UNIVERSITY OF MUMBAI
No. UG/ J>Tif 2017

CIRCULAR:-

A reference **is invited to** the Syllabi relating to the B.Sc. degree course, vide this office Circular No. UG/42 of 2016-17, dated 5'h August , 2016 and the Principals of the affiliated Colleges in Science are hereby informed that the recommendation made by Ad-hoc-Board of Studies Ln Computer Science at its meeting held on **5/5/2017 has** been accepted by the Academic Council at its meeting held on 11.5.2017 vide item No. 4.210 and that in accordance therewith, in revised syllabus as per the Credit Based Semester and Grading System for S.Y.B.Sc Computer Science (Sem III & IV) which is available on the University's website (www.mu.ac.in) and that the same has been brought into force with effect from the academic year 2016-17.

MUMBAI — 400 032
July, 2017

REGISTRAR

To,

The Principal of the affiliated Colleges in Science and the Head of Recognized Institutions concerned.

A.C/4.210/11.05.2017

›>Io. **UG/)bJ- A** of 2017 .M AJ-40*0 032 ২৮th July, 2017

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l) The Co-ordinator, Faculty of Science.,
2) The Offg. Director of Board of Examinations and Evaluation,
3) The Chairperson, Board of Studies in Botar.y,
4) The Director of Board of Studies Development.
5) The Professor-cum-Director, Ir.stitute of Distance and Open Leamlng.
6) The Co-Ordinator, University Cen.puierization Centre.

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UNIVERSITY OF MUMBAI

Syllabus for SemIII
Program: B.Sc.
Course: Computer Science

(Credit Based Semester and Grading System with effect from the academic year **2017-2018**)

Preamble

The revised and restructured curriculum for the Three-year integrated course is systematically designed considering the current industry needs in terms of skills sets demanded under new technological environment. It also endeavours to align the programme structure and course curriculum with student aspirations and corporate expectations. The proposed curriculum is more contextual, industry affable and suitable to cater the needs of society and nation in present day context.

Second year of this course is about studying core computer science subjects. Theory of Computation course provides understanding of grammar, syntax and other elements of modern language designs. It also covers developing capabilities to design formulations of computing models and its applications in diverse areas.

The course in Operating System satisfies the need of understanding the structure and functioning of system. Programming holds key indispensable position in any curriculum of Computer Science. It is essential for the learners to know how to use object oriented paradigms. There is also one dedicated course Android Developer Fundamentals as a skill enhancement catering to modern day needs of Mobile platforms and applications. The syllabus has Database Systems courses in previous semesters. The course in Database Management Systems is its continuation in third semester. The course has objectives to develop understanding of concepts and techniques for data management along with covers concepts of database at advance level.

The course of Combinatorics and Graph Theory in third semester and the course of Linear Algebra in fourth semester take the previous courses in Mathematics. Graph theory is rapidly moving into the mainstream mainly because of its applications in diverse fields which include can further open new opportunities in the areas of genomics, communications networks and coding theory, algorithms and computations and operations research.

Introducing one of the upcoming concepts Physical Computing and IoT programming will definitely open future area as Embedded Engineer, involvement in IoT projects, Robotics and many more. The RasPi is a popular platform as it offers a complete Linux server in a tiny platform for a very low cost and custom-built hardware with minimum complex hardware builds which is easier for projects in education domain.

S.Y.B.Sc. (Semester III and IV)
Computer Science Syllabus
Credit Based Semester and Grading System
To be implemented from the Academic year 2017-2018

SEMESTER III			
Course	**TOPICS**	**Credits**	**L / Week**
USCS301	Theory of Computation	2	3
USCS302	Core JAVA	2	3
USCS303	Operating System	2	3
USCS304	Database Management Systems	2	3
USCS305	Combinatorics and Graph Theory	2	3
USCS306	Physical Computing and IoT Programming	2	3
USCS307	Skill Enhancement: Web Programming	2	3
USCSP301	USCS302+USCS303+USCS304	3	9
USCSP302	USCS305+USCS306+USCS307	3	9

