UNIVERSITY OF MUMBAI

Bachelor of Engineering

in

- Artificial Intelligence and Data Science
- Artificial Intelligence and Machine Learning
- Cyber Security
- Internet of Things (IoT)
- Data Engineering
- Computer Science and Engineering (Data Science)
- Computer Science and Engineering (Artificial Intelligence and Machine Learning)
- Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology)

Second Year with Effect from AY 2021-22

Under

FACULTY OF SCIENCE & TECHNOLOGY

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

UNIVERSITY OF MUMBAI

Syllabus for Approval

Sr. No.	Heading	Particulars
1	Title of the Course	**Second Year Engineering (Eight New Branches)**
2	Eligibility for Admission	**After Passing First Year Engineering as per the Ordinance 0.6242**
3	Passing Marks	40%
4	Ordinances / Regulations (if any)	**Ordinance 0.6242**
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: 2021-2022**

Dr. S. K. Ukarande
Associate Dean
Faculty of Science and Technology
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Dr Anuradha Muzumdar
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Program Structure for Second Year Computer Engineering

UNIVERSITY OF MUMBAI (With Effect from 2020-2021)
Semester III

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
CSC301	Engineering Mathematics-III	3	--	1*	3	--	1	4
CSC302	Discrete Structures and Graph Theory	3	--	--	3	--	--	3
CSC303	Data Structure	3	--	--	3	--	--	3
CSC304	Digital Logic & Computer Architecture	3	--	--	3	--	--	3
CSC305	Computer Graphics	3	--	--	3	--	--	3
CSL301	Data Structure Lab	--	2	--	--	1	--	1
CSL302	Digital Logic & Computer Architecture Lab	--	2	--	--	1	--	1
CSL303	Computer Graphics Lab	--	2	--	--	1	--	1
CSL304	Skill base Lab course: Object Oriented Programming with Java	--	2+2*	--	--	2	--	2
CSM301	Mini Project – 1 A	--	4$	--	--	2	--	2
	Total	**15**	**14**	**1**	**15**	**07**	**1**	**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					
CSC301	Engineering Mathematics-III	20	20	20	80	3	25	--	125
CSC302	Discrete Structures and Graph Theory	20	20	20	80	3	--	--	100
CSC303	Data Structure	20	20	20	80	3	--	--	100
CSC304	Digital Logic & Computer Architecture	20	20	20	80	3	--	--	100
CSC305	Computer Graphics	20	20	20	80	3	--	--	100
CSL301	Data Structure Lab	--	--	--	--	--	25	25	50
CSL302	Digital Logic & Computer Architecture Lab	--	--	--	--	--	25	--	25
CSL303	Computer Graphics Lab	--	--	--	--	--	25	25	50
CSL304	Skill base Lab course: Object Oriented Programming with Java	--	--	--	--	--	50	25	75
CSM301	Mini Project – 1 A	--	--	--	--	--	25	25	50
	Total	--	--	**100**	**400**	--	**175**	**100**	**775**

*Should be conducted batch wise and

$ indicates workload of Learner (Not Faculty), Students can form groups with minimum 2 (Two) and not more than 4 (Four), Faculty Load: 1 hour per week per four groups

Program Structure for Second Year Computer Engineering
UNIVERSITY OF MUMBAI (With Effect from 2020-2021)
Semester IV

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
CSC401	Engineering Mathematics-IV	3	--	1*	3	--	1	4
CSC402	Analysis of Algorithm	3	--	--	3	--	--	3
CSC403	Database Management System	3	--	--	3	--	--	3
CSC404	Operating System	3	--	--	3	--	--	3
CSC405	Microprocessor	3	--	--	3	--	--	3
CSL401	Analysis of Algorithm Lab	--	2	--	--	1	--	1
CSL402	Database Management System Lab	--	2	--	--	1	--	1
CSL403	Operating System Lab	--	2	--	--	1	--	1
CSL404	Microprocessor Lab	--	2	--	--	1	--	1
CSL405	Skill Base Lab Course: Python Programming	--	2*+2	--	--	2	--	2
CSM401	Mini Project 1-B	--	4$	--	--	2	--	2
	Total	15	16	1	15	7	1	24

