



**Bharatiya Vidya Bhavan's**  
**SARDAR PATEL INSTITUTE OF TECHNOLOGY**  
Munshi Nagar, Andheri (W), Mumbai – 400 058.  
(Autonomous Institute Affiliated to University of Mumbai)

**2.6.1:** The institution has stated learning outcomes (programme and course outcome)/graduate attributes which are integrated into the assessment process and widely publicized through the website and other documents and the attainment of the same are evaluated by the institution.

### **CONTENT**

<b>Sr. No.</b>	<b>Documents of Evidence</b>	<b>Page No.</b>
A.	Program Outcomes	2
B.	Attainment of Program Outcomes	
	1. Computer Engineering	4
	2. Information Technology	23
	3. Electronics & Telecommunication Engineering	41
	4. Master of Computer Application	71
C.	Dissemination of Program Outcomes by Institute	
	1. Pictures of PO Display on the institute website	125
	2. Display in respective HoD cabin	138
	3. Display in Laboratory	145
	4. Display Departments Notice Boards	147
	5. Display at prominent places in the Institute	149
D.	COs for all courses	
	1. Information Technology	153
	2. Electronics & Telecommunication Engineering	245



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## Programme Outcomes:

**PO1: Engineering Knowledge:** apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

**PO2: Problem Analysis:** identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3: Design & Development of Solutions:** design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4: Conduct Investigation of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

**PO5: Modern Tools Usage:** create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6: The Engineer and Society:** apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7: Environment & Sustainability:** understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8: Ethics:** apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

**PO9: Individual & Team work:** function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings

**PO10: Communication:** communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.





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**PO11: Project management & Finance:** demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

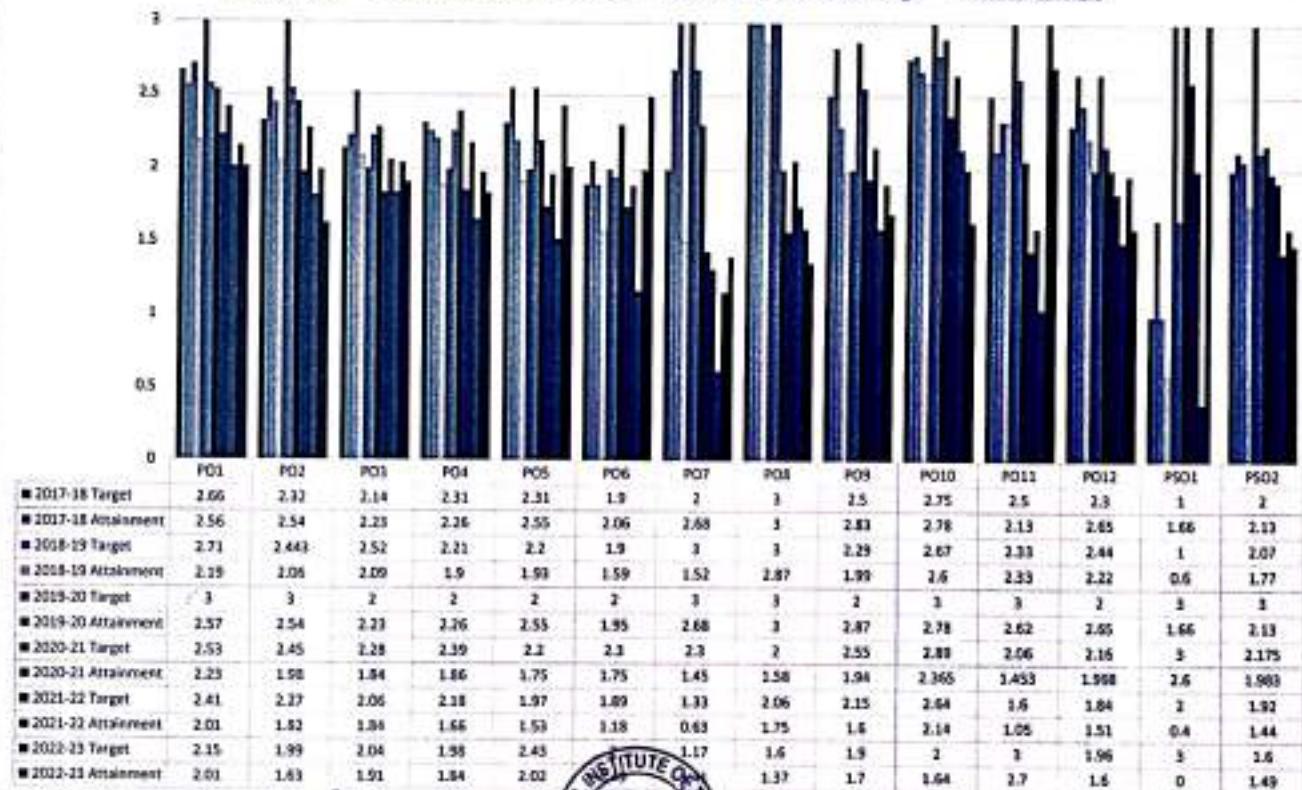
**PO12: Life-long Learning:** recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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### Target and Attainment from 2017-18 to 2022-23

2017-18 Target     2017-18 Attainment     2018-19 Target     2018-19 Attainment     2019-20 Target     2019-20 Attainment  
 2020-21 Target     2020-21 Attainment     2021-22 Target     2021-22 Attainment     2022-23 Target     2022-23 Attainment



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## Program Outcomes Target Attainment Observation Action

### **Batch-2019-2023**

Following table shows the observations and actions proposed for the batch of students which graduated in 2019-23.

POs	Target	Attainment	Observation
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
PO1	2.15	2.01	It's evident that the students have gained a solid foundation in engineering fundamentals from their entry-level courses, but the shift to online learning seems to have hindered their overall performance and ability to solve complex engineering problems effectively.
<b>Action:</b> Due to hybrid teaching learning mode( Offline Lab session and online classes session), more practices can be carried out to improve their performance by arranging teaching learning sessions in a complete offline mode. DAPC committee had advised to ensure the maximum weightage of 20% ISE and 20% MSE to be adopted for evaluation.			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
PO2	1.99	1.63	The attained value in the context of identifying, formulating, reviewing research literature, and analyzing complex engineering problems using first principles of mathematics, natural sciences, and engineering sciences. It is clear that there is room for improvement in the students' ability to reach substantiated conclusions when dealing with complex engineering problems.
<b>Action:</b> Mini-Projects and Major Projects will focus on, Strengthen Research Literature Skills, Analytical Thinking and Continuous Feedback.			
<b>PO3: Design/ development of solutions:</b> Design solutions for complex engineering problems and design system components of processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations			
PO3	2.04	1.91	Although the students have made progress, there is room for improvement in their ability to create engineering solutions that comprehensively address these critical aspects.
<b>Action:</b> Mini-Project-I should be related to public health and safety, and the cultural, societal, and environmental considerations. There should be industrial and research organization tie-ups . Multi disciplinary projects must also be motivated.			
<b>PO4: Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			

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PO4	1.98	1.84	There is a need to further enhance their proficiency in employing research methods and data analysis to draw valid and substantiated conclusions.
<b>Action:</b> One-to-one engagement for newly introduced multiple projects in the upcoming batches can improve the research culture.			
<b>PO5: Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and Modern engineering and IT tools Including prediction and modelling to complex engineering activities with an understanding of the limitations			
PO5	2.43	2.02	The attainment shows that technology driven courses in the syllabus are moderate.
<b>Action:</b> For upcoming batches new lab courses such as Cloud and Internet Technology lab can be introduced. Along with mini-project courses it is expected to increase the impact on students' performance.			
<b>PO6: The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.			
PO6	2	2.49	Due to online learning nature, it was difficult for students to convert the skills for solving societal, health, safety, legal and cultural issues into professional engineering problems.
<b>Action:</b> Introduction of Seva Satva course in various domains like societal, health, safety, legal and cultural issues will be helpful to understand the reasons to solve it using engineering skills.			
<b>PO7: Environment and sustainability:</b> Understand the Impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.			
PO7	1.17	1.41	Students are able to understand the Environment and sustainability issues through basic science courses.
<b>Action:</b> Set higher targets for upcoming batches. More emphasis will be given in existing courses and activities related to Environment and sustainability can be conducted to improve students' performance.			
<b>PO8: Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
PO8	1.6	1.37	Students are able to understand the ethical aspect via rubrics in laboratory evaluation, plagiarism software for similarity checking.
<b>Action:</b> Students are encouraged to use open source plagiarism check software for similarity checking for assignments, reports, research papers etc.			
<b>PO9: Individual and teamwork:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.			
PO9	1.9	1.7	Attainment is moderately done due to virtual meets and under utilization of resources available at Institute.

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**Action:**  
Attainment can be improved for the upcoming batches by doing their projects in offline mode utilizing the resources and working in a team.

**PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO10	2	1.64	The students showed nice oral communication skills due to soft skill courses but moderate with technical writing
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Students are encouraged to use open source software for grammar checking, similarity checking for assignments, reports, research papers like Latex software, Grammarly, ginger etc.

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO11	3	2.7	Students are good with planning their projects and apply project management and finance aspects for their project.
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**Action:**  
More practices and activities by various committees in Institute and seminar talks can be conducted to improve project management and finance skills.

**PO12: Life – long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life – long learning in the broadest context of technological change

PO12	1.96	1.6	Students are able to attain life-long learning skills through various courses.
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**Action:** More activities such as research internship, Teaching assistantship, Mentoring by Seniors students to junior students, collaborative research projects can be planned to inculcate more life-long learning skills.

**PSO1:** Successfully complete internship offered by industries or other institutes of repute.

PSO1	3		Students are able to complete the 6-months long internships in various industries and research Institutes.
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**Action:** Encouraging students to do internships at more reputed Industry/institutes.

**PSO2:** Develop Software Application to Solve Real-World Problems.

PSO2	1.6	1.49	The students were able to develop software which is used to solve real world problems.
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**Action:** As pandemic situation is over, upcoming batches will have a scope to have thorough testing of their real-world application.

*B. Senthil Kumar*

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## Program Outcomes Target Attainment Observation Action

### Batch-2018-2022

Following table shows the observations and actions proposed for the batch of students which graduated in 2018-22.

POs	Target	Attainment	Observation
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
PO1	2.41	2.01	<p>The attainment shows that the students were able to acquire knowledge of fundamental engineering concepts from entry level course.</p> <p>Due to online learning in pandemic, they have hampered their performance.</p>
<b>Action:</b> Due to hybrid teaching learning mode( Offline Lab session and online classes session), more practices can be carried out to improve their performance by arranging teaching learning sessions in a complete offline mode. DAPC committee had advised to ensure the maximum weightage of 40% to be adopted for evaluation.			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
PO2	2.27	1.82	Student lacked research aptitude to incorporate necessary skills for reviewing research and articulating research gaps or analyse complex research problem.
<b>Action:</b> The new course such as Mini-Project -II will be introduced for coming batches. Mini-Project-II will focus early start to inculcate research culture in the students before they go for their final year project.			
<b>PO3: Design/ development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations			
PO3	2.06	1.84	Students finds difficulties in implementing /practising the design oriented problems even though course based on software and system design are introduced to provide consideration to public health and safety, and the cultural, societal, and environmental aspect
<b>Action:</b> Mini-Project-I will be introduced for upcoming batches. So that students can take up development projects related to public health and safety, and the cultural, societal, and environmental considerations			
<b>PO4: Conduct Investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	2.18	1.66	Students finds difficulties in understanding the complexity of the

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			research due to less attainment and one-to-one engagement with students and faculty.
<b>Action:</b> One-to-one engagement for newly introduced Mini-project-II in the upcoming batches can improve the research culture.			
<b>PO5: Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and Modern engineering and IT tools including predication and modelling to complex engineering activities with an understanding of the limitations			
PO5	1.97	1.53	The attainment shows that technology driven course in the syllabus are moderate.
<b>Action:</b> For upcoming batches new lab courses such as Cloud and Internet Technology lab can be introduced. Along with mini-project courses it is expected to increase the impact on students' performance.			
<b>PO6: The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.			
PO6	1.89	1.18	Due to online learning nature, it was difficult for students to convert the skills for solving societal, health, safety, legal and cultural issues into professional engineering problem.
<b>Action:</b> Introduction of Seva Satva course in various domain like societal, health, safety, legal and cultural issues will be helpful to understand the reasons to solve it using engineering skills.			
<b>PO7: Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.			
PO7	1.33	0.63	Students are able to understand the Environment and sustainability issues through basic science courses.
<b>Action:</b> More emphasis will be given in existing courses and activities related to Environment and sustainability can be conducted to improve students' performance.			
<b>PO8: Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
PO8	2.06	1.75	Students are able to understand the ethical aspect via rubrics in laboratory evaluation, plagiarism software for similarity checking.
<b>Action:</b> Students are encouraged to use open source plagiarism check software for similarity checking for assignments, reports, research papers etc.			
<b>PO9: Individual and teamwork:</b> Function effectively as an individual, and as a member or Leader in diverse teams, and in multidisciplinary settings.			
PO9	2.15	1.6	Attainment is moderately done due to virtual meets and under utilization of resources available at Institute.

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<b>Action:</b> Attainment can be improved for the upcoming batches by doing their projects in offline mode utilizing the resources and works in a team.			
<b>PO10: Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.			
PO10	2.64	2.14	The students showed nice oral communication skills due to soft skill courses but moderate with technical writing
Students are encouraged to use open source software for grammar checking, similarity checking for assignments, reports, research papers like Latex software, grammerly, ginger etc.			
<b>PO11: Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments			
PO11	1.6	1.05	Students are moderately able to apply project management and finance aspect for their project.
<b>Action:</b> More practices and activities by various committees in Institute and seminar talks can be conducted to improve project management and finance skills.			
<b>PO12: Life – long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life – long learning in the broadest context of technological change			
PO12	1.84	1.51	Students are able to attain the life-long learning skills through various courses.
<b>Action:</b> More activities such as research internship, Teaching assistantship, Mentoring by Seniors students to junior students, collaborative research projects can be planned to inculcate more life-long learning skills.			
<b>PSO1:</b> Successfully complete Internship offered by Industries or other institutes of repute.			
PSO1	2	0.4	Students are able to complete the 6-months long internships in various industries and research institutes.
<b>Action:</b> Encouraging students to do Internship at more reputed Industry/institutes.			
<b>PSO2:</b> Develop Software Application to Solve Real-World Problems.			
PSO2	1.92	1.44	The students were able to develop many software which are pertaining to solve real world problems.
<b>Action:</b> As pandemic situation is over, upcoming batches will have a scope to have thorough testing of their real-world application.			

## Program Outcomes Target Attainment Observation Action

### **Batch-2017-2021**

Following table shows the observations and actions proposed for the batch of students which graduated In 2017-21.

