AC:
Item No.

UNIVERSITY OF MUMBAI

Bachelor of Engineering

in

- Computer Science and Engineering (Data Science)
- Computer Science and Engineering (Artificial Intelligence and Machine Learning)
- Artificial Intelligence and Data Science
- Artificial Intelligence and Machine Learning
- Data Engineering

Third Year with Effect from AY 2022-23

(REV- 2019 'C' Scheme) from Academic Year 2020 – 21

Under

FACULTY OF SCIENCE & TECHNOLOGY

(As per AICTE guidelines with effect from the academic year 2019–2020)

AC:
Item No.

UNIVERSITY OFMUMBAI

Syllabus for Approval

Sr. No.	Heading	Particulars
1	Title of the Course	**Third Year Engineering**
2	Eligibility for Admission	**After Passing Second Year Engineering as per the Ordinance 0.6243**
3	Passing Marks	**40%**
4	Ordinances / Regulations (if any)	**Ordinance 0.6243**
5	No. of Years / Semesters	**8 semesters**
6	Level	~~P.G.~~ / **U.G.**/ ~~Diploma / Certificate~~ (Strike out which is not applicable)
7	Pattern	~~Yearly~~ / **Semester** (Strike out which is not applicable)
8	Status	~~**New**~~/ Revised (Strike out which is not applicable)
9	To be implemented from Academic Year	**With effect from Academic Year:2022-2023**

Dr. S.K.Ukarande
Associate Dean
Faculty of Science and Technology
University of Mumbai

Dr. Anuradha Muzumdar
Dean
Faculty of Science and Technology
University of Mumbai

Preamble

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited. In line with this Faculty of Science and Technology (in particular Engineering) of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

Faculty resolved that course objectives and course outcomes are to be clearly defined for each course, so that all faculty members in affiliated institutes understand the depth and approach of course to be taught, which will enhance learner's learning process. Choice based Credit and grading system enables a much-required shift in focus from teacher-centric to learner-centric education since the workload estimated is based on the investment of time in learning and not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. Credit assignment for courses is based on 15 weeks teaching learning process, however content of courses is to be taught in 13 weeks and remaining 2 weeks to be utilized for revision, guest lectures, coverage of content beyond syllabus etc.

There was a concern that the earlier revised curriculum more focused on providing information and knowledge across various domains of the said program, which led to heavily loading of students in terms of direct contact hours. In this regard, faculty of science and technology resolved that to minimize the burden of contact hours, total credits of entire program will be of 170, wherein focus is not only on providing knowledge but also on building skills, attitude and self learning. Therefore in the present curriculum skill based laboratories and mini projects are made mandatory across all disciplines of engineering in second and third year of programs, which will definitely facilitate self learning of students. The overall credits and approach of curriculum proposed in the present revision is in line with AICTE model curriculum.

The present curriculum will be implemented for Second Year of Engineering from the academic year 2021-22. Subsequently this will be carried forward for Third Year and Final Year Engineering in the academic years 2022-23, 2023-24, respectively.

Dr. S.K. Ukarande
Associate Dean
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Dr Anuradha Muzumdar
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Incorporation and Implementation of Online Contents fromNPTEL/ Swayam Platform

The curriculum revision is mainly focused on knowledge component, skill based activities and project based activities. Self learning opportunities are provided to learners. In the revision process this time in particular Revised syllabus of 'C' scheme wherever possible additional resource links of platforms such as NPTEL, Swayam are appropriately provided. In an earlier revision of curriculum in the year 2012 and 2016 in Revised scheme 'A' and 'B' respectively, efforts were made to use online contents more appropriately as additional learning materials to enhance learning of students.

In the current revision based on the recommendation of AICTE model curriculum overall credits are reduced to 171, to provide opportunity of self learning to learner. Learners are now getting sufficient time for self learning either through online courses or additional projects for enhancing their knowledge and skill sets.

The Principals/ HoD's/ Faculties of all the institute are required to motivate and encourage learners to use additional online resources available on platforms such as NPTEL/ Swayam. Learners can be advised to take up online courses, on successful completion they are required to submit certification for the same. This will definitely help learners to facilitate their enhanced learning based on their interest.

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Associate Dean
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Dr Anuradha Muzumdar
Dean
Faculty of Science and Technology
University of Mumbai

Preface by Board of Studies in Computer Engineering

Dear Students and Teachers, we, the members of Board of Studies Computer Engineering, are very happy to present Third Year Computer Engineering syllabus effective from the Academic Year 2021-22 (REV-2019'C' Scheme). We are sure you will find this syllabus interesting, challenging, fulfill certain needs and expectations.

Computer Engineering is one of the most sought-after courses amongst engineering students. The syllabus needs revision in terms of preparing the student for the professional scenario relevant and suitable to cater the needs of industry in present day context. The syllabus focuses on providing a sound theoretical background as well as good practical exposure to students in the relevant areas. It is intended to provide a modern, industry-oriented education in Computer Engineering. It aims at producing trained professionals who can successfully acquainted with the demands of the industry worldwide. They obtain skills and experience in up-to-date the knowledge to analysis, design, implementation, validation, and documentation of computer software and systems.

The revised syllabus is finalized through a brain storming session attended by Heads of Departments or senior faculty from the Department of Computer Engineering of the affiliated Institutes of the Mumbai University. The syllabus falls in line with the objectives of affiliating University, AICTE, UGC, and various accreditation agencies by keeping an eye on the technological developments, innovations, and industry requirements.