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.					
CSC401	Engineering Mathematics - IV	20	20	20	80	3	25	--	125
CSC402	Analysis of Algorithm	20	20	20	80	3	--	--	100
CSC403	Database Management System	20	20	20	80	3	--	--	100
CSC404	Operating System	20	20	20	80	3	--	--	100
CSC405	Microprocessor	20	20	20	80	3	--	--	100
CSL401	Analysis of Algorithm Lab	--	--	--	--	--	25	25	50
CSL402	Database Management System Lab	--	--	--	--	--	25	25	50
CSL403	Operating System Lab	--	--	--	--	--	25	25	50
CSL404	Microprocessor Lab	--	--	--	--	--	25	--	25
CSL405	Skill Base Lab Course: Python Programming	--	--	--	--	--	25	--	25
CSM401	Mini Project 1-B	--	--	--	--	--	25	25	50
	Total	--	--	100	400	--	175	100	775

*Should be conducted batchwise and

$ indicates workload of Learner (Not Faculty), Students can form groups with minimum 2 (Two) and not more than 4 (Four), Faculty Load: 1 hour per week per four groups.

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 2019 – 20

Under

FACULTY OF SCIENCE & TECHNOLOGY

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

University of Mumbai

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

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	--	150	100	750

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

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
CSDLO601X	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
CSDLO601X	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: Internet of Things
Department Optional Course -2	VI	CSDLO6011 :High Performance Computing CSDLO6012: Distributed Computing CSDLO6013: Image & Video processing

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

Fourth Year with Effect from AY 2023-24

(REV- 2019 'C' Scheme) from Academic Year 2019 – 20

Under

FACULTY OF SCIENCE & TECHNOLOGY

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

University of Mumbai

Sr. No.	Heading	Particulars
1	Title of the Course	**Fourth 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:2023-2024**

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Program Structure for Fourth Year CSE (AIML), CSE (DS) AI&DS, DE, AI&ML
UNIVERSITY OF MUMBAI (With Effect from 2023-2024)

Semester VII

Course Code	Course Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Pract. Tut.	Theory	Pract.	Total
CSC701	Deep Learning	3	--	3	--	3
CSC702	Big Data Analytics	3	--	3		3
CSDO 701X	Department Level Optional Course-3	3	--	3	--	3
CSDO 702X	Department Level Optional Course-4	3	--	3	--	3
ILO 701X	Institute Level Optional Course-1	3	--	3	--	3
CSL701	Deep Learning Lab	--	2	--	1	1
CSL702	Big Data Analytics Lab	--	2	--	1	1
CSDOL 701X	Department Level Optional Course-3 Lab	--	2	--	1	1
CSDOL 702X	Department Level OptionalCourse-4 Lab	--	2	--	1	1
CSP701	Major Project1	--	6#	--	3	3
Total		**15**	**14**	**15**	**7**	**22**

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					
CSC701	Deep Leaning	20	20	20	80	3	--	--	100
CSC702	Big Data Analytics	20	20	20	80	3	--	--	100
CSDO 701X	Department Level Optional Course-3	20	20	20	80	3	--	--	100
CSDO 702X	Department Level Optional Course-4	20	20	20	80	3	--	--	100
ILO 701X	Institute Level Optional Course-1	20	20	20	80	3	--	--	100
CSL701	Deep Leaning Lab	--	--	--	--	--	25	25	50
CSL702	Big Data Analytics Lab	--	--	--	--	--	25	25	50
CSDOL 701X	Department Level Optional Course-3 Lab						25	-	25
CSDOL 702X	Department Level OptionalCourse-4 Lab	--	--	--	--	--	25	-	25
CSP701	Major Project1	--	--	--	--	--	50	25	75
Total		**--**	**--**	**100**	**400**	**--**	**150**	**75**	**725**

Semester VIII

Course Code	Course Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Pract. Tut.	Theory	Pract.	Total
CSC801	Advanced Artificial Intelligence	3	--	3	--	3
CSDO 801X	Department Level Optional Course-5	3	--	3	--	3
CSDO 802X	Department Level OptionalCourse-6	3	--	3	--	3
ILO 801X	Institute Level OptionalCourse-2	3	--	3	--	3
CSL801	Advanced Artificial Intelligence Lab	--	2	--	1	1
CSDOL 801X	Department Level Optional Course-5 Lab	--	2	--	1	1
CSDOL 802X	Department Level Optional Course-6 Lab	--	2	--	1	1
CSP801	Major Project-2	--	12#	--	6	6
Total		12	18	12	9	21