POs	Target	Attainment	Observation
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
PO1	2.53	2.23	Updated experiment lists for courses resulted in better attainment as compared to previous batch.
Action: Assignment and course project needs to be improved to achieve target.			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
PO2	2.45	1.98	Student considered unconstraint research problem and because of this problem analysis was not up to the mark and hence solution was not outcome driven.
Action: Constraints on the research problem should be during the analysis phase of project			
<b>PO3: Design/ development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations			
PO3	2.28	1.84	The attainment is less as compared to previous batch because of the pandemic situation students did not have access to environmental and cultural ecosystem for extra-curricular activities, while subject in charge could tackle teaching-learning challenges.
Action: Students need to access information on environmental and cultural consideration through virtual channels due to unpredictable pandemic situation.			
<b>PO4: Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	2.39	1.86	The attainment improved because resource provision on complex problems and its rigorous investigation.
Action: Students need to improve data interpretation skills using various tools.			
<b>PO5: Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and Modern engineering and IT tools including predication and modelling to complex engineering activities with an understanding of the limitations			
PO5	2.2	1.75	The slight decrease in attainment as compared to last batch is because of students did not have access to Institute resources for last 3 semesters.

Action: The students should be encouraged to use virtual labs.

**PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO6	2.3	1.75	The slight difference from previous year because students still struggled with converting societal and cultural problems to engineering problem.
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Action: In depth study on converting problem from societal/cultural domain to engineering domain.

**PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO7	2.3	1.45	The attainment is better as compared to last year because few final year projects came up with sustainable solution.
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Action: Student need to perform in depth investigation of their proposed solution to the problem.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO8	2	1.58	The percentage of attainment is very close to last year batch.
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Action: Students should be made to use anti-plagiarism software more frequently.

**PO9: Individual and teamwork:** Function effectively as an individual, and as a member or Leader in diverse teams, and in multidisciplinary settings.

PO9	2.55	1.94	Small decrease from last year is due to virtual nature of teamwork.
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Action: Students should be made comfortable with virtual teamwork.

**PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO10	2.89	2.365	Attainment is less as compared to previous batch because of students were able to publish their research paper in conference.
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Action: Students must be encouraged to improve their technical writing so that their paper can be accepted in Scopus/SCI publication

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO11	2.06	1.453	It was observed that students could not register to finance courses which correlate to IT sector because of unavailability of that courses in MOOC courses.
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Action: Encourage students to enrol into MOOC courses which are conforming to finance domain.

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**PO12: Life – long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life – long learning in the broadest context of technological change

PO12	2.16	1.998	The attainment percentage is higher as compared last year because students used Machine Learning tools extensively in their major and minor projects.
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**Action:** Students should be encouraged to use available licensed MATLAB as compared to open sources for analysis of all features in ML.

**PSO1:** Successfully complete internship offered by industries or other institutes of repute.

PSO1	3	2.6	The attainment is the result of 6 months internship.
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**Action:** Need to improve the internship quality.

**PSO2:** Develop Software Application to Solve Real-World Problems.

PSO2	2.175	1.983	The attainment is better as compared to last batch due to availability of various real-world problems because of pandemic situation.
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**Action:** Students need to be further educated about industrial standards for software development.

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## Program Outcomes Target Attainment Observation Action

### Batch-2016-2020

Following table shows the observations and actions proposed for the batch of students which graduated in 2016-20.

POs	Target	Attainment	Observation
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
PO1	3	2.57	The attainment is better compared to the batch 2018-19 due to more emphasis on fundamental engineering concepts in internal assessments.
<b>Action:</b> The focus on core computer engineering problems needs to be increased in the entire evaluation mechanism.			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
PO2	3	2.54	The attainments is more as compared to batch-2018-19 as number of course projects were regulated and student participated in SCOPE courses resulting in better students performance
<b>Action:</b> Need to improve the quality of problems undertaken by students. And increase technical sources such as SCOPE.			
<b>PO3: Design/ development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations			
PO3	2	2.23	The improved attainment compared to batch-2018-19 is due to the modifying the evaluation for the lab courses and Activity Based Learning .
<b>Action:</b> The lab course must be modified to provide a more realistic design scenario. <b>Action:</b> More emphasis on Activity Based Learning.			
<b>PO4: Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	2	2.26	The lab course and internal assessment along with a few course projects helped to improve the attainment as compared to the previous batch of 2018-19.
<b>Action:</b> The lab courses and internal assessment must incorporate more assignments demanding complex investigation.			
<b>PO5: Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and Modern engineering and IT tools including predication and modelling to complex engineering activities with an understanding of the limitations			

PO5	2	2.55	The Increase in attainment compared to last batch 2018-19 because assignments of lab courses and internal assessment were performed using modern tools such as colab, scilab, pycharm, anaconda, hadoop. Some projects were deployed using the GPU system provided in the department.
<b>Action:</b> Make students aware about the modern facilities provided by the department.			
<b>PO6: The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.			
PO6	2	1.95	The students participation in SIH and hackathons conducted by other Institutions have increased resulting in Improved attainment compared to previous batch of 2018-19.
<b>Action:</b> More final year and course projects must be aimed at societal, health, safety, legal and cultural issues			
<b>PO7: Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.			
PO7	3	2.68	The students participation in ABL and Social activities(Abhayudhya, Bleach cleaning, etc) helped them to be aware towards societal and environmental context improving attainment compared to previous batch 2018-19.
<b>Action:</b> More final year and course projects must be aimed at social and environmental issues.			
<b>PO8: Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
PO8	3	3	The reduced course projects helped students to complete their allocated work in provided time resulting in better attainment compared to previous batch of 2018-19. Plagiarism checks performed before thesis submission helps to uphold the better standards.
<b>Action:</b> Continue with good practices.			
<b>PO9 :Individual and teamwork:</b> Function effectively as an individual, and as a member or Leader in diverse teams, and in multidisciplinary settings.			
PO9	2	2.87	The team work has improved and a number of course projects have been regulated. And also students are working in teams in events like hackathons.
<b>Action:</b> Encourage students to participate in team events.			
<b>PO10: Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.			
PO10	3	2.78	The attainment is better compared to the batch of 2018-19 due to the addition of ABL and liberal arts courses.

<b>Action:</b> More rigorous evaluation must be carried out in order to increase soft skills.			
<b>PO11: Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments			
PO11	3	2.62	Participating in multiple team events, final year projects, minor projects and course projects has improved students project management skills resulting in better attainment compared to the batch of 2018-19.
<b>Action:</b> Some events must be organised to provide knowledge regarding finance management.			
<b>PO12: Life – long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life – long learning in the broadest context of technological change			
PO12	2	2.65	Students were able to get a good publication due to the online nature of presentation this year resulting in improvements in attainment compared to the batch of 2018-19.
<b>Action:</b> Target SCOPUS and SCI indexed Journal and conferences to target quality over quantity.			
<b>PSO1:</b> Successfully complete internship offered by industries or other institute of repute.			
PSO1	3	1.66	The improved attainment is due to the six months internship program in final year(VIII Sem).
<b>Action:</b> Students must be evaluated more rigorously for the internship term.			
<b>PSO2:</b> Develop software applications to solve real life problems.			
PSO2	3	2.13	Students participation in Hackathons and SCOPE projects along with Final Year, Minor and course projects increased the attainment compared to the last batch of 2018-19.
<b>Action:</b> More of the final year and minor projects must be based on real life problems.			

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## Program Outcomes Target Attainment Observation Action

### **Batch-2015-2019**

Following table shows the observations and actions proposed for the batch of students which graduated in 2015-19.

POs	Target	Attainment	Observation
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
PO1	2.71	2.19	The attainment is less as compared to the 2017-18 as the evaluation now has more weightage to internal assessment which tries to evaluate students on deeper level for fundamental concepts
<b>Action:</b> More emphasis on core courses is required.			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
PO2	2.443	2.06	Too many course projects has resulted in decrease in attainment when compared with the batch 2017-18
<b>Action:</b> Need to control the number of course projects, so that students are not overburdened.			
<b>PO3: Design/ development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations			
PO3	2.52	2.09	The increased lab oral and practical examinations reduced the preparation time for students resulting in less attainment as compared batch 2017-18
<b>Action:</b> Conduct Oral/Practical exam for the course which are absolutely necessary			
<b>PO4: Conduct Investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	2.21	1.90	The attainment is less as compared to batch 2017-18 as evaluation scheme was changed twice for the said batch of 2018-19
<b>Action:</b> Make sure that forthcoming changes are slow paced.			
<b>PO5: Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and Modern engineering and IT tools including predication and modelling to complex engineering activities with an understanding of the limitations			
PO5	2.2	1.93	The attainment is less as compared to batch 2018-19 because modern hardware like GPU, Unlimited git access provided in the department was not used by students .
<b>Action:</b> Make students aware of these modern facilities.			

100% 2015-1915-19  
95% 4th year students have completed  
100% 2nd year students have completed  
95% 1st year students have completed  
85% 3rd year students have completed

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<b>PO6: The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.			
PO6	1.9	1.59	Students participation was less in events such as hackathon due to limitation put by SIH resulting in decrease in attainment
<b>Action:</b> Students needs to be encouraged to enter in the multiple hackathon and not only SIH			
<b>PO7: Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.			
PO7	3	1.52	The decrease in student participation in events of Fire safety drills and bleach cleaning resulted in decrease as compared to batch of 2017-18
<b>Action:</b> Motivate students to participate in activities involving societal and environmental concerns			
<b>PO8: Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
PO8	3	2.87	The students were not able to meet deadlines due to increased internal assessments and course projects resulting in decrease in attainment compared to previous batch.
<b>Action:</b> Students must be well informed about internal assessment timeline. <b>Action:</b> Need to control the number of course projects, so that students are not overburdened.			
<b>PO9 :Individual and teamwork:</b> Function effectively as an individual, and as a member or Leader in diverse teams, and in multidisciplinary settings.			
PO9	2.29	1.99	The attainment is less as compared to the batch of 2017-18 because too many course projects have affected students ability to work as a group.
<b>Action:</b> Need to control the number of course projects, so that students are not overburdened.			
<b>PO10: Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.			
PO10	2.67	2.60	The attainment is less as compared to batch of 2017-18 due to the performance of students in communication and course project presentation was affected by too many mini and course project
<b>Action:</b> Need to control the number of course projects, so that students are not overburdened.			
<b>PO11: Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments			
PO11	2.33	2.33	The course project in most of the course has enabled students to show better performance towards project management hence the improvement as compared to the previous batch.



Action: Need to maintain a balance between the number of course projects and learning curve of project management.			
<b>PO12: Life – long learning:</b> Recognize the need for, and have the preparation and ability to engage independent and life – long learning in the broadest context of technological change			
PO12	2.44	2.22	Attainment is less as compared to the previous batch due to reduction of students participation in social, technical and environmental events.
Action: Students need to be encouraged to participate in social, technical and environmental events.			
<b>PSO1:</b> Successfully complete internship offered by industries or other institute of repute.			
PSO1	1	0.6	The attainment is less as compared to last batch but students were still able to complete internship in reputed organizations
Action: Students need to complete their internships from better and more diverse organizations			
PSO2: Develop software applications to solve real life problems.			
PSO2	2.07	1.77	The attainment is less as compared to the previous batch as too many course projects resulted in suboptimal implementation when held against real life constraints.
Action: Need to control the number of course projects, so that students are not overburdened			
Action: Need to give more stringent constraints for the development problems.			

  
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## Program Outcomes Target Attainment Observation Action

### **Batch-2014-2018**

Following table shows the observations and actions proposed for the batch of students which graduated in 2014-18.

POs	Target	Attainment	Observation
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
PO1	2.66	2.56	The students were accustomed with the courses focusing on fundamental concepts of Computer engineering
<b>Action:</b> The evaluation scheme for theory courses is changed.			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
PO2	2.32	2.54	The inclusion of mini-project and final year projects with few course projects accounts for this achievement.
<b>Action:</b> More course projects were included with increased target level.			
<b>PO3: Design/ development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations			
PO3	2.14	2.23	The attainment is due to inclusion of Lab courses as separate courses which have design based problems.
<b>Action:</b> The evaluation scheme for theory courses is changed.			
<b>PO4: Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	2.31	2.26	The lab courses and internal assessment for few courses such as Machine Learning and Big Data helped to reach this attainment.
<b>Action:</b> More investigation based problems are included in courses with increased weightage in evaluation for the same.			
<b>PO5: Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and Modern engineering and IT tools including predication and modelling to complex engineering activities with an understanding of the limitations			
PO5	2.31	2.55	The attainment is due to use modern tools such as Latex, Colab, Anaconda, etc. for conduction of their project, mini-project and course projects
<b>Action:</b> Lab course assignment list and evaluation must be revised to accommodate more modern tool usage.			

**PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO6	1.9	2.06	The participation of events such as Hackathons helped students to develop a keen for societal, health, safety, legal and cultural issues which was reflected in their projects, mini-projects and course projects
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Action: Students are encouraged to participate more in such events to increase their awareness.

**PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO7	2	2.68	The students participation in Social and environmental events such as Fire Safety Inspections and Bleach Cleaning helped them to inculcate the environment related issue in their projects, Mini-projects and course projects.
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Action: Students are encouraged to participate more in such events to increase their awareness.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO8	3	3	All course evaluation are conducted in timely manner while following the guidelines laid by Institute and department which in turn reflects in students
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Action: Continue with good practices.

**PO9 :Individual and teamwork:** Function effectively as an individual, and as a member or Leader in diverse teams, and in multidisciplinary settings.

PO9	2.5	2.83	The attainment represent due to the team projects given by soft skill and technical course
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Action: Increased number of course projects

**PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO10	2.75	2.78	The communication course along with project presentation helped students to improve soft skills.
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Action: More course projects are introduced to improve the soft skills.

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO11	2.5	2.13	The students were able to manage their final year and course projects in timely manner
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Action: The evaluation of final year projects has been tweaked to suit more of project management avenues.

**PO12: Life – long learning:** Recognize the need for, and have the preparation and ability to engage independent and life – long learning in the broadest context of technological change

PO12	2.3	2.65	The attainment represents the learning students got from projects, courses and different events held at institute.
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Action: The target level is increased for the next batch

**PSO1:** Successfully complete Internship offered by industries or other institute of repute.

PSO1	1	1.66	The attainment is due to many students got opportunity to do Internship from institute placement cell
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Action: Students were encouraged to participate in Off- campus internship

**PSO2:** Develop software applications to solve real life problems.

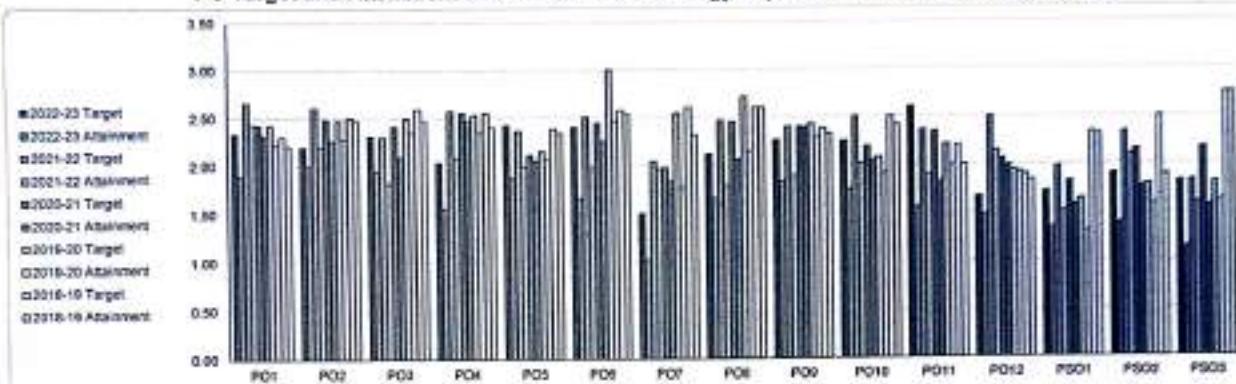
PSO2	2	2.13	Course projects and mini-projects helped students helped to reach said attainment
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Action: Increased number of course projects.