The salient features of the revised syllabus are:

1. Reduction in credits to 170 is implemented to ensure that students have more time for extracurricular activities, innovations, and research.
2. The department Optional Courses will provide the relevant specialization within the branch to a student.
3. Introduction of Skill Based Lab and Mini Project to showcase their talent by doing innovative projects that strengthen their profile and increases the chance of employability.
4. Students are encouraged to take up part of course through MOOCs platform SWAYAM

We would like to place on record our gratefulness to the faculty, students, industry experts and stakeholders for having helped us in the formulation of this syllabus.

Board of Studies in Computer Engineering

Prof. Sunil Bhirud	: Chairman
Prof. SunitaPatil	: Member
Prof. LeenaRaga	: Member
Prof. Subhash Shinde	: Member
Prof .Meera Narvekar	: Member
Prof. Suprtim Biswas	: Member
Prof. Sudhir Sawarkar	: Member
Prof. Dayanand Ingle	: Member
Prof. Satish Ket	: Member

PROGRAM STRUCTURE FOR THIRD YEAR
UNIVERSITY OF MUMBAI (With Effect from 2022-2023)

Semester V

Course Code	Course Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Pract.	Theory	Pract.	Total
CSC501	Computer Network	3	--	3	--	3
CSC502	Web Computing	3	--	3		3
CSC503	Artificial Intelligence	3	--	3	--	3
CSC504	Data Warehousing & Mining	3	--	3	--	3
CSDLO501X	Department Level Optional Course- 1	3	--	3	--	3
CSL501	Web Computing and Network Lab	--	2	--	1	1
CSL502	Artificial Intelligence Lab	--	2	--	1	1
CSL503	Data Warehousing & Mining Lab	--	2	--	1	1
CSL504	Business Communication and Ethics-II	--	2*+2	--	2	2
CSM501	Mini Project: 2 A	--	4$	--	2	2
Total		**15**	**14**	**15**	**07**	**22**

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract &oral	Total
		Internal Assessment			End Sem Exam	Exam. Duration (in Hrs)			
		Test1	Test2	Avg					
CSC501	Computer Network	20	20	20	80	3	-	--	100
CSC502	Web Computing	20	20	20	80	3	--	--	100
CSC503	Artificial Intelligence	20	20	20	80	3	--	--	100
CSC504	Data Warehousing & Mining	20	20	20	80	3	--	--	100
CSDLO501X	Department Level Optional Course- 1	20	20	20	80	3	--	--	100
CSL501	Web Computing and Network Lab	--	--	--	--	--	25	25	50
CSL502	Artificial Intelligence Lab	--	--	--	--	--	25	25	50
CSL503	Data Warehousing & Mining Lab	--	--	--	--	--	25	25	50
CSL504	Business Communication and Ethics-II	--	--	--	--	--	50	--	50
CSM501	Mini Project : 2A	--	--	--	--	--	25	25	50
Total		--	--	**100**	**400**	--	**175**	**100**	**775**

* Theory class to be conducted for full class and $ indicates workload of Learner (Not Faculty), students can formgroups with minimum 2(Two) and not more than 4(Four). Faculty Load: 1hour per week per four groups.

PROGRAM STRUCTURE FOR THIRD YEAR
UNIVERSITY OF MUMBAI (With Effect from 2022-2023)

Semester VI

Course Code	Course Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Pract. Tut.	Theory	Pract.	Total
CSC601	Data Analytics and Visualization	3	--	3	--	3
CSC602	Cryptography and System Security	3	--	3		3
CSC603	Software Engineering and Project Management	3	--	3	--	3
CSC604	Machine Learning	3	--	3	--	3
CSDLO6 01X	Department Level Optional Course -2	3	--	3	--	3
CSL601	Data Analytics and Visualization Lab	--	2	--	1	1
CSL602	Cryptography & System Security Lab	--	2	--	1	1
CSL603	Software Engineering and Project Management Lab	--	2	--	1	1
CSL604	Machine Learning Lab	--	2	--	1	1
CSL605	Skill base Lab Course: Cloud Computing	--	4	--	2	2
CSM601	Mini Project Lab: 2B	--	4[$]	--	2	2
Total		**15**	**16**	**15**	**08**	**23**

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract. &oral	Total
		Internal Assessment			End Sem Exam	Exam. Duration (in Hrs)			
		Test 1	Test 2	Avg					
CSC601	Data Analytics and Visualization	20	20	20	80	3	--	--	100
CSC602	Cryptography and System Security	20	20	20	80	3	--	--	100
CSC603	Software Engineering and Project Management	20	20	20	80	3	--	--	100
CSC604	Machine Learning	20	20	20	80	3	--	--	100
CSDLO6 01X	Department Level Optional Course -2	20	20	20	80	3	--	--	100
CSL601	Data Analytics and Visualization Lab	--	--	--	--	--	25	25	50
CSL602	Cryptography & System Security Lab	--	--	--	--	--	25	--	25
CSL603	Software Engineering and Project Management Lab	--	--	--	--	--	25	-	25
CSL604	Machine Learning Lab						25	25	50
CSL605	Skill base Lab Course: Cloud Computing	--	--	--	--	--	50	25	75
CSM601	Mini Project Lab: 2B	--	--	--	--	--	25	25	50
Total		--	--	**100**	**400**	--	**175**	**100**	**775**

PROGRAM STRUCTURE FOR THIRD YEAR

UNIVERSITY OF MUMBAI (With Effect from 2022-2023)

DEPARTMENT OPTIONAL COURSES

Department Optional Courses	**Semester**	**Code & Subject**
Department Optional Course -1	V	CSDLO5011 : Statistics for Artificial Intelligence & Data Science CSDLO5012: Advanced Algorithms CSDLO5013: Intent of Things
Department Optional Course -2	VI	CSDLO6011 :High Performance Computing CSDLO6012: Distributed Computing CSDLO6013: Image & Video processing