Course Code	Course Name	Examination Scheme					Term Work	Pract & oral	Total
		Theory							
		Internal Assessment			End Sem Exam	Exam Duration (in Hrs)			
		Test 1	Test 2	Avg					
CSC801	Advanced Artificial Intelligence	20	20	20	80	3	--	--	100
CSDO801X	Department Level Optional Course -5	20	20	20	80	3	--	--	100
CSDO 802X	Department Level Optional Course -6	20	20	20	80	3	--	--	100
ILO80X	Institute Level Optional Course-2	20	20	20	80	3	--	--	100
CSL801	Advanced Artificial Intelligence Lab	--	--	--	--	--	25	25	50
CSDOL 801X	Department Level Optional Course -5 Lab	--	--	--	--	--	25	25	50
CSDOL 802X	Department Level Optional Course -6 Lab						25	25	50
CSP801	Major Project 2	--	--	--	--	--	100	50	150
Total		--	--	80	320	--	175	125	700

Major Project 1 and 2 :
- Students can form groups with minimum 2 (Two) and not more than 4 (Four)
- Faculty Load : In Semester VII – ½ hour per week per project group
  In Semester VIII – 1 hour per week per project group

Program Structure for Fourth Year CSE (AIML), CSE (DS) AI&DS, DE, AI&ML

UNIVERSITY OF MUMBAI (With Effect from 2023-2024)

Department and Institute Optional Courses and Labs

Semester	Department/ Institute Optional Courses and Labs	Subject and Labs
VII	Department Optional Course -3	CSDO7011: Natural Language Processing CSDO7012.: AI for Healthcare CSDO7013: Neural Network & Fuzzy System
	Department Optional Lab -3	CSDOL7011: Natural Language Processing Lab CSDOL7012.: AI for Healthcare Lab CSDOL7013: Neural Network & Fuzzy System
	Department Optional Course -4	CSDO7021: User Experience Design with VR CSDO7022: Blockchain Technologies CSDO7023: Game Theory for Data Science
	Department Optional Lab -4	CSDOL7021: User Experience Design with VR Lab CSDOL7022: Blockchain Technologies Lab CSDOL7023: Game Theory for Data Science Lab
	Institute level Optional Courses-I	ILO7011:Product Lifecycle Management ILO7012: Reliability Engineering ILO7013.: Management Information System ILO7014: Design of Experiments ILO7015: Operation Research ILO7016: Cyber Security and Laws ILO7017: Disaster Management & Mitigation Measures ILO7018: Energy Audit and Management ILO7019: Development Engineering

Program Structure for Fourth Year CSE (AIML), CSE (DS) AI&DS, DE, AI&ML

UNIVERSITY OF MUMBAI (With Effect from 2023-2024)

Department and Institute Optional Courses and Labs

Semester	Department/ Institute Optional Courses and Labs	Subject and Labs
VIII	Department Optional Course -5	CSDO8011: AI for financial & Banking application
		CSDO8012: Quantum Computing
		CSDO8013: Reinforcement Learning
	Department Optional Lab -5	CSDOL8011: AI for financial & Banking application Lab
		CSDOL8012: Quantum Computing Lab
		CSDOL8013: Reinforcement Learning Lab
	Department Optional Course -6	CSDO8021: Graph Data Science
		CSDO8022: Recommendation Systems
		CSDO8023: Social Media Analytic
	Department Optional Lab -6	CSDOL8021: Graph Data Science Lab
		CSDOL8022: Recommendation Systems Lab
		CSDOL8023: Social Media Analytic Lab
	Institute level Optional Courses-II	ILO8021: Project Management
		ILO8022: Finance Management
		ILO8023: Entrepreneurship Development and Management
		ILO8024: Human Resource Management
		ILO8025: Professional Ethics and CSR
		ILO8026: Research Methodology
		ILO8027: IPR and Patenting
		ILO8028: Digital Business Management
		ILO8029: Environmental Management