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**PO Target and Attainment of Information Technology Department from 2018-19 to 2022-23**



	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	P001	P002	P003
2022-23 Target	2.35	2.19	2.31	2.03	2.42	2.40	1.99	2.11	2.16	2.25	2.60	1.67	1.73	1.80	1.82
2022-23 Attainment	1.89	1.99	1.94	1.58	1.87	1.66	1.03	1.66	1.63	1.75	1.58	1.48	1.38	1.39	1.14
2021-22 Target	2.56	2.8	2.3	2.57	2.36	2.5	2.04	2.46	2.4	2.5	2.38	2.49	1.87	2.32	1.63
2021-22 Attainment	2.43	2.16	1.81	2.06	1.98	1.97	1.26	1.76	1.9	2.02	1.9	2.14	1.82	2.09	1.6
2020-21 Target	2.42	2.48	2.41	2.65	2.15	2.44	1.87	2.45	2.4	2.19	2.34	2.06	1.82	2.15	2.17
2020-21 Attainment	2.31	2.26	2.09	2.47	2.05	2.25	1.83	2.06	2.39	2.05	1.83	1.89	1.58	1.77	1.57
2019-20 Target	2.42	2.47	2.49	2.53	2.16	2	2.54	2.71	2.43	2.09	2.21	1.84	1.84	1.73	1.85
2019-20 Attainment	2.21	2.27	2.34	2.34	2.06	2.46	1.77	2.14	2.29	1.92	1.99	1.82	1.31	1.56	1.63
2018-19 Target	2.36	2.49	2.59	2.55	2.36	2.61	2.6	2.6	2.38	2.5	2.2	1.9	2.33	2.5	2.75
2018-19 Attainment	2.35	2.47	2.46	2.4	2.33	2.03	2.31	2.6	2.32	2.42	2	1.84	2.31	1.89	2.76

*[Handwritten signature]*  
M.P

# IT Dept - Batch - 2019 - 2023

Following table shows the observations and actions proposed for the batch of students which graduated in 2019-23.

POs	Target	Attainment	Observation
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
PO1	2.33	1.89	From their introductory courses, it is apparent that the students have acquired a robust understanding of engineering fundamentals. However, it appears that the transition to online learning has had an adverse impact on their overall performance and their capacity to effectively resolve intricate engineering challenges.
<b>Action:</b> Further performance improvement exercises can be conducted by organising teaching and learning sessions entirely offline, as opposed to the hybrid mode that combines online classes and offline lab sessions. The maximum weighting of 20% ISE and 20% MSE would be implemented for evaluation, as recommended by the DAPC committee.			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
PO2	2.19	1.99	Clearly, the students' capacity to arrive at substantiated conclusions when confronted with complex engineering problems requires little improvement.
<b>Action:</b> The objectives of both major and mini-projects will be to improve analytical reasoning, research literature skills, and continuous feedback.			
<b>PO3: Design/ development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations			
PO3	2.31	1.94	While the students have demonstrated some advancements, there remains scope for enhancement in their capacity to devise engineering solutions that adequately tackle these pivotal elements.
<b>Action:</b> In addition to cultural, societal, and environmental factors, Mini-Project-I ought to concern public health and safety. Motivation is also essential for multidisciplinary projects.			
<b>PO4: Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	2.03	1.56	In order to derive valid and substantiated conclusions, they must improve their proficiency in utilising research methods and conducting data analysis.
<b>Action:</b> Research culture may be enhanced through one-on-one consultations for newly introduced multiple projects in subsequent batches.			

*B. Tharsh*  
HOD

**PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and Modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

PO5	2.42	1.87	Attainment indicates that the proportion of technology-focused courses in the curriculum is a little affected..
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**Action:**

For upcoming batches new lab courses such as Cloud and Internet Technology lab can be introduced. Along with mini-project courses it is expected to increase the impact on students' performance.

**PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO6	2.40	1.66	The transition from online learning to professional engineering presented challenges for students in applying the skills acquired to address societal, health, safety, legal, and cultural concerns.
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**Action:**

Societal, health, safety, legal, and cultural issues will be covered in the Seva Satva introductory course, which will aid in comprehending the rationale behind the application of engineering skills to their resolution.

**PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO7	1.5	1.03	Although foundational science courses enable students to comprehend environmental and sustainability concerns, there remains room for further enhancement in this regard.
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**Action:**

Additional focus will be placed on current courses, and endeavours pertaining to the environment and sustainability may be implemented in order to enhance students' academic achievements.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO8	2.11	1.66	Students are able to understand the ethical aspect via rubrics in laboratory evaluation, plagiarism software for similarity checking. However, some room for improvement as most of the batch was online due to the pandemic.
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**Action:**

Students are advised to utilise open source plagiarism detection software to verify the originality of their assignments, reports, and research papers, among other things.

**PO9: Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO9	2.26	1.83	Due to virtual meetings and inadequate utilisation of Institute resources, attainment is only moderately achieved.
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**Action:**

A handwritten signature in black ink, appearing to read "Dean" or "Principal".

Attainment for the upcoming batches can be improved by doing their projects offline, utilising resources, and working in a team.

**PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO10	2.25	1.75	Because of the soft skill courses, the students demonstrated excellent oral communication skills but were only average at technical writing.
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Students are encouraged to use open source software for grammar checking, similarity checking for assignments, reports, research papers like Latex software, Grammarly, ginger etc.

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO11	2.6	1.56	Students execute project management and financial considerations in a moderate manner when it comes to project planning.
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**Action:**

For the purpose of enhancing project management and finance expertise, additional practises and activities led by various committees in institute and seminar talks may be implemented.

**PO12: Life – long learning:** Recognize the need for, and have the preparation and ability to engage independent and life – long learning in the broadest context of technological change

PO12	1.67	1.48	By enrolling in a variety of courses, students can acquire capacities for lifelong learning.
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**Action:** To further cultivate lifelong learning skills, additional activities may be organised, including research internships, teaching assistantships, mentoring from senior students to junior students, and collaborative research projects.

**PSO1: To develop, test and deploy application software through mini-projects.**

PSO1	1.72	1.35	The students achieved a moderate level of success in developing a diverse range of software applications that tackle practical challenges.
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**Action:** As the pandemic situation is over, upcoming batches will have a scope to have thorough testing of their real-world application.

**PSO2: To develop a research attitude by understanding existing research papers or publish new research ideas.**

PSO2	1.90	1.39	The students notably expanded their collection of skills that are relevant to research.
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**Action:** Following the resolution of the pandemic, subsequent batches will have the opportunity to invest more in research-oriented endeavours and projects.

**PSO3: Anticipate the changing direction of Information Technology and gain knowledge of new**



Dr. Jayashankar  
HOD

technologies from an individual or organization

PSO3	1.82	1.14	To some degree, students were capable of obtaining knowledge pertaining to emerging technologies from an individual or organisation.
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Action: Professors of practise and industry collaborations can impart to students new industry knowledge.

  
R. M. Bhatnagar  
HOD

Following table shows the observations and actions proposed for the batch of students which graduated in 2020-21.

POs	Target	Attainment	Observation
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
PO1	2.42	2.31	Improved course attainment was the result of revised experiment lists in comparison to the previous batch.
<b>Action:</b> Improving the assignment and course project is necessary to reach the desired outcome.			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
PO2	2.48	2.26	The students were successful in solving a significant number of problems; consequently, the solution was outcome-driven in order to enhance the attainment.
<b>Action:</b> There should be constraints placed on the research problem during the phase of the project that is devoted to analysis.			
<b>PO3: Design/ development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations			
PO3	2.41	2.09	Due to the pandemic situation, students did not have access to environmental and cultural ecosystems for extra-curricular activities. This prevented subject matter experts from addressing teaching-learning challenges, which resulted in a lower level of attainment compared to the previous batch.
<b>Action:</b> As a result of the unpredictability of the pandemic situation, it is imperative that students have access to information regarding environmental and cultural considerations through virtual channels.			
<b>PO4: Conduct Investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	2.55	2.47	As a result of more resources being put toward solving difficult problems and thorough investigations, attainment improved.
<b>Action:</b> Students need to get better at using different tools to understand data.			
<b>PO5: Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and Modern engineering and IT tools including predication and modelling to complex engineering activities with an understanding of the limitations			
PO5	2.11	2.05	While the pandemic was going on, many of the classes used open source tools and technologies.
<b>Action:</b> We should tell the students to use virtual labs.			
<b>PO6: The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess			



R. Balasubramanian  
HOD

societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO6	2.44	2.25	Students were able to converting societal and cultural problems to engineering problem to a considerable extent.
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Action: In depth study on converting problem from societal/cultural domain to engineering domain.

**PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO7	1.97	1.83	The attainment is better as compared to last year because few final year projects came up with sustainable solution.
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Action: Student need to perform in depth investigation of their proposed solution to the problem.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO8	2.45	2.06	The percentage of attainment is very close to last year batch.
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Action: Students should be made to use anti-plagiarism software more frequently.

**PO9: Individual and teamwork:** Function effectively as an individual, and as a member or Leader in diverse teams, and in multidisciplinary settings.

PO9	2.4	2.39	Students could collaborate together in the virtual setup too.
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Action: Students can collaborate with virtual teamwork, however, the impact can be checked more clearly for next batch if the pandemic continues.

**PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO10	2.19	2.05	Attainment is similar as compared to previous batch because many students were able to publish their research paper in conference.
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Action: Students must be encouraged to improve their technical writing so that their paper can be accepted in Scopus/SCI publication

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO11	2.34	1.83	Students were unable to enrol in finance courses that are relevant to the IT industry due to the lack of availability of those courses in MOOC courses.
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Action: Encourage students to enrol into MOOC courses which are conforming to finance domain.

**PO12: Life – long learning:** Recognize the need for, and have the preparation and ability to engage independent and life – long learning in the broadest context of technological change

*swathankar*  
HOD

PO12	2.06	1.99	The attainment percentage is similar as compared last year because students used Machine Learning tools extensively in their major and minor projects.
Action: Students should be encouraged to use available licensed MATLAB as compared to open sources for analysis of all features in ML.			
PSO1: To develop, test and deploy application software through mini-projects.			
PSO1	1.82	1.58	Students were successful in creating a variety of software applications that address real-world issues.
Action: As the pandemic situation is over, upcoming batches will have a scope to have thorough testing of their real-world application.			
PSO2: To develop a research attitude by understanding existing research papers or publish new research ideas.			
PSO2	2.15	1.77	Students significantly broadened their repertoire of research-oriented skills.
Action: As the pandemic situation is over, upcoming batches will have a scope to have more orientation towards research based projects and activities.			
PSO3: Anticipate the changing direction of Information Technology and gain knowledge of new technologies from an individual or organization			
PSO3	2.17	1.57	Students were able to acquire knowledge of emerging technologies from an individual or organisation to a certain extent
Action: Industrial visits and sessions can be arranged in select courses.			


  
 Dr. Latha  
 H.C.

Following table shows the observations and actions proposed for the batch of students which graduated in 2018-22.

POs	Target	Attainment	Observation
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
PO1	2.66	2.43	Students demonstrated the ability to acquire fundamental engineering concepts through the entry-level course, as evidenced by their attainment. Their performance has been impacted to a small extent by the online learning pandemic.
<b>Action:</b> Further performance improvement exercises can be conducted by organising teaching and learning sessions entirely offline, as opposed to the hybrid mode that combines online classes and offline lab sessions. The maximum weighting of forty percent was recommended by the DAPC committee for evaluation purposes.			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
PO2	2.6	2.19	The student demonstrated an inability to integrate essential research skills required for evaluating research, identifying research gaps, and analysing complex research problems.
<b>Action:</b> Future batches will be the first to take the new courses, including Mini-Project II. Prior to the students undertaking their senior thesis, Mini-Project-II will emphasise an early start to instil in them a research-oriented mindset.			
<b>PO3: Design/ development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations			
PO3	2.3	1.81	Although software and system design courses are introduced with public health and safety, cultural, societal, and environmental considerations in mind, students still encounter challenges when attempting to implement or practise design-oriented problems.
<b>Action:</b> The forthcoming batches will incorporate Mini-Project-I. To enable pupils to engage in development initiatives pertaining to cultural, societal, and environmental factors, as well as public health and safety.			
<b>PO4: Conduct Investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	2.57	2.08	Because of reduced attainment and one-on-one interaction with faculty and students, it is difficult for pupils to comprehend the complexity of the research.

A handwritten signature in black ink, appearing to read "Dr. Venkatesh H Upadhyay". The signature is written in a cursive style with a large oval containing a stylized 'D' at the beginning.

**Action:** In the forthcoming batches, a one-on-one engagement for the newly introduced Mini-project-II can enhance the research culture.

**PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and Modern engineering and IT tools including predication and modelling to complex engineering activities with an understanding of the limitations

PO5	2.36	1.98	Based on the attainment, the technology-focused courses in the curriculum are of a moderate nature.
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**Action:**

Possible lab course additions for future batches include a lab focused on cloud and Internet technology. It is anticipated to enhance the influence on students' academic achievements in conjunction with mini-project courses.

**PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO6	2.5	1.97	It was challenging for students to apply the competencies they gained in addressing societal, health, safety, legal, and cultural concerns to solve engineering problems in a professional setting, due to the nature of online learning.
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**Action:**

Introduction of Seva Satva course in various domain like societal, health, safety, legal and cultural issues will be helpful to understand the reasons to solve it using engineering skills.

**PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO7	2.04	1.96	By taking courses in fundamental sciences, students can gain insight into environmental and sustainability concerns.
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**Action:**

In order to enhance students' performance, additional focus will be placed on current courses and initiatives pertaining to the environment and sustainability.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO8	2.46	1.79	By utilising similarity-checking software and laboratory evaluation rubrics, students can gain an understanding of the ethical realm.
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**Action:**

Students are strongly encouraged to utilise open source plagiarism detection software to authenticate assignments, reports, and research papers, among other things.

