

**UNIVERSITY OF MUMBAI**

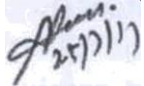
**No. UG/ J>Tif 2017**

**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**

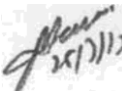
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२३<sup>th</sup> July, 2017

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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 SemIV**  
**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 Fundamentals	2	3
USCSP401	USCS401+ USCS402+ USCS403	3	9
USCSP402	USCS405+ USCS406+ USCS407	3	9

## Suggested List of Practical – SEMESTER IV

<b>Course:</b> <b>USCSP402</b>	<b>(Credits : 03 Lectures/Week:09)</b> <b>USCS405+ USCS406+ USCS407</b>	
<b>USCS405: Linear Algebra using Python</b>		
<ol style="list-style-type: none"><li>1. Write a program which demonstrates the following:<ul style="list-style-type: none"><li>• Addition of two complex numbers</li><li>• Displaying the conjugate of a complex number</li><li>• Plotting a set of complex numbers</li><li>• Creating a new plot by rotating the given number by a degree 90, 180, 270 degrees and also by scaling by a number <math>a=1/2</math>, <math>a=1/3</math>, <math>a=2</math> etc.</li></ul></li><li>2. Write a program to do the following:<ul style="list-style-type: none"><li>• Enter a vector <math>u</math> as a <math>n</math>-list</li><li>• Enter another vector <math>v</math> as a <math>n</math>-list</li><li>• Find the vector <math>au+bv</math> for different values of <math>a</math> and <math>b</math></li><li>• Find the dot product of <math>u</math> and <math>v</math></li></ul></li><li>3. Write a program to do the following:<ul style="list-style-type: none"><li>• Enter two distinct faces as vectors <math>u</math> and <math>v</math>.</li><li>• Find a new face as a linear combination of <math>u</math> and <math>v</math> i.e. <math>au+bv</math> for <math>a</math> and <math>b</math> in <math>\mathbb{R}</math>.</li><li>• Find the average face of the original faces.</li></ul></li><li>4. Write a program to do the following:<ul style="list-style-type: none"><li>• Enter an <math>r</math> by <math>c</math> matrix <math>M</math> (<math>r</math> and <math>c</math> being positive integers)</li><li>• Display <math>M</math> in matrix format</li><li>• Display the rows and columns of the matrix <math>M</math></li><li>• Find the scalar multiplication of <math>M</math> for a given scalar.</li><li>• Find the transpose of the matrix <math>M</math>.</li></ul></li><li>5. Write a program to do the following:<ul style="list-style-type: none"><li>• Find the vector –matrix multiplication of a <math>r</math> by <math>c</math> matrix <math>M</math> with an <math>c</math>-vector <math>u</math>.</li><li>• Find the matrix-matrix product of <math>M</math> with a <math>c</math> by <math>p</math> matrix <math>N</math>.</li></ul></li><li>6. Write a program to enter a matrix and check if it is invertible. If the inverse exists, find the inverse.</li><li>7. Write a program to convert a matrix into its row echelon form.</li></ol>		

8. Write a program to do the following:
  - Enter a positive number  $N$  and find numbers  $a$  and  $b$  such that  $a^2 - b^2 = N$
  - Find the gcd of two numbers using Euclid's algorithm.
9. Write a program to do the following:
  - Enter a vector  $b$  and find the projection of  $b$  orthogonal to a given vector  $u$ .
  - Find the projection of  $b$  orthogonal to a set of given vectors
10. Write a program to enter a given matrix and an eigen value of the same. Find its eigen vector.

### **USCS406: .NET Technologies**

1. Write C# programs for understanding C# basics involving
 

a. Variables and Data Types	b. Object-Based Manipulation
c. Conditional Logic	d. Loops
	e. Methods
2. Write C# programs for Object oriented concepts of C# such as:
 

a. Program using classes	b. Constructor and Function Overloading
c. Inheritance	d. Namespaces
3. Design ASP.NET Pages with
  - a. Server controls.
  - b. Web controls and demonstrate the use of AutoPostBack
  - c. Rich Controls (Calendar / Ad Rotator)
4. Design ASP.NET Pages for State Management using
 

a. Cookies	b. Session State	c. Application State
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5. Perform the following activities
  - a. Design ASP.NET page and perform validation using various Validation Controls
  - b. Design an APS.NET master web page and use it other (at least 2-3) content pages.
  - c. Design ASP.NET Pages with various Navigation Controls
6. Performing ADO.NET data access in ASP.NET for
 

a. Simple Data Binding	b. Repeated Value Data Binding
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7. Design ASP.NET application for Interacting (Reading / Writing) with XML documents
8. Design ASP.NET Pages for Performance improvement using Caching
9. Design ASP.NET application to query a Database using LINQ
10. Design and use AJAX based ASP.NET pages.

## **USCS407:Android Developer Fundamentals**

1. Install Android Studio and Run Hello World Program.
2. Create an android app with Interactive User Interface using Layouts.
3. Create an android app that demonstrates working with TextView Elements.
4. Create an android app that demonstrates Activity Lifecycle and Instance State.
5. Create an android app that demonstrates the use of Keyboards, Input Controls, Alerts, and Pickers.
6. Create an android app that demonstrates the use of an Options Menu.
7. Create an android app that demonstrate Screen Navigation Using the App Bar and Tabs.
8. Create an android app to Connect to the Internet and use BroadcastReceiver.
9. Create an android app to show Notifications and Alarm manager.
10. Create an android app to save user data in a database and use of different queries.

## 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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