

**UNIVERSITY OF MUMBAI**

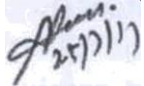
**No. UG/ J>Tif 2017**

**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<sup>th</sup> 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](http://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 Prin.cipal of the affiliated Colleges in Science and the Head of Recognized Institutions concerned.

**A.C/4.210/11.05.2017**

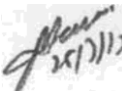
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२३<sup>th</sup> July, 2017

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- 1) 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**

| <b>SEMESTER III</b> |  |                |                 |
|---------------------|--|----------------|-----------------|
| <b>Course</b>       | <b>TOPICS</b>                          | <b>Credits</b> | <b>L / Week</b> |
| 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               |

| <b>SEMESTER IV</b> |  |                |                 |
|--------------------|--|----------------|-----------------|
| <b>Course</b>      | <b>TOPICS</b>  | <b>Credits</b> | <b>L / Week</b> |
| 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<br>Fundamentals | 2              | 3               |
| USCSP401           | USCS401+ USCS402+ USCS403                            | 3              | 9               |
| USCSP402           | USCS405+ USCS406+ USCS407                            | 3              | 9               |

## Suggested List of Practical- SEMESTER III

|   |  |  |                            |                                 |              |                         |               |   |
|---|--|--|----------------------------|---------------------------------|--------------|-------------------------|---------------|---|
| <b>Course:</b><br>USCSP302  | <b>(Credits : 03 Lectures/Week: 09)</b><br><b>USCS305+ USCS306+USCS307</b> |  |                            |                                 |              |                         |               |   |
| <b>USCS305: Combinatorics and Graph Theory</b>  |  |  |                            |                                 |              |                         |               |   |
| <ol style="list-style-type: none"> <li>1. Solving problems on strings, sets and binomial coefficients.</li> <li>2. Solving problems using induction.</li> <li>3. Solving problems on Eulerian and Hamiltonian graphs.</li> <li>4. Solving problems on Chromatic number and coloring</li> <li>5. Solving problems using Kruskal's Algorithm</li> <li>6. Solving problems using Prim's Algorithm</li> <li>7. Solving problems using Dijkstra's Algorithm</li> <li>8. Solving problems of finding augmenting paths in network flows.</li> <li>9. Solving problems on network flows using Ford-Fulkerson Labeling Algorithm</li> <li>10. Solving problems on posets and their associated networks.</li> </ol>                               |  |  |                            |                                 |              |                         |               |   |
| <b>USCS306: Physical Computing and IoT Programming</b>  |  |  |                            |                                 |              |                         |               |   |
| <ol style="list-style-type: none"> <li>1. Preparing Raspberry Pi: Hardware preparation and Installation</li> <li>2. Linux Commands: Exploring the Raspbian</li> <li>3. GPIO: Light the LED with Python</li> <li>4. GPIO: LED Grid Module: Program the 8X8 Grid with Different Formulas</li> <li>5. SPI: Camera Connection and capturing Images using SPI</li> <li>6. Real Time Clock display using PWM.</li> <li>7. Stepper Motor Control: PWM to manage stepper motor speed.</li> <li>8. Node RED: Connect LED to Internet of Things</li> <li>9. Stack of Raspberry Pi for better Computing and analysis</li> <li>10. Create a simple Web server using Raspberry Pi</li> </ol>   |  |  |                            |                                 |              |                         |               |   |
| <b>USCS307: Web Programming</b>   |  |  |                            |                                 |              |                         |               |   |
| <ol style="list-style-type: none"> <li>1. Design a webpage that makes use of               <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; padding: 0 10px;">a. Document Structure Tags</td> <td style="width: 50%; padding: 0 10px;">b. Various Text Formatting Tags</td> </tr> <tr> <td style="padding: 0 10px;">c. List Tags</td> <td style="padding: 0 10px;">d. Image and Image Maps</td> </tr> </table> </li> <li>2. Design a webpage that makes use of               <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; padding: 0 10px;">a. Table tags</td> <td style="width: 50%; padding: 0 10px;">b. Form Tags (forms with various form elements)</td> </tr> </table> </li> </ol> |  |  | a. Document Structure Tags | b. Various Text Formatting Tags | c. List Tags | d. Image and Image Maps | a. Table tags | b. Form Tags (forms with various form elements) |
| a. Document Structure Tags  | b. Various Text Formatting Tags  |  |                            |                                 |              |                         |               |   |
| c. List Tags  | d. Image and Image Maps  |  |                            |                                 |              |                         |               |   |
| a. Table tags   | b. Form Tags (forms with various form elements)                            |  |                            |                                 |              |                         |               |   |

- c. Navigation across multiple pages
  - d. Embedded Multimedia elements
3. Design a webpage that make use of Cascading Style Sheets with
  - a. CSS properties to change the background of a Page
  - b. CSS properties to change Fonts and Text Styles
  - c. CSS properties for positioning an element
4. Write JavaScript code for
  - a. Performing various mathematical operations such as calculating factorial / finding Fibonacci Series / Displaying Prime Numbers in a given range / Evaluating Expressions / Calculating reverse of a number
  - b. Validating the various Form Elements
5. Write JavaScript code for
  - a. Demonstrating different JavaScript Objects such as String, RegExp, Math, Date
  - b. Demonstrating different JavaScript Objects such as Window, Navigator, History, Location, Document,
  - c. Storing and Retrieving Cookies
6. Create a XML file with Internal / External DTD and display it using
  - a. CSS
  - b. XSL
7. Design a webpage to handle asynchronous requests using AJAX on
  - a. Mouseover
  - b. button click
8. Write PHP scripts for
  - a. Retrieving data from HTML forms
  - b. Performing certain mathematical operations such as calculating factorial / finding Fibonacci Series / Displaying Prime Numbers in a given range / Evaluating Expressions / Calculating reverse of a number
  - c. Working with Arrays
  - d. Working with Files (Reading / Writing)
9. Write PHP scripts for
  - a. Working with Databases (Storing Records / Reprieving Records and Display them)
  - b. Storing and Retrieving Cookies
  - c. Storing and Retrieving Sessions
10. Design a webpage with some jQuery animation effects.

# 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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