unit III	Introduction to OpenStack, OpenStack test-drive, Basic OpenStack operations, OpenStack CLI and APIs, Tenant model operations, Quotas, Private cloud building blocks, Controller deployment, Networking deployment, Block Storage deployment, Compute deployment, deploying and utilizing OpenStack in production environments, Building a production environment, Application orchestration using OpenStack Heat	**15L**

Textbook(s):

1) Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, Tata McGraw Hill Education Private Limited, 2013
2) OpenStack in Action, V. K. CODY BUMGARDNER, Manning Publications Co, 2016

Additional Reference(s)*:*

1) OpenStack Essentials, Dan Radez, PACKT Publishing, 2015
2) OpenStack Operations Guide, Tom Fifield, Diane Fleming, Anne Gentle, Lorin Hochstein, Jonathan Proulx, Everett Toews, and Joe Topjian, O'Reilly Media, Inc., 2014
3) https://www.openstack.org

Suggested List of Practical – SEMESTER VI

Course: **USCSP601**	**(Credits : 02 Lectures/Week:06)** **Practical of Elective-I**	
USCS602: Cloud Computing		
1. Study and implementation of Infrastructure as a Service. 2. Installation and Configuration of virtualization using KVM. 3. Study and implementation of Infrastructure as a Service 4. Study and implementation of Storage as a Service 5. Study and implementation of identity management 6. Study Cloud Security management 7. Write a program for web feed. 8. Study and implementation of Single-Sing-On. 9. User Management in Cloud. 10. Case study on Amazon EC2/Microsoft Azure/Google Cloud Platform		

Scheme of Examination

1. Theory:

I. Internal 25 Marks :

a) Test – 20 Marks

20 marks Test – Duration 40 mins
It will be conducted either using any open source learning management system like Moodle (Modular object-oriented dynamic learning environment)

OR

A test based on an equivalent online course on the contents of the concerned course (subject) offered by or build using MOOC (Massive Open Online Course) platform.

b) 5 Marks – Active participation in routine class instructional deliveries
Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.

II. External 75 Marks as per University Guidelines

11. Practical and Project Examination:

There will be separate Practical examination for Elective-I, II, Skill enhansement and project of these Elective-I 100, Elective-II: 100 and Skill Enhansement: 50 and Project Implementation: 50.

In the Practical Examination of Elective-I and II, the student has to perform practical on each of the subjects chosen. The Marking Scheme for each of the Elective is given below:

	Subject Code	**Experiment-I**	**Experiment-II**	**Total Marks**
Elective-I	**USCSP501/ USCSP601**	Experiment-40+Journal-5 +viva-5 Total:50M	Experiment-40+Journal-5+viva-5 Total:50M	100 M
Elective-II	**USCSP502/ USCSP602**	Experiment-40+Journal-5 +viva-5 Total:50M	Experiment-40+Journal-5+viva-5 Total:50M	100 M
Project Implementation	**USCSP503/ USCSP603**	****Project Evaluation Scheme**		**50M**
Skill Enhancement	**USCSP504/ USCSP604**	Experiment-40+Journal:5+viva-5 Total-50M		**50M**
Total Marks				**300M**

(Certified Journal is compulsory for appearing at the time of Practical Examination)

****Project Evaluation Scheme:**

Presentation	**Working of the Project**	**Quality of the Project**	**Viva**	**Documentation**
10Marks	10 Marks	10 Marks	10 Marks	10Marks

(Certified Project Document is compulsory for appearing at the time of Project Presentation)

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