SEMESTER IV			
Course	**TOPICS**	**Credits**	**L / Week**
USCS401	Fundamentals of Algorithms	2	3
USCS402	Advanced JAVA	2	3
USCS403	Computer Networks	2	3
USCS404	Software Engineering	2	3
USCS405	Linear Algebra using Python	2	3
USCS406	.NET Technologies	2	3
USCS407	Skill Enhancement: Android Developer Fundamentals	2	3
USCSP401	USCS401+ USCS402+ USCS403	3	9
USCSP402	USCS405+ USCS406+ USCS407	3	9

Course: USCS306	TOPICS (Credits : 02 Lectures/Week:03) Physical Computing and IoT Programming

Objectives:

To learn about SoC architectures; Learn how Raspberry Pi. Learn to program Raspberry Pi. Implementation of internet of Things and Protocols.

Expected Learning Outcomes:

1. Enable learners to understand System On Chip Architectures.
2. Introduction and preparing Raspberry Pi with hardware and installation.
3. Learn physical interfaces and electronics of Raspberry Pi and program them using practical's
4. Learn how to make consumer grade IoT safe and secure with proper use of protocols.

Unit I	**SoC and Raspberry Pi** **System on Chip:** What is System on chip? Structure of System on Chip. **SoC products:** FPGA**,** GPU, APU, Compute Units. **ARM 8 Architecture:** SoC on ARM 8. ARM 8 Architecture Introduction **Introduction to Raspberry Pi:** Introduction to Raspberry Pi, Raspberry Pi Hardware, Preparing your raspberry Pi. **Raspberry Pi Boot:** Learn how this small SoC boots without BIOS. Configuring boot sequences and hardware.	**15L**
Unit II	**Programming Raspberry Pi** **Raspberry Pi and Linux:** About Raspbian, Linux Commands, Configuring Raspberry Pi with Linux Commands **Programing interfaces:** Introduction to Node.js, Python. **Raspberry Pi Interfaces:** UART, GPIO, I2C, SPI **Useful Implementations:** Cross Compilation, Pulse Width Modulation, SPI for Camera.	**15L**
Unit III	**Introduction to IoT:** What is IoT? IoT examples, Simple IoT LED Program. **IoT and Protocols** **IoT Security:** HTTP, UPnp, CoAP, MQTT, XMPP**.** **IoT Service as a Platform:** Clayster, Thinger.io, SenseIoT, carriots and Node RED.	**15L**

	IoT Security and Interoperability: Risks, Modes of Attacks, Tools for Security and Interoperability.	

Textbook(s):

1) Learning Internet of Things, Peter Waher, Packt Publishing(2015)
2) Mastering the Raspberry Pi, Warren Gay, Apress(2014)

Additional Reference(s):

1) Abusing the Internet of Things, Nitesh Dhanjani, O'Reilly

Suggested List of Practical- SEMESTER III

USCS306: Physical Computing and IoT Programming
1. Preparing Raspberry Pi: Hardware preparation and Installation 2. Linux Commands: Exploring the Raspbian 3. GPIO: Light the LED with Python 4. GPIO: LED Grid Module: Program the 8X8 Grid with Different Formulas 5. SPI: Camera Connection and capturing Images using SPI 6. Real Time Clock display using PWM. 7. Stepper Motor Control: PWM to manage stepper motor speed. 8. Node RED: Connect LED to Internet of Things 9. Stack of Raspberry Pi for better Computing and analysis 10. Create a simple Web server using Raspberry Pi

Evaluation Scheme

I. Internal Exam - 25 Marks

(i) 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.

(ii) 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 Exam– 75 Marks

III. Practical Exam – 50 Marks

- Each course carry 50 Marks : 40 marks + 05 marks (journal) + 05 marks (viva)
- Minimum 75 % practical from each paper are required to be completed and written in the journal**.**

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

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