**PO9: Individual and teamwork:** Function effectively as an individual, and as a member or Leader in diverse teams, and in multidisciplinary settings.

PO9	2.4	1.9	Virtual meets and underutilization of institute resources lead to moderate achievement.
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*Shankar*  
HOD

**Action:**

Future batches can achieve better results if they complete their projects offline, make good use of the resources, and collaborate.

**PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

<b>PO10</b>	2.5	2.02	Students' proficiency in technical writing was moderate, but their oratory abilities were strong, thanks to their participation in soft skill courses.
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Students are encouraged to utilise open-source software such as Latex, Grammarly, Ginger, etc., to check their work for plagiarism and grammar mistakes in their reports, essays, and other academic papers.

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

<b>PO11</b>	2.36	1.9	Students have a moderate ability to incorporate financial and project management considerations into their projects.
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**Action:**

Further practises and activities can be organised by different committees within the institute and seminar talks in order to enhance proficiency in project management and finance.

**PO12: Life – long learning:** Recognize the need for, and have the preparation and ability to engage independent and life – long learning in the broadest context of technological change

<b>PO12</b>	2.49	2.14	Students can acquire the skills necessary for lifelong learning by enrolling in a variety of courses.
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**Action:** More activities such as research internship, Teaching assistantship, Mentoring by Seniors students to junior students, collaborative research projects can be planned to inculcate more life-long learning skills.

**PSO1:** To develop, test and deploy application software through mini-projects.

<b>PSO1</b>	1.97	1.52	Students were successful in creating a variety of software applications that address real-world issues.
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**Action:** As the pandemic situation is over, upcoming batches will have a scope to have thorough testing of their real-world application.

**PSO2:** To develop a research attitude by understanding existing research papers or publish new research ideas.

<b>PSO2</b>	2.33	2.09	Students significantly broadened their repertoire of research-oriented skills.
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**Action:** As the pandemic situation is over, upcoming batches will have a scope to have more orientation towards research based projects and activities.

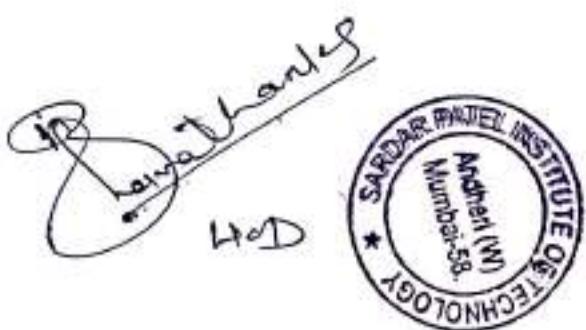
Dr. Vaishali Patel  
HOD



**PSO3:** Anticipate the changing direction of Information Technology and gain knowledge of new technologies from an individual or organization

PSO3	1.83	1.6	Students were able to acquire knowledge of emerging technologies from an individual or organisation to a certain extent
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Action: More collaborations with industry and professor of practice can inculcate new industry knowledge to students.



## Program Outcomes Target Attainment Observation Action

### Batch-2016-2020

Following table shows the observations and actions proposed for the batch of students which graduated in 2016-20.

POs	Target	Attainment	Observation
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
PO1	2.42	2.21	The attainment is lower in comparison to the 2018-19 academic year due to an increased emphasis on internal assessment, which aims to assess students' comprehension of foundational concepts at a more profound level.
Action: The focus on core computer engineering problems needs to be increased in the entire evaluation mechanism.			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
PO2	2.47	2.27	The attainments is more as compared to batch-2018-19 as number of course projects were regulated and student participated in SCOPE courses resulting in better students performance
Action: Need to improve the quality of problems undertaken by students. And increase technical sources such as SCOPE.			
<b>PO3: Design/ development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations			
PO3	2.49	2.34	The improved attainment is at a similar level as compared to previous batch
Action: The lab course must be modified to provide a more realistic design scenario with sufficient emphasis on Activity Based Learning.			
<b>PO4: Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	2.53	2.34	The lab course and internal assessment along with a few course projects reduced the attainment as compared to the previous batch of 2018-19.
Action: The lab courses and internal assessment must incorporate more assignments demanding complex investigation.			
<b>PO5: Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and Modern engineering and IT tools including predication and modelling to complex engineering activities with an understanding of the limitations			

  
Dr. D. V. Patil



<b>PO5</b>	2.15	2.06	The attainment is substantially obtained because modern hardware like GPU, Unlimited git access provided in the department was used by students. Many courses encouraged open source tools usage.
<b>Action:</b> Introduce more such tools in future lab courses.			
<b>PO6: The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.			
<b>PO6</b>	3	2.46	Increasing the target, the students' participation in SIH and hackathons conducted by other institutions have however, decreased the attainment due to more competitions.
<b>Action:</b> More final year and course projects must be aimed at societal, health, safety, legal and cultural issues			
<b>PO7: Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.			
<b>PO7</b>	2.54	1.77	The students participation in ABL and Social activities(Abhayudha, Bleach cleaning, etc) and increased competitiveness has reduced attainment
<b>Action:</b> More final year and course projects must be aimed at social and environmental issues.			
<b>PO8: Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
<b>PO8</b>	2.71	2.14	Plagiarism checks performed before thesis submission helps to uphold the better standards.
<b>Action:</b> Continue with good practices and sensitise students towards ethical practices.			
<b>PO9 :Individual and teamwork:</b> Function effectively as an individual, and as a member or Leader in diverse teams, and in multidisciplinary settings.			
<b>PO9</b>	2.43	2.29	The team work is good. And also students are working in teams in events like hackathons.
<b>Action:</b> Encourage students to participate in team events.			
<b>PO10: Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.			
<b>PO10</b>	2.08	1.92	The attainment is commensurate due to the addition of ABL and liberal arts courses.
<b>Action:</b> More rigorous evaluation must be carried out in order to increase soft skills.			
<b>PO11: Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in			

*Ramchandra*  
APD



a team, to manage projects and in multidisciplinary environments			
PO11	2.21	1.99	Participating in multiple team events, final year projects, minor projects and course projects has improved students project management skills resulting in better attainment compared to the batch of 2018-19.
<b>Action:</b> Some events must be organised to provide knowledge regarding finance management.			
<b>PO12: Life – long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life – long learning in the broadest context of technological change			
PO12	1.94	1.92	Students were able to get a good publication due to the online nature of presentation this year resulting in improvements in attainment.
<b>Action:</b> Target SCOPUS and SCI indexed Journal and conferences to target quality over quantity.			
<b>PSO1:</b> To develop, test and deploy application software through mini-projects.			
PSO1	1.64	1.31	Good attainments due to multiple courses offering mini projects.
<b>Action:</b> Students must be evaluated more rigorously for the mini projects.			
<b>PSO2:</b> To develop a research attitude by understanding existing research papers or publish new research ideas.			
PSO2	1.79	1.58	Students participation in Hackathons and SCOPE projects along with Final Year, Minor and course projects increased the attainment compared to the last batch of 2018-19.
<b>Action:</b> More of the final year and minor projects must be research oriented.			
<b>PSO3:</b> Anticipate the changing direction of Information Technology and gain knowledge of new technologies from an individual or organization			
PSO3	1.81	1.63	The attainment is moderate as many courses made use of open source tools and learning from MOOCs was also encouraged.
<b>Action:</b> Industry partnerships may be strengthened in order to provide internships and training that will assist in the attainment of greater objectives.			


  
 Dr. K. D. Patil  
 H. D.



## Program Outcomes Target Attainment Observation Action

### Batch-2015-2019

Following table shows the observations and actions proposed for the batch of students which graduated in 2015-19.

POs	Target	Attainment	Observation
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
PO1	2.3	2.2	The attainment is almost obtained due to more emphasis on fundamental engineering concepts in internal assessments.
<b>Action:</b> More emphasis on core courses is required.			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
PO2	2.49	2.47	A comparative increase in attainment has resulted from an excessive number of course projects.
<b>Action:</b> Need to improve the complexity of course projects, so that students can do projects better.			
<b>PO3: Design/ development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations			
PO3	2.59	2.46	The increased oral and practical laboratory examinations improved students' performance, resulting in higher academic attainment.
<b>Action:</b> Conduct Oral/Practical exam for the course which are absolutely necessary and not for all courses			
<b>PO4: Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	2.55	2.4	The attainment is good as moderate complex assignments were taken by various courses.
<b>Action:</b> We can improve the complexity level further for the upcoming batches.			
<b>PO5: Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and Modern engineering and IT tools including predication and modelling to complex engineering activities with an understanding of the limitations			
PO5	2.38	2.33	The attainment is substantially obtained because modern hardware like GPU, Unlimited git access provided in the department was used by students. Many courses encouraged open source tools usage.
<b>Action:</b> Introduce more such tools in future lab courses.			

*Arvindshankar*  
HOD



**PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO6	2.57	2.53	Many project topics were society oriented and participating in hackathons enables this shift in thinking of students.
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Action: Students needs to be encouraged to participate in multiple hackathons for further improvement.

**PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO7	2.6	2.31	The decrease in student participation in events of Fire safety drills and beach cleaning resulted in slight decrease as compared to batch of 2017-18
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Action: Motivate students to participate in activities involving societal and environmental concerns

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO8	2.6	2.6	The students were successfully able to meet deadlines due to increased internal assessments and course projects resulting in improved attainment compared to previous batch.
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Action: Target should be improved by including ethics in almost all courses for evaluation

**PO9 :Individual and teamwork:** Function effectively as an individual, and as a member or Leader in diverse teams, and in multidisciplinary settings.

PO9	2.38	2.32	The attainment is good as minor project, mini projects were introduced in many courses for evaluating the students in most courses.
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Action: Need to control the number of course projects, so that students are not overburdened. Also, target can be increased for next batch.

**PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO10	2.5	2.42	The attainment is moderate due to adequate performance of students in communication and course project presentations
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Action: more courses to have projects as ISE evaluation component.

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO11	2.2	2	The course project in most of the courses has enabled students to
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*Mr. Shankar  
H.O.D*



			show better performance towards project management hence the improvement as compared to the previous batch.
<b>Action:</b> Need to maintain a balance between the number of course projects and learning curve of project management.			
<b>PO12: Life – long learning:</b> Recognize the need for, and have the preparation and ability to engage independent and life – long learning in the broadest context of technological change			
PO12	1.9	1.84	Attainment is good due to increase of students' participation in social, technical and environmental events.
<b>Action:</b> Students need to be encouraged to participate in social, technical and environmental events.			
<b>PSO1:</b> To develop, test and deploy application software through mini-projects.			
PSO1	2.33	2.31	The attainment is substantial as mini projects were part of ISE evaluation of many courses
<b>Action:</b> Can increase the target to include more such projects for next batch			
<b>PSO2:</b> To develop a research attitude by understanding existing research papers or publish new research ideas.			
PSO2	2.5	1.89	The attainment is less as compared to the previous batch as too many course projects resulted in suboptimal implementation when held against real life constraints.
<b>Action:</b> Need to control the number of course projects, so that students are not overburdened			
<b>Action:</b> Need to give more stringent constraints for the development problems.			
<b>PSO3:</b> Anticipate the changing direction of Information Technology and gain knowledge of new technologies from an individual or organization			
PSO3	2.75	2.75	The attainment is achieved as many courses made use of open source tools and learning from MOOCs was also encouraged.
<b>Action:</b> Further collaborations can be made with industries to impart industrial internships and training for achieving higher targets.			

Dr. Venkatesh H D





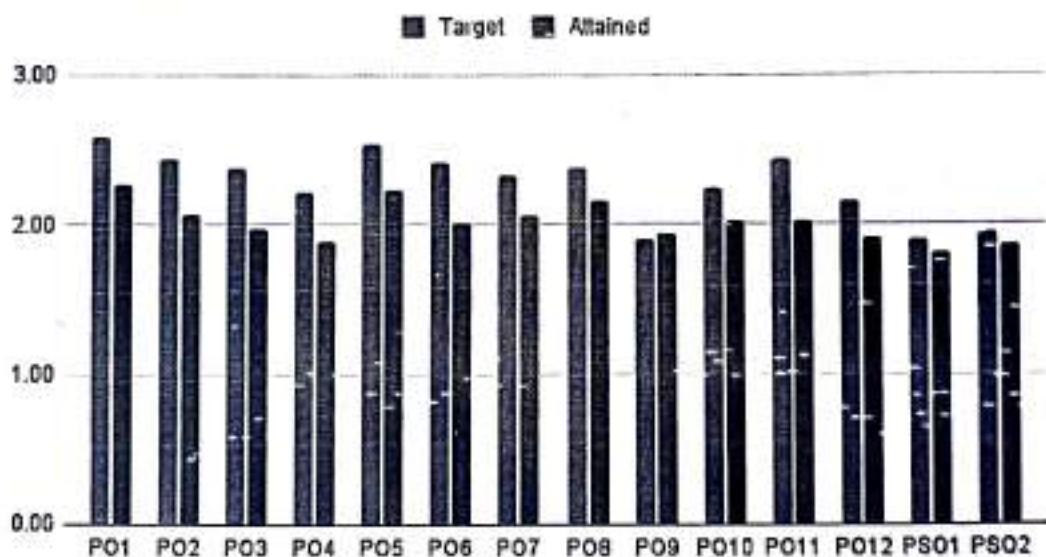
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Department of Electronics and Telecommunication

**Batch (2019-2023)**

**PO target and attainment**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Target	2.58	2.44	2.37	2.22	2.54	2.41	2.33	2.37	1.90	2.24	2.43	2.16	1.89	1.95
Attained	2.27	2.07	1.97	1.88	2.22	2.01	2.06	2.16	1.93	2.02	2.02	1.91	1.81	1.86

**Batch (2019-2023) PO Target and Attained**



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Head of Department





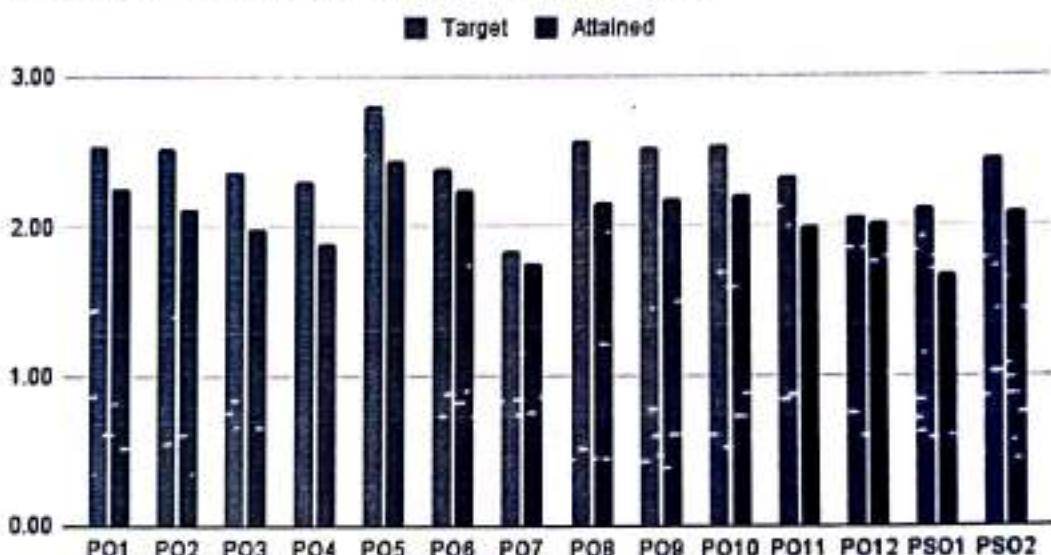
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**Batch (2018-2022)**

**PO target and attainment**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Target	2.53	2.52	2.36	2.30	2.80	2.39	1.84	2.58	2.62	2.54	2.33	2.06	2.12	2.45
Attained	2.25	2.12	1.98	1.88	2.44	2.24	1.75	2.16	2.18	2.21	2.00	2.02	1.68	2.09

**Batch (2018-2022) PO Target and Attained**



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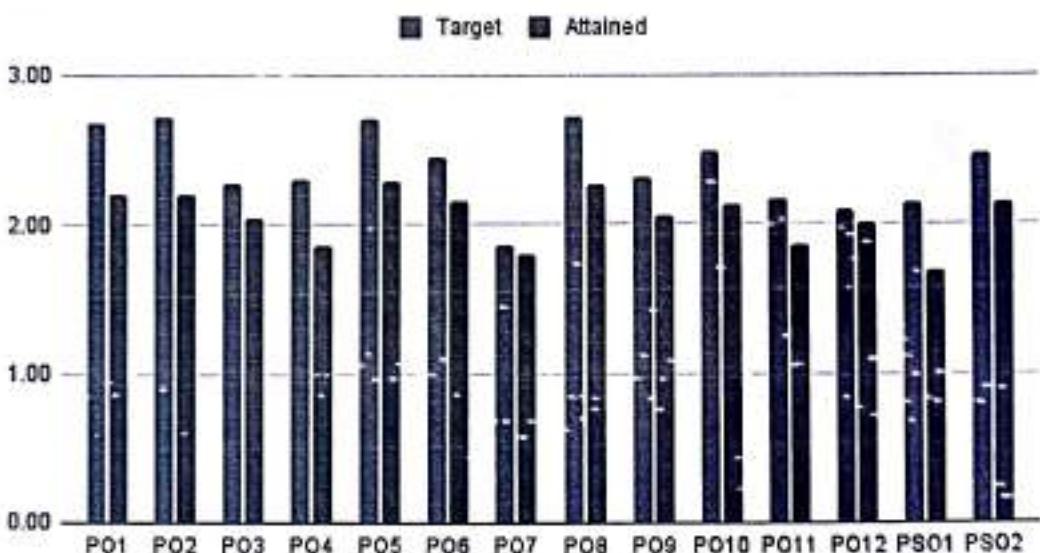
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Batch (2017-2021)

**PO target and attainment**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Target	2.68	2.73	2.27	2.30	2.71	2.45	1.86	2.72	2.32	2.49	2.17	2.10	2.14	2.47
Attained	2.21	2.21	2.05	1.86	2.29	2.15	1.80	2.27	2.06	2.13	1.86	2.00	1.69	2.15

Batch (2017-2021) PO Target and Attained



  
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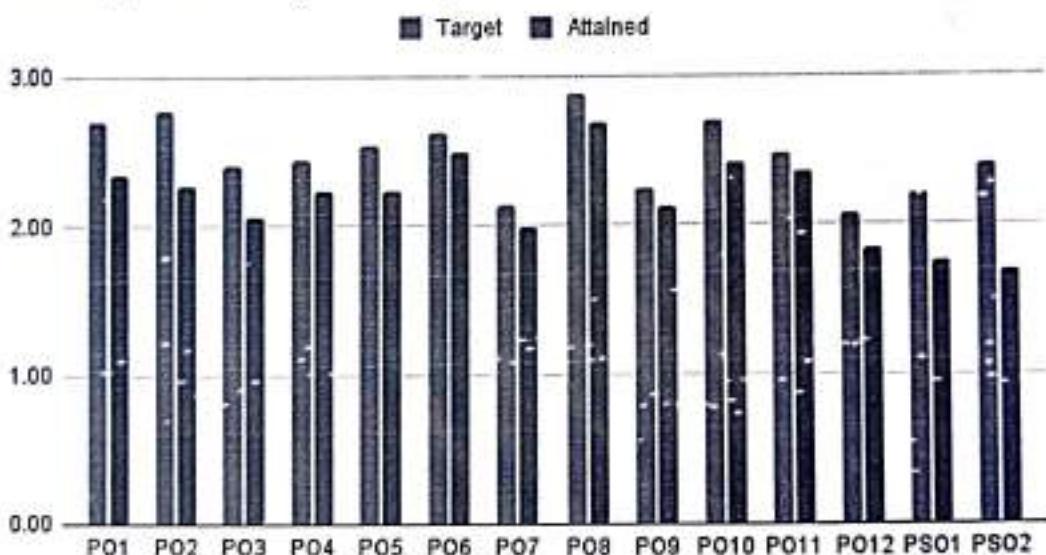
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**Batch (2016-2020)**

**PO target and attainment**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Target	2.70	2.77	2.41	2.44	2.53	2.63	2.13	2.88	2.24	2.70	2.47	2.07	2.20	2.40
Attained	2.34	2.27	2.05	2.23	2.23	2.49	1.99	2.68	2.12	2.41	2.35	1.84	1.75	1.69

**Batch (2016-2020) PO Target and Attained**



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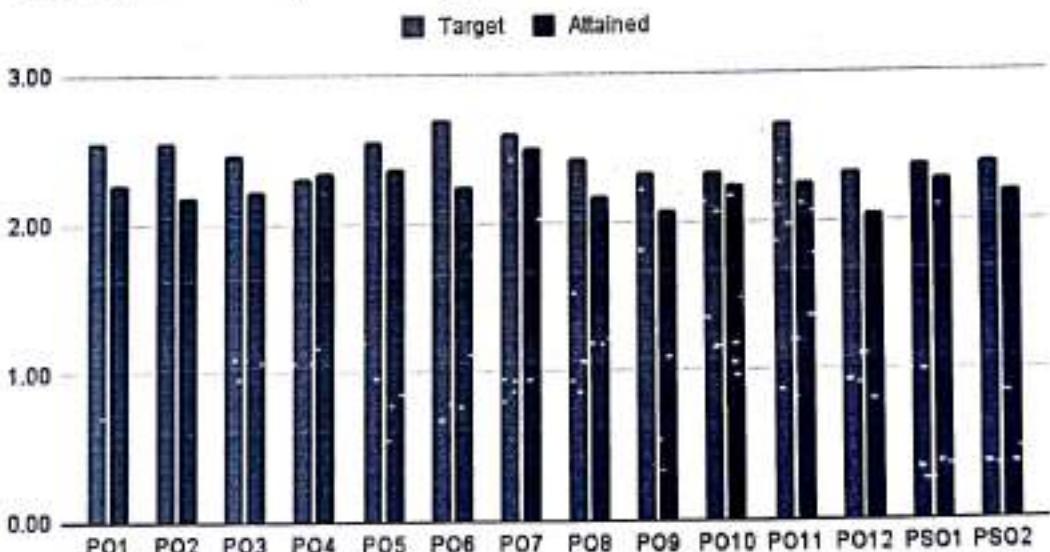
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**Batch (2015-2019)**

**PO Target and Attainment**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Target	2.55	2.55	2.47	2.31	2.56	2.70	2.60	2.43	2.33	2.33	2.67	2.33	2.38	2.39
Attained	2.27	2.19	2.23	2.34	2.37	2.24	2.51	2.17	2.08	2.24	2.26	2.05	2.29	2.20

**Batch (2015-2019) PO Target and Attained**



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Batch (2019-2023)

POs	Target Level	Attainment Level	Observations
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
PO1	2.58	2.27	Lateral entry students are admitted late and they found mathematical subjects challenging
<b>Action:</b> <ol style="list-style-type: none"><li>Bridge courses (Non-credit) such as Foundation in Mathematics are introduced in the curriculum.</li></ol>			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
PO2	2.44	2.07	This attainment is low in courses like Analog Electronics, analog communication, signals-systems, digital signal processing that requires analytical skills
<b>Action:</b> <ol style="list-style-type: none"><li>In semester evaluation and assessment methods such as one to one lab assessment based on rubrics are introduced.</li><li>Also, ISE has the liberty of research paper analysis in some subjects.</li></ol>			
<b>PO3: Design / development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.			
PO3	2.37	1.97	Students have satisfactorily demonstrated the need of solutions considering the public health and safety, and the cultural, societal, and environmental through Projects, National level industry sponsored events.
<b>Action:</b> <ol style="list-style-type: none"><li>Students are encouraged to undertake such mini as well as major projects, prepare seed proposals and participate in industry sponsored events at TI as well as IIT, etc</li></ol>			
<b>PO4: Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	2.22	1.88	Students are not fully complying with the standards of physical lab documentation and average understanding of drawing a valid conclusion related to laboratories.
<b>Action:</b> <ol style="list-style-type: none"><li>Teachers are instructed to guide students to arrive at a valid conclusion.</li></ol>			





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2. Faculty has started to use an online LMS portal like Moodle for various labs and internal assessment.			
<b>PO5: Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.			
PO5	2.54	2.22	Students have shown resilience in adopting the use of modern tools in laboratories.
<b>Action :</b> <ol style="list-style-type: none"><li>1. Changes in the objectives are encouraged by revising various experiments with different sets of data.</li><li>2. Students are encouraged to use various simulators and open source tools</li></ol>			
<b>PO6: The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.			
PO6	2.41	2.01	Awareness related to professional engineering practices is increased.
<b>Action:</b> Credit based courses like law for engineers and Industrial and Organizational Psychology are introduced in the curriculum along with various other SEVA/SATVA courses.			
<b>PO7: Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.			
PO7	2.33	2.06	Awareness about environmental issues is increased.
<b>Action:</b> <ol style="list-style-type: none"><li>1. To encourage the field visit for better understanding of sustainability issues.</li><li>2. FSAI student chapter is formed at Institute level</li></ol>			
<b>PO8: Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
PO8	2.37	2.16	Students are aware about the professional ethical standards
<b>Action:</b> <ol style="list-style-type: none"><li>1. Students are also encouraged to take part in non credit courses like Creative Thinking, Diversity and Workplace Etiquette.</li><li>2. Major Project groups are made use of ethical standards while developing products and filing patents/publishing papers.</li><li>3. To encourage ethical standards in publication the institute has provided licensed based Turnitin plagiarism software.</li><li>4. Training sessions on corporate ethics planned by TPO.</li></ol>			
<b>PO9: Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.			
PO9	1.90	1.93	Good involvement in multidisciplinary activities





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Department of Electronics and Telecommunication

**Action:**

1. Activity based courses are introduced in the curriculum for holistic development of students.
2. To encourage participation in hackathons to exhibit team building along with individual responses.

**PO10 : Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO10	2.24	2.02	Class is moderately good in communication.
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**Action:**

1. Students are motivated to use verbal and non-verbal communication skills.
2. Training sessions on effective communication skills have been arranged through elite recruiters.

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO11	2.43	2.02	Project Budget and accounting knowledge is average.
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**Action:**

1. Guidance given related to principles of management through Minor/ SCOPE courses.
2. Students are asked to submit Project Budget and Expenditure Report during project phase presentation.
3. Department/Domain experts are appointed for effective Project management.

**PO12: Life – long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life – long learning in the broadest context of technological change.

PO12	2.16	1.91	Students are able to bench mark their work at various national and international conferences. Substantial participation in competitive exams and conferences is observed.
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**Action:**

1. Department has focused on individual project group mentoring to create awareness in participating at national, international conferences and technical events.
2. Hackathon Participation is encouraged at the highest level.
3. Encouragement for Internship in both Industry as well as Research.

**PSO1:** The ability to troubleshoot hardware and software faults/ bugs in Communication systems.

PSO1	1.89	1.81	To demonstrate the skills for troubleshooting hardware and software faults/ bugs in Communication Systems.
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**Action:**

1. Guidance was given related to troubleshooting of hardware and software faults and bugs.



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2. Project competitions were held to test the skills			
PSO2: The ability to apply open source tools for solving technical problems.			
PSO2	1.95	1.86	Recognised the needs for an ability to use the open source tools for solving technical problems
<b>Action:</b>			
1. Students are motivated in many courses to use open source tools such as Scilab, NS2, Linux, Mathematica etc.			

  
Dr. Reena Sonkusare  
Head of the Department





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 Department of Electronics and Telecommunication

Batch (2018-2022)

POs	Target Level	Attainment Level	Observations
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.			
PO1	2.53	2.25	Lateral entry students are admitted late and they find mathematical subjects challenging.
<b>Action:</b> <ol style="list-style-type: none"> <li>Bridge courses (Non-credit) such as Foundation in Mathematics are introduced in the curriculum.</li> <li>The skill based courses are introduced in the curriculum.</li> </ol>			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences-			
PO2	2.52	2.12	This attainment is low in courses like Analog Electronics, analog communication, signals-systems, digital signal processing that requires analytical skills
<b>Action:</b> <ol style="list-style-type: none"> <li>In-semester evaluation and assessment methods such as case studies and rubrics are introduced.</li> <li>Also, in ISE two modes of evaluation methods are executed in every subject.</li> </ol>			
<b>PO3: Design / development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.			
PO3	2.36	1.98	Students have satisfactorily demonstrated the need of solutions considering the public health and safety, and the cultural, societal, and environmental through Projects, National level industry sponsored events.
<b>Action:</b> <ol style="list-style-type: none"> <li>Students were encouraged to undertake mini as well as major projects but were unable to participate in industry sponsored events due to Covid.</li> </ol>			
<b>PO4: Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	2.30	1.88	Students are not fully complying with the standards of physical lab documentation and average understanding of drawing a valid conclusion related to laboratories.





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**Action:** 1. Teachers are instructed to guide students to arrive at a valid conclusion.

1. Faculty has started to use an online LMS portal like Moodle for various labs and internal assessment.

**PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

<b>PO5</b>	<b>2.80</b>	<b>2.44</b>	Students have shown resilience in adopting the use of modern tools in laboratories.
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**Action :**

1. Changes in the objectives are encouraged by revising various experiments with different sets of data.
2. Students are encouraged to use various simulators and open source tools.

**PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

<b>PO6</b>	<b>2.39</b>	<b>2.24</b>	Awareness related to professional engineering practices is increased.
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**Action:**

1. Credit based courses like law for engineers and Industrial and Organizational Psychology are introduced in the curriculum along with various other SEVA/SATVA courses.

**PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

<b>PO7</b>	<b>1.84</b>	<b>1.75</b>	Awareness about environmental issues and it's sustainability was demonstrated through various SEVA/SATVA activities
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**Action:**

1. In SEVA/SATVA courses like Terrace Gardening, Beach cleaning, Trekking, etc.
2. Some of our Mini and Major projects related to environment and sustainability were implemented.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

<b>PO8</b>	<b>2.58</b>	<b>2.16</b>	Students are aware about the professional ethical standards
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**Action:**

1. Students are also encouraged to take part in non credit courses like Creative Thinking, Diversity and Workplace Etiquette.
2. Major Project groups are made use of ethical standards while developing products and filing patents/publishing papers.
3. To encourage ethical standards in publication the institute has provided licensed based Turnitin plagiarism software.
4. Training sessions on corporate ethics planned by TPO.





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<b>PO9: Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.			
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<b>PO9</b>	<b>2.52</b>	<b>2.18</b>	Good involvement in multidisciplinary activities
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**Action:**

1. Activity based courses are introduced in the curriculum for holistic development of students.
2. To encourage participation in hackathons to exhibit team building along with individual responses.

<b>PO10 : Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.			
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<b>PO10</b>	<b>2.54</b>	<b>2.21</b>	Class is moderately good in communication.
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**Action:**

1. Students are motivated to use verbal and non-verbal communication skills.
2. Training sessions on effective communication skills have been arranged through elite recruiters.

<b>PO11: Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.			
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<b>PO11</b>	<b>2.33</b>	<b>2.00</b>	Project Budget and accounting knowledge is average.
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**Action:**

1. Guidance given related to principles of management through Minor/ SCOPE courses.
2. Students are asked to submit Project Budget and Expenditure Report during project phase presentation.
3. Department/Domain experts are appointed for effective Project management.

<b>PO12: Life – long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life – long learning in the broadest context of technological change.			
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<b>PO12</b>	<b>2.06</b>	<b>2.02</b>	Students are able to bench mark their work at various national and international conferences. Substantial participation in competitive exams and conferences is observed.
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**Action:**

1. Department has focused on individual project group mentoring to create awareness in participating at national, international conferences and technical events.
2. Hackathon Participation is encouraged at the highest level.
3. Encouragement for Internship in both Industry as well as Research.

<b>PSO1:</b> The ability to troubleshoot hardware and software faults/ bugs in Communication systems.			
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<b>PSO1</b>	<b>2.12</b>	<b>1.68</b>	To demonstrate the skills for troubleshooting hardware and software faults/ bugs in Communication Systems.
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Action:

1. Guidance was given related to troubleshooting of hardware and software faults and bugs.
2. Project competitions were held to test the skills

**PSO2:** The ability to apply open source tools for solving technical problems.

PSO2	2.45	2.09	Recognised the needs for an ability to use the open source tools for solving technical problems
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Action:

1. Students are motivated in many courses to use open source tools such as Scilab, NS2, Linux, Mathematica etc.

Dr. Reena Sonkusare  
Head of the Department



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Department of Electronics and Telecommunication

Batch (2017-2021)

POs	Target Level	Attainment Level	Observations
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
PO1	2.68	2.21	Lateral entry students are admitted late and they find mathematical subjects challenging.
<b>Action:</b> <ol style="list-style-type: none"><li>Bridge courses (Non-credit) such as Foundation in Mathematics are introduced in the curriculum.</li><li>The skill based courses are introduced in the curriculum.</li></ol>			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
PO2	2.73	2.21	This attainment is low in courses like Analog Electronics, analog communication, signals-systems, digital signal processing that requires analytical skills
<b>Action:</b> <ol style="list-style-type: none"><li>In-semester evaluation and assessment methods such as case studies and rubrics are introduced.</li><li>Also, in ISE two modes of evaluation methods are executed in every subject.</li></ol>			
<b>PO3: Design / development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.			
PO3	2.27	2.05	Students have satisfactorily demonstrated the need of solutions considering the public health and safety, and the cultural, societal, and environmental through Projects, National level industry sponsored events.
<b>Action:</b> Students were encouraged to undertake mini as well as major projects but were unable to participate due to Covid.			
<b>PO4: Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	2.3	1.86	Students are not fully complying with the standards of physical lab documentation and average understanding of drawing a valid conclusion related to laboratories due to





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			covid.
<b>Action:</b>			
1. Teachers are instructed to guide students to arrive at a valid conclusion. 2. Faculty has started to use an online LMS portal like Moodle for various labs and internal assessment.			
PO5	2.71	2.29	Students have shown resilience in adopting the use of modern tools in laboratories due to covid.
<b>Action :</b>			
1. Changes in the objectives are encouraged by revising various experiments with different sets of data. 2. Students are encouraged to use various simulators and open source tools.			
PO6	2.45	2.15	Awareness related to professional engineering practices were limited.
<b>Action:</b>			
1. Credit based courses like law for engineers and Industrial and Organizational Psychology are introduced in the curriculum along with various other SEVA/SATVA courses.			
PO7	1.86	1.80	Awareness about environmental issues and it's sustainability was demonstrated through various ABL activities
<b>Action:</b>			
1. In ABL courses like Design thinking, Beach Cleaning, etc. 2. Some of our Mini and Major projects related to environment and sustainability were implemented.			
PO8	2.72	2.27	Students are aware about the professional ethical standards
<b>Action:</b>			
1. Students are also encouraged to take part in non credit courses like Creative Thinking, Diversity and Workplace Etiquette. 2. Major Project groups are made use of ethical standards while developing products and filing patents/publishing papers.			





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|----|---|
| 3. | To encourage ethical standards in publication the institute has provided licensed based Turnitin plagiarism software. |
| 4. | Training sessions on corporate ethics planned by TPO.   |

**PO9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

<b>PO9</b>	<b>2.32</b>	<b>2.06</b>	Good involvement in multidisciplinary activities
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**Action:**

1. Activity based courses are introduced in the curriculum for holistic development of students.
2. To encourage participation in hackathons to exhibit team building along with individual responses.

**PO10 : Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

<b>PO10</b>	<b>2.49</b>	<b>2.13</b>	Class is moderately good in communication.
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**Action:**

1. Students are motivated to use verbal and non-verbal communication skills.
2. Training sessions on effective communication skills have been arranged through elite recruiters.

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

<b>PO11</b>	<b>2.17</b>	<b>1.86</b>	Project Budget and accounting knowledge is average.
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**Action:**

1. Guidance given related to principles of management through Minor/ SCOPE courses.
2. Students are asked to submit Project Budget and Expenditure Report during project phase presentation.
3. Department/Domain experts are appointed for effective Project management.

**PO12: Life – long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life – long learning in the broadest context of technological change.

<b>PO12</b>	<b>2.10</b>	<b>2.00</b>	Students were unable to benchmark their work at various national and international conferences due to Covid. Very few participation in competitive exams and conferences were observed.
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**Action:**

1. Department has focused on individual project group mentoring to create awareness in





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participating at national, international conferences and technical events.

2. Hackathon Participation is encouraged at the highest level.
3. Encouragement for Internship in both Industry as well as Research.

**PSO1:** The ability to troubleshoot hardware and software faults/ bugs in Communication systems.

<b>PSO1</b>	<b>2.14</b>	<b>1.69</b>	To demonstrate the skills for troubleshooting hardware and software faults/ bugs in Communication Systems.
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**Action:**

1. Guidance was given related to troubleshooting of hardware and software faults and bugs.
2. Project competitions were held to test the skills

**PSO2:** The ability to apply open source tools for solving technical problems.

<b>PSO2</b>	<b>2.47</b>	<b>2.15</b>	Recognised the needs for an ability to use the open source tools for solving technical problems
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**Action:**

1. Students are motivated in many courses to use open source tools such as Scilab, NS2, Linux, Mathematica etc.

Dr. Reena Sonkusare  
Head of the Department





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Department of Electronics and Telecommunication

Batch (2016-2020)

POs	Target Level	Attainment Level	Observations
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
PO1	2.70	2.34	Lateral entry students are admitted late and their mathematical foundations are poor.
<b>Action:</b> 1. Bridge courses should be included in university curriculum. 2. The skill based courses should be introduced in the curriculum.			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
PO2	2.77	2.27	This attainment is low in courses like Analog Electronics, analog communication, signals-systems, digital signal processing that requires analytical skills
<b>Action:</b> 1. In semester evaluation and assessment methods such as one to one lab assessment based on rubrics are introduced. 2. Also, ISE has the liberty of research paper analysis in some subjects			
<b>PO3: Design / development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.			
PO3	2.41	2.05	Students have satisfactorily demonstrated the need of solutions considering the public health and safety, and the cultural, societal, and environmental through Projects, National level industry sponsored events.
<b>Action:</b> 1. Students are encouraged to undertake such mini as well as major projects, prepare seed proposals and participate in industry sponsored events at TI as well as IIT, etc.			
<b>PO4: Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
PO4	2.44	2.23	Students are fully complying with the standards of physical lab documentation and average understanding of drawing a valid conclusion related to laboratories.
<b>Action:</b> 1. Teachers are instructed to guide students to arrive at a valid conclusion.			





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POs	Target Level	Attainment Level	Observations
			2. Faculty has started to use an online LMS portal like Moodle for various labs and internal assessment.
PO5	2.53	2.23	<b>PO5: Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.  Students have shown resilience in adopting the use of modern tools in laboratories.
			<b>Action :</b> 1. Changes in the objectives are encouraged by revising various experiments with different sets of data. 2. Students are encouraged to use various simulators and open source tools.
PO6	2.63	2.49	<b>PO6: The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.  Awareness related to professional engineering practices is increased.
			<b>Action:</b> 1. Credit based courses like law for engineers and Industrial and Organizational Psychology are introduced in the curriculum along with various other SEVA/SATVA courses.
PO7	2.13	1.99	<b>PO7: Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.  Students are exposed to environmental issues but weak in proposing Engineering solution to Environmental issues.
			<b>Action:</b> 1. Students are encouraged to take project and propose solution for a green environment.
PO8	2.88	2.68	<b>PO8: Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.  Students are aware about the professional ethical standards
			<b>Action:</b> 1. Some professional software should be there to check plagiarism.
PO9	2.24	2.12	<b>PO9: Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.  Good involvement in multidisciplinary activities
			<b>Action:</b> 1. Students are also encouraged to take part in non credit courses like Creative Thinking.





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POs	Target Level	Attainment Level	Observations
			Diversity and Workplace Etiquette. 2. Major Project groups are made use of ethical standards while developing products and filing patents/publishing papers. 3. To encourage ethical standards in publication the institute has provided licensed based Turnitin plagiarism software. 4. Training sessions on corporate ethics planned by TPO.
PO10	2.70	2.41	<b>PO10 : Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	2.47	2.35	<b>PO11: Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	2.07	1.84	<b>PO12: Life – long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life – long learning in the broadest context of technological change.
			<b>Action:</b> 1. Students are motivated to use verbal and non-verbal communication skills. 2. Training sessions on effective communication skills have been arranged through elite recruiters.
			<b>PO11: Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
			<b>Action:</b> 1. Guidance given related to principles of management through Minor/ SCOPE courses. 2. Students are asked to submit Project Budget and Expenditure Report during project phase presentation. 3. Department/Domain experts are appointed for effective Project management.
			<b>PO12: Life – long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life – long learning in the broadest context of technological change.
			<b>Action:</b> 1. Department has focused on individual project group mentoring to create awareness in participating at national, international conferences and technical events. 2. Hackathon Participation is encouraged at the highest level. 3. Encouragement for Internship in both Industry as well as Research.
			<b>PSO1:</b> The ability to troubleshoot hardware and software faults/ bugs in Communication systems.





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Department of Electronics and Telecommunication

POs	Target Level	Attainment Level	Observations
PSO1	2.20	1.75	To demonstrate the skills for troubleshooting hardware and software faults/ bugs in Communication Systems.
<b>Action:</b>			
1. Guidance was given related to troubleshooting of hardware and software faults and bugs. 2. Project competitions were held to test the skills			
<b>PSO2:</b> The ability to apply open source tools for solving technical problems.			
PSO2	2.40	1.69	Recognised the needs for an ability to use the open source tools for solving technical problems
<b>Action:</b>			
1. Students are motivated in many courses to use open source tools such as Scilab, NS2, Linux, Mathematica etc.			

Head of the Department

Dr. Reena Sonkusare





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 Department of Electronics and Telecommunication

Batch (2015-2019)

POs	Target Level	Attainment Level	Observations
<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems			
<b>PO1</b>	<b>2.55</b>	<b>2.27</b>	Lateral entry students are admitted late and their mathematical foundations are poor.
<b>Action:</b> <ol style="list-style-type: none"> <li>Bridge courses should be included in university curriculum.</li> <li>The skill based courses should be introduced in the curriculum.</li> </ol>			
<b>PO2: Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences			
<b>PO2</b>	<b>2.55</b>	<b>2.19</b>	This attainment is low in courses like Analog Electronics, analog communication, signals-systems, digital signal processing that requires analytical skills
<b>Action:</b> <ol style="list-style-type: none"> <li>In semester evaluation and assessment methods such as one to one lab assessment based on rubrics are introduced.</li> <li>Also, ISE has the liberty of research paper analysis in some subjects.</li> </ol>			
<b>PO3: Design / development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.			
<b>PO3</b>	<b>2.47</b>	<b>2.23</b>	Students have satisfactorily demonstrated the need of solutions considering the public health and safety, and the cultural, societal, and environmental through Projects, National level industry sponsored events.
<b>Action:</b> <ol style="list-style-type: none"> <li>Students are encouraged to undertake such mini as well as major projects, prepare seed proposals and participate in industry sponsored events at TI as well as IIT, etc.</li> </ol>			
<b>PO4: Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
<b>PO4</b>	<b>2.31</b>	<b>2.34</b>	Students are fully complying with the standards of physical lab documentation and average understanding of drawing a valid conclusion related to laboratories.
<b>Action:</b> <ol style="list-style-type: none"> <li>Teachers are instructed to guide students to arrive at a valid conclusion.</li> </ol>			





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Department of Electronics and Telecommunication

- |    |   |
|----|---|
| 2. | Faculty has started to use an online LMS portal like Moodle for various labs and internal assessment. |
|----|---|

**PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

<b>PO5</b>	<b>2.56</b>	<b>2.37</b>	Students have shown resilience in adopting the use of modern tools in laboratories.
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**Action :**

1. Changes in the objectives are encouraged by revising various experiments with different sets of data.
2. Students are encouraged to use various simulators and open source tools.

**PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

<b>PO6</b>	<b>2.70</b>	<b>2.24</b>	Awareness related to professional engineering practices is increased.
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**Action:**

1. Credit based courses like law for engineers and Industrial and Organizational Psychology are introduced in the curriculum along with various other SEVA/SATVA courses.

**PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

<b>PO7</b>	<b>2.60</b>	<b>2.51</b>	Students are exposed to environmental issues but weak in proposing Engineering solutions to Environmental issues.
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**Action:**

1. Students are encouraged to take project and propose solution for a green environment.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

<b>PO8</b>	<b>2.43</b>	<b>2.17</b>	Students are aware about the professional ethical standards
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**Action:**

1. Some professional software should be there to check plagiarism.

**PO9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

<b>PO9</b>	<b>2.33</b>	<b>2.08</b>	Good involvement in multidisciplinary activities.
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**Action:**

1. Students are also encouraged to take part in non credit courses like Creative Thinking, Diversity and Workplace Etiquette.
2. Major Project groups are made use of ethical standards while developing products and filing patents/publishing papers.
3. To encourage ethical standards in publication the institute has provided licensed based





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Tumitin plagiarism software.

4. Training sessions on corporate ethics planned by TPO.

**PO10 : Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

<b>PO10</b>	2.33	2.24	Class is moderately good in communication.
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Action:

1. Students are motivated to use verbal and non-verbal communication skills.
2. Training sessions on effective communication skills have been arranged through elite recruiters.

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

<b>PO11</b>	2.67	2.26	Project Budget and accounting knowledge is average.
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Action:

1. Guidance given related to principles of management through Minor/ SCOPE courses.
2. Students are asked to submit Project Budget and Expenditure Report during project phase presentation.
3. Department/Domain experts are appointed for effective Project management.

**PO12: Life – long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life – long learning in the broadest context of technological change.

<b>PO12</b>	2.33	2.05	Students are able to bench mark their work at various national and international conferences. Substantial participation in competitive exams and conferences is observed.
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Action:

1. Department has focused on individual project group mentoring to create awareness in participating at national, international conferences and technical events.
2. Hackathon Participation is encouraged at the highest level.
3. Encouragement for Internship in both Industry as well as Research.

**PSO1:** The ability to troubleshoot hardware and software faults/ bugs in Communication systems.

<b>PSO1</b>	2.38	2.29	To demonstrate the skills for troubleshooting hardware and software faults/ bugs in Communication Systems.
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Action:

1. Guidance was given related to troubleshooting of hardware and software faults and bugs.
2. Project competitions were held to test the skills

**PSO2:** The ability to apply open source tools for solving technical problems.



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Department of Electronics and Telecommunication

<b>PSO2</b>	<b>2.39</b>	<b>2.20</b>	Recognised the needs for an ability to use the open source tools for solving technical problems
<b>Action:</b>			
1. Students are motivated in many courses to use open source tools such as Scilab, NS2, Linux, Mathematica etc.			

  
Dr. Reena Sonkusare  
Head of the Department



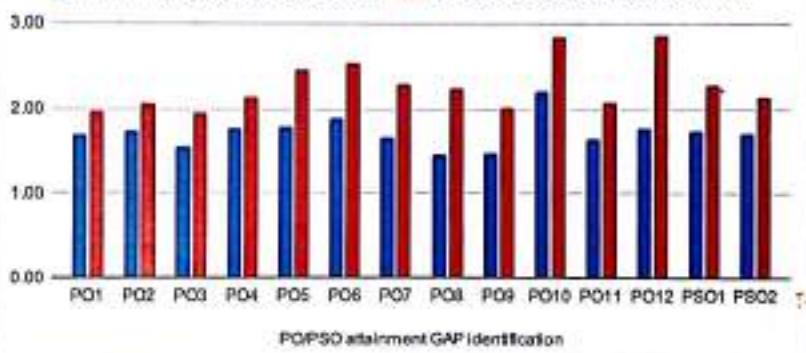
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For Batch 2021-2023

PO/PSO attainment GAP identification	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
average PO/PSO (direct) 2021-23 batch	1.70	1.75	1.55	1.78	1.78	1.88	1.88	1.46	1.47	2.20	1.65	1.77	1.74	1.71
average PO/PSO (in-direct) 2021-23 batch	1.96	2.06	1.95	2.14	2.47	2.54	2.28	2.25	2.02	2.84	2.08	2.87	2.27	2.15

average PO/PSO (direct) 2021-23 batch and average PO/PSO (in-direct) 2021-23 batch

■ average PO/PSO (direct) 2021-23 batch ■ average PO/PSO (in-direct) 2021-23 batch



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**PO-PSO ATTAINMENT FOR THE BATCH 2021-2023 (DIRECT ATTAINMENT VALUES)**

Course Name	Course Outcome number	Course Outcome Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Linear Algebra	MAS01.1	Solve a homogeneous and non-homogeneous system of linear equations using rank of a matrix.	1	2	2											
	MAS01.2	Solve system of linear equations by Numerical Methods.	1	2	2											
	MAS01.3	Solve equations in real life problems and to encode and decode messages using the concept of matrices.	1	2	2											
	MAS01.4	Identify whether given structures are vector spaces and subspaces and construct a basis for them.	1	2	2											
	MAS01.5	Show if a given matrix is diagonalisable or not.	1	2	2											
	MAS01.6	Apply concepts of eigenvalues and eigenvectors to calculate functions of a square matrix, Google page rank vector and solve systems of differential equations using diagonalisation of matrices.	1	2	2											
	MC501.1	Apply various operations of Stack, Queue and Linked List to solve problems from different domains.	2.7	2.8									1.8		0.9	



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Data Structures	MC501.2	Apply various operations of Tree and Graph to solve problems from different domains.	2.7	2.6					1.8		0.9
	MC501.3	Make use of searching and hashing techniques for efficient data retrieval and data mapping.			2.98				1.8		
	MC501.4	Compare efficiency of various sorting algorithms.		2.6					1.8		
Database Management System	MC502.1	Design ER diagram and relational database.		1.51	0.8			0.76	1.51	1.47	1.47
	MC502.2	Apply normalization on given database.	2.24	1.51				0.76	1.51	1.47	
	MC502.3	Analyze transaction and concurrency control mechanism.	2.24	1.51				0.76	1.51		
	MC502.4	Illustrate emerging database systems.	2.24	1.51				0.76	1.51		1.47
	MC502.5	Formulate SQL queries for information retrieval.	2.24	1.51		1.33		0.76	1.51	1.47	1.47
	MC502.6	Demonstrate various PL/SQL queries.	2.24	1.51		1.33		0.76	1.51	1.47	1.47
Software Engineering	MC503.1	Analyze requirements for relevant process model.	0.75	1.51	1.98	2.26		1.44		1.7	1.57
	MC503.2	Design/Construct system models with Software Requirement Specification.	0.75	1.51	1.98	2.26				1.7	1.57
	MC503.3	Apply estimation techniques for software planning	0.75	1.51		2.26		1.44	2.26	1.7	1.57
	MC503.4	Apply umbrella activities for the Software.	0.75	1.51		2.26		1.44	2.26	1.7	1.57
	MC504.1	Create web pages using HTML5, CSS3, and Java scripting.	1.95	1.3	1.3						

*S. Chaudhari* 20



Web Techn ology Lab	MC504.2	Design web pages using Angular concepts and components.	1.95	1.3	1.3		1.26						
	MC504.3	Develop dynamic web pages using Node and Express js	1.95	1.3	1.3		1.26						
	MC504.4	Develop webpages and store it in database using node js	1.95	1.3	1.3		1.26						

Writin g Skills	AS501.1	Apply the principles of business writing for professional documents					1.67		1.67		1.67		
	AS501.2	Develop advance vocabulary and grammr for spoken and written communication.					1.67		1.67		1.67		
	AS501.3	Draft a formal report.					1.67		1.67		1.67		

sem2

Course Name	Course Outcome number	Course Outcome Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Probabilit y and Statisti cs	MA503.1	Apply different statistical measures on various types of data	1.33	1.33	1.33										0.6	
	MA503.2	Perform Hypothesis testing on the data given to validate the Assumptions	1.33	1.33	1.33										0.6	
	MA503.3	Illustrate basic probability axioms, rules and their applicability.	1.33	1.33	1.33										0.6	
	MA503.4	Apply probability distribution to solve given problems.	1.33	1.33	1.33										0.6	



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Java Programming	MC506.1	Build programming concept using OO constructs	2	2														2
	MC506.2	Analyze real world problem for database connection and file handling using Exception handling		2	2	2	2		2			2					2	2
	MC506.3	Develop Web Applications using JSP and servlets	2	2		2												2
	MC506.4	Explain concept of Spring and Hibernate in advanced JAVA programming		2	2		2	2				2	2			2	2	2
Design and Analysis of Algorithms	MC507.1	Analyze time and space complexity of different algorithms.	1.63	1.95	0.98	1.3			0.65									
	MC507.2	Analyze various divide & conquer algorithms.	1.63	1.95	0.98	1.3			0.65									
	MC507.3	Apply greedy and dynamic method to given problem.	1.63	1.95	0.98	1.3			0.65									
	MC507.4	Make use of backtracking, branch and bound techniques, graphs to solve a problem.	1.63	1.95	0.98	1.3			0.65									
Process	MC508.1	Explain the basics of Process Automation		3														
	MC508.2	Analyze the methodologies and techniques used in Process Automation		2.85		2.78												
	MC508.3	Develop the BOT's using Process Automation			3		3	3				3						
	MC508.4	Explain different intelligent Process Automation techniques	3	2.85														



<b>Process Automation</b>	<b>MC508.5</b>	Analyze the securities required for Process Automation	2.85	2.78							
<b>Machine Learning</b>	<b>MC511.1</b>	Explain basic concepts and need of machine learning	1.4								
	<b>MC511.2</b>	Apply machine learning algorithms to solve the given problem	1.4	1.26	1.26	1.53	1.47		0.63	0.63	
	<b>MC511.3</b>	Explain various reinforcement learning techniques	1.4								
	<b>MC511.4</b>	Apply Dimensionality reduction techniques.	1.4	1.26	1.26		1.47		0.63	0.63	
	<b>MC511.5</b>	Make use of basic concepts of Python/R to solve given problems.	1.4	1.26	1.26		1.47		0.63	0.63	
<b>Cloud Computing</b>	<b>MC518.1</b>	Illustrate fundamentals of Cloud Computing.	1.7	0.85	0.85						1.7
	<b>MC518.2</b>	Analyze different virtualization techniques and their role in enabling the cloud computing system model.	1.7	0.85							1.7
	<b>MC518.3</b>	Categorize various Cloud architecture and Infrastructure.	1.7	0.85	0.85		1.7				1.7
	<b>MC518.4</b>	Analyze security issues and synchronization protocols of cloud.	1.7	0.85	0.85	1.7					1.7
	<b>MC509.1</b>	Install the ionic framework with all the dependencies				1.6	0.67				1.3



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Mobile Programming Lab	MC509.2	Create apps using the components of ionic framework and SASS stylesheet		1.5								1.3	
	MC509.3	Create apps using API's of ionic framework		1.5								1.3	
	MC509.4	Create apps with backend connectivity		1.5								1.3	
Communication and Presentation Skills	AS502.1	Demonstrate persuasive skills in interviews					1.25	1.25		1.25	1.25		
	AS502.2	Demonstrate creative and critical thinking in Group Discussions					1.25	1.25		1.25	1.25		
	AS502.3	Explain research, analysis and presentation skills					1.25	1.25		1.25	1.25		
	AS502.4	Apply data transformation skills					1.25	1.25		1.25	1.25		
Computer Graphics	MC523.1	Apply output primitive algorithms	1.53	1.33					1.98				
	MC523.2	Apply 2D geometric transformations	1.53	1.33					1.98				
	MC523.3	Apply basics of 3D concepts and Fractals	1.33		0.83		1.98						
	MC523.4	Apply image processing techniques in a given application	1.4										

sem3

Course Name	Course Outcome number	Course Outcome Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Summer Project	AS602.1	Conduct literature survey in the given area	1.98	1.48	1.75	1.81		1.98		1.32	1.98	1.98	1.98	1.98	1.98	1.98
	AS602.2	Design the prototype.	1.98	1.48	1.75	1.81	1.32		1.98	0.66		1.98	1.98	1.98	1.98	1.98
	AS602.3	Test the prototype and Analyse its performance	1.98	1.48		1.81	1.32		1.98	0.66		1.98	1.98	1.98	1.98	1.98
	AS602.4	Develop research inclination to solve real life problems	1.98	1.48	1.75	1.81		1.98	1.98			1.98	1.98			

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		AS602.5	Communicate findings effectively to the range of audience.	1.98	1.98		1.32			1.98	1.98
		MC518.1	Illustrate fundamentals of Cloud	1.7	0.85	0.85					1.7
		MC518.2	Analyze different virtualization t	1.7	0.85						1.7
Cloud Computing		MC518.3	Categorize various Cloud archite	1.7	0.85	0.85	1.7				1.7
		MC518.4	Analyze security issues and sync	1.7	0.85	0.85	1.7				1.7
		MC522.1	Identify the scope and essentiality of Data Warehousing and Mining.	1.39	1.56				0.74	0.74	
Data Warehousing and Mining		MC522.2	Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining	1.39		2.09			0.74	0.74	
		MC522.3	Build Data warehouse for real time problems		1.56	2.09	1.48		0.74	0.74	0.74
		MC522.4	Identify appropriate data mining algorithms to solve real world problems	1.39	1.56	2.09	1.48		0.74	0.74	0.74
		MC601.1	Conduct a requirement analysis a	1.7	2.26	2.55	1.98	2.55	0.66	2.55	2.55
Project II		MC601.2	Develop the solution based on th	1.7	2.26	2.55	1.98	2.26	2.55	2.55	2.55
		MC601.3	Test prototypical solution using d	1.7	2.26	2.55	1.98	2.26	2.55	2.55	2.55
		MC601.4	Develop effective interpersonal and communication ski	2.26	2.55	2.55		2.55	2.55	2.55	2.38
		MC601.5	Understand professional, ethical, legal, industry practices and	2.55	2.55	0.66	2.55	2.55	2.55	2.36	

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Course Name	Course Outcome number	Course Outcome Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Institut e / Interns hip with Startu p at TBI	ICASP61.1	Apply programming concepts to dev	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	ICASP61.2	Apply the software engineering principles to solve real life problems using modern tools, used in the organization														
	ICASP61.3	Apply the software project management processes to carry out the successful completion of project														
	ICASP61.4	Apply technical communication effectively in the organization														
	ICASP61.5	Use professional ethics in application development														
	ICASP61.6	Develop skills for working in the team and for life-long learning														
average			2	2	2	2	2	2	2	2	2	2	2	2	2	2

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**PO-PSO ATTAINMENT FOR THE BATCH 2021-2023 (IN-DIRECT ATTAINMENT VALUES)**

Course Name	Course Outcome # number	Course Outcome Description																
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PE O1	PE O2	PE O3
Linear Algebra	MA501.1	Solve a homogeneous and non-homogeneous system of linear equations using rank of a matrix.	1	3	2													
	MA501.2	Solve system of linear equations by Numerical Methods.	1	3	2													
	MA501.3	Solve equations in real life problems and to encode and decode messages using the concept of matrices.	1	3	2													
	MA501.4	Identify whether given structures are vector spaces and subspaces and construct a basis for them.	1	3	2													
	MA501.5	Show if a given matrix is diagonalizable or not.	1	3	2													
	MA501.6	Apply concepts of eigenvalues and eigenvectors to calculate functions of a square matrix, Google page rank vector and solve systems of differential equations using diagonalisation of matrices.	1	3	2													
	MC501.1	Apply various operations of Stack, Queue and Linked List to solve problems from different domains.	2.5	2.33									1.5	0.83				



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Data Structures	MC501.2	Apply various operations of Tree and Graph to solve problems from different domains.	2.5	2.33					1.5	0.83
	MC501.3	Make use of searching and hashing techniques for efficient data retrieval and data mapping.			2				1.5	
	MC501.4	Compare efficiency of various sorting algorithms.		2.33					1.5	
Database Management System	MC502.1	Design ER diagram and relational database.		1.55	1			0.77	1.55	1.67 1.67
	MC502.2	Apply normalization on given database.	2.2	1.55				0.77	1.55	1.67
	MC502.3	Analyze transaction and concurrency control mechanism.	2.2	1.55				0.77	1.55	1.67
	MC502.4	Illustrate emerging database systems.	2.2	1.55				0.77	1.55	
	MC502.5	Formulate SQL queries for information retrieval.	2.2	1.55		1.67		0.77	1.55	1.67
	MC502.6	Demonstrate various PL/SQL queries.	2.2	1.55		1.67		0.77	1.55	1.67 1.67
Software Engineering	MC503.1	Analyze requirements for relevant process model.	0.91	1.83	3		2.75	1.73 2.75		1.83
	MC503.2	Design/Construct system models with Software Requirement Specification.	0.91	1.83	3		2.75	2.75		1.83 1.73
	MC503.3	Apply estimation techniques for software planning	0.91	1.83			2.75	1.73 2.75	1.66	1.83 1.73
	MC503.4	Apply umbrella activities for the Software.	0.91	1.83			2.75	1.73 2.75	1.66	1.83 1.73
	MC504.1	Create web pages using HTML5, CSS3, and Java scripting.	2.25	1.5	1.5					

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Web Technology Lab	MC504.2	Design web pages using Angular concepts and components.	2.25	1.5	1.5								
	MC504.3	Develop dynamic web pages using Node and Express js	2.25	1.5	1.5								
	MC504.4	Develop webpages and store it in database using node js	2.25	1.5	1.5								

Writing Skills	AS501.1	Apply the principles of business writing for professional documents				2.67	2.67	2.67					
	AS501.2	Develop advance vocabulary and grammar for spoken and written communication.				2.67	2.67	2.67					
	AS501.3	Draft a formal report.				2.67	2.67	2.67					

sem 2

Course Name	Course Outcome number	Course Outcome Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	SOP	PO2
Probability and Statistics	MA503.1	Apply different statistical measures on various types of data	2	2	2									1		
	MA503.2	Perform Hypothesis testing on the data given to validate the Assumptions	2	2	2									1		
	MA503.3	Illustrate basic probability axioms, rules and their applicability.	2	2	2									1		
	MA503.4	Apply probability distribution to solve given problems.	2	2	2									1		



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Java Programming	MC506.1	Build programming concept using OO constructs	2	2															
	MC506.2	Analyze real world problem for database connection and file handling using Exception handling															2		
	MC506.3	Develop Web Applications using JSP and servlets	2	2	2	2		2		2		2							
	MC506.4	Explain concept of Spring and Hibernate in advanced JAVA programming	2	2		2												2	
			2	2		2	2			2	2		2	2					
Design and Analysis of Algorithms	MC507.1	Analyze time and space complexity of different algorithms.																	
	MC507.2	Analyze various divide & conquer algorithms.	1.47	1.760.88	1.17				0.56										
	MC507.3	Apply greedy and dynamic method to given problem.	1.47	1.760.88	1.17			0.56											
	MC507.4	Make use of backtracking, branch and bound techniques, graphs to solve a problem.	1.47	1.760.88	1.17		0.56												
Process Automation	MC508.1	Explain the basics of Process Automation																	
	MC508.2	Analyze the methodologies and techniques used in Process Automation	3																
	MC508.3	Develop the BOTs using Process Automation		3	3											3			
	MC508.4	Explain different intelligent Process Automation techniques	3	3			3	3	3										



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Process Automation	MC508.5	Analyze the securities required for Process Automation.		3	3									
	MC511.1	Explain basic concept and need of machine learning	1.6											
	MC511.2	Apply machine learning algorithms to solve the given problem	1.6	1.55	1.55	1.33	1.8		0.77	0.77				
	MC511.3	Explain various reinforcement learning techniques	1.6											
	MC511.4	Apply Dimensionality reduction techniques.	1.6	1.55	1.55		1.8		0.77	0.77				
	MC511.5	Make use of basic concepts of Python/R to solve given problems.	1.6	1.55	1.55		1.8		0.77	0.77				
Machine Learning	MC518.1	Illustrate fundamentals of Cloud	2		1	1					2			
	MC518.2	Analyze different virtualization t	2		1						2			
	MC518.3	Categorize various Cloud architc	2	1	1		2				2			
	MC518.4	Analyze security issues and sync	2		1	1	2				2			
	MC509.1	Install the ionic framework with all the dependencies				3	1.25			2.5				
Mobile Programming Lab	MC509.2	Create apps using the components of ionic framework and SASS stylesheet			3	3	1.25			2.5				
	MC509.3	Create apps using API's of ionic framework			3	3	1.25			2.5				
	MC509.4	Create apps with backend connectivity			3	3	1.25			2.5				



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Communication and Presentation Skills	AS502.1	Demonstrate persuasive skills in interviews				2	2	2	2				
	AS502.2	Demonstrate creative and critical thinking in Group Discussions				2	2	2	2				
	AS502.3	Explain research, analysis and presentation skills				2	2	2	2				
	AS502.4	Apply data transformation skills				2	2	2	2				
Computer Graphics	MC523.1	Apply output primitive algorithms	1.33	1.33			1.78						
	MC523.2	Apply 2D geometric transformations	1.33	1.33			1.78						
	MC523.3	Apply basics of 3D concepts and Fractals	1.33	1.33			1.78						
	MC523.4	Apply image processing techniques in graphics	1.33	1.33			1.78						

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Course Name	Course Outcome number	Course Outcome Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	SO1	SO2	PEO1	PEO2	PEO3	PEO4
			2.75	2.00	2.30	2.52			2.8			2.8	2.8	3	3	3	3	3	3	
Summer Project I	AS602.1	Conduct literature survey in the preferred domain and formulate problem statements.	2.75	2.00	2.30	2.52			2.8			2.8	2.8	3	3	3	3	3	3	
	AS602.2	Design the prototype.	2.75	2.00	2.30	2.52	3	2.8	1		2.8	2.8	3	3	3	3	3	3	3	
	AS602.3	Test the prototype and Analyse findings from obtained results.	2.75	2.00		2.52		3		1	2.8	2.8	3	3	3	3	3	3	3	
	AS602.4	Develop research inclination to solve societal problems.	2.75	2.00	2.30	2.52		2.5			2.8	2.8					3	3	2.5	
	AS602.5	Communicate findings effectively to the range of audience.							2.8	2.8		2.8	2.8			3	3	3	2.5	



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Cloud Computing	MC518.1	Illustrate fundamentals of Cloud Computing.	2	1	1				2		
	MC518.2	Analyze different virtualization techniques and their role in enabling the cloud computing system model.	2	1					2		
	MC518.3	Categorize various Cloud architecture and Infrastructure.	2	1	1	2			2		
	MC518.4	Analyze security issues and synchronization protocols of cloud.	2	1	1	2			2		
Data Warehousing and Mining	MC522.1	Identify the scope and essentiality of Data Warehousing and Mining.	1.77	1.77				0.91	0.91		
	MC522.2	Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining	1.77		2.66			0.91	0.91		
	MC522.3	Build Data warehouse for real time problems	1.77		2.66	1.66		0.91	0.91	0.83	
	MC522.4	Identify appropriate data mining algorithms to solve real world problems	1.77	1.77	2.66	1.66		0.91	0.91	0.83	
											3
	MC601.1	Conduct a requirement analysis and formulate requirements in the preferred domain.	2	2.06	2.66	2.33		3	2	3	3
								3	3	3	2.6
								2.6	2.6		

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	MC601.2	Develop the solution based on the requirement analysis.	2	2.00	2.66	2.33	2.66		3		3	3	3	3	2.8	2.6		2.6	2.6	3
	MC601.3	Test prototypical solution using advanced tools	2	2.00	2.66	2.33	2.66		3		3	3	3	3	2.8	2.6		2.6	2.6	3
	MC601.4	Develop effective interpersonal and communication skills in project development.				2.66	3	3		3	3	3	3	3	2.8			2.6	2.6	3
Project II	MC601.5	Understand professional, ethical, legal, industry practices and responsibilities.					3	3	2	3	3	3	3	3	2.8			2.6	2.6	3
																	2.6	2.6		

Course Name	Course Outcome number	Course Outcome Description	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	S01	P502			
			3	3	3	3	3	3	3	3	3	3	3	3	3	3			
6-Month Industry Internship /Research Internship at SPIT or Other Institute / Internship with Startup at TBI	ICASP61.1	Apply programming concepts to develop software solutions																	
	ICASP61.2	Apply the software engineering principles to solve real life problems using modern tools, used in the organization																	
	ICASP61.3	Apply the software project management processes to carry out the successful completion of project																	
	ICASP61.4	Apply technical communication effectively in the organization																	
	ICASP61.5	Use professional ethics in application development																	
	ICASP61.6	Develop skills for working in the team and for life-long learning																	



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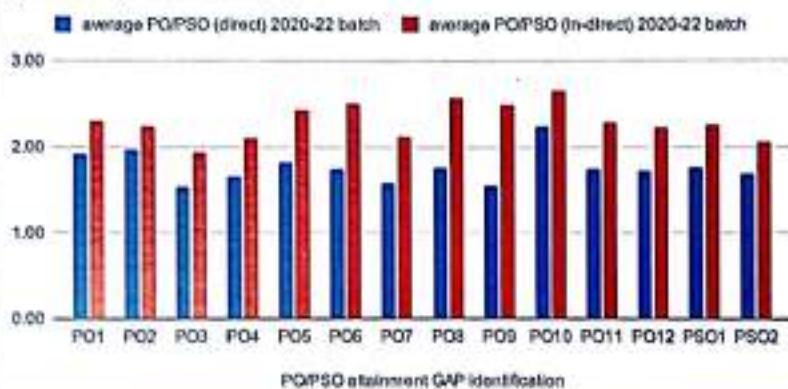


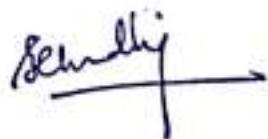
Bharatiya Vidya Bhawan  
Sardar Patel Institute of Technology  
Munshinagar, Andheri(W), Mumbai-400058  
(Autonomous College Affiliated to University of Mumbai)

For Batch 2020-2022

PO/PSO attainment GAP identification	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02
average PO/PSO (direct) 2020-22 batch	1.91	1.98	1.53	1.67	1.82	1.75	1.59	1.70	1.55	2.24	1.75	1.73	1.77	1.70
average PO/PSO (in-direct) 2020-22 batch	2.31	2.23	1.94	2.11	2.43	2.51	2.13	2.57	2.49	2.65	2.28	2.22	2.26	2.06

average PO/PSO (direct) 2020-22 batch and average PO/PSO (in-direct) 2020-22 batch



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**PO-PSO ATTAINMENT FOR THE BATCH 2020-2022 TWO YEAR PROGRAMME (DIRECT ATTAINMENT)**

<b>Course Name</b>	<b>Course Outcome number</b>	<b>Course Outcome Description</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PS 01</b>	<b>PS 02</b>
Linear Algebra	MA501.1	Solve a homogeneous and non-homogeneous system of linear equations using rank of a matrix.	1.5	1.5		1.5						1.5				
	MA501.2	Solve system of linear equations by Numerical Methods.	1.5	1.5		1.5	1.5					1.5				
	MA501.3	Solve equations in real life problems and to encode and decode messages using the concept of matrices.	1.5	1.5		1.5	1.5		1.5							
	MA501.4	Identify whether given structures are vector spaces and subspaces and construct a basis for them.	1.5	1.5		1.5			1.5							
	MA501.5	Show if a given matrix is diagonalizable or not.	1.5	1.5		1.5	1.5		1.5		1.5					
	MA501.6	Apply concepts of eigenvalues and eigenvectors to calculate functions of a square matrix, Google page rank vector and solve systems of differential equations using diagonalisation of matrices.	1.5	1.5		1.5	1.5		1.5		1.5					
	MC501.1	Apply various operations of Stack, Queue and Linked List to solve problems from different domains.	2.9	2.71								1.83		0.97		



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Data Structure	MC501.2	Apply various operations of Tree and Graph to solve problems from different domains.	2.9	2.71						1.83	0.97
	MC501.3	Make use of searching and hashing techniques for efficient data retrieval and data mapping.			2.8					1.83	
	MC501.4	Compare efficiency of various sorting algorithms.		2.71						1.83	
Database Management System	MC502.1	Design ER diagram and relational database.		1.63	0.81				0.54	1.63	1.65 1.62
	MC502.2	Apply normalization on given database.	2.4	1.63					0.54	1.63	1.65
	MC502.3	Analyze transaction and concurrency control mechanism.	2.4	1.63					0.54	1.63	
	MC502.4	Illustrate emerging database systems.	2.4	1.63					0.54	1.63	
	MC502.5	Formulate SQL queries for information retrieval.	2.4	1.63	1.57				0.54	1.63	1.62
	MC502.6	Demonstrate various PL/SQL queries.	2.4	1.63	1.57				0.54	1.63	1.65 1.62
Software Engineering	MC503.1	Analyze requirements for relevant process model.	0.68	1.36 2.1	2.04		1.36	2.01			
	MC503.2	Design/Construct system models with Software Requirement Specification.	0.68	1.36 2.1	2.04			2.01		1.81	
	MC503.3	Apply estimation techniques for software planning	0.68	1.36	2.04		1.36	2.01	1.32	1.81	1.32
	MC503.4	Apply umbrella activities for the Software.	0.68	1.36	2.04		1.36	2.01	1.32	1.81	1.32
	MC504.1	Create web pages using HTML5, CSS3, and Java scripting.	1.58	1.58 1.5							



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11

Web Technology Lab	MC504.2	Design web pages using Angular concepts and components.	1.58	1.58	1.51	1.71								
	MC504.3	Develop dynamic web pages using Node and Express js	1.58	1.58	1.51	1.71								
	MC504.4	Develop webpages and store it in database using node js	1.58	1.58	1.51	1.71								
Writing Skills	AS501.1	Apply the principles of business writing for professional documents					1.38	1.38	2					
	AS501.2	Develop advance vocabulary and grammar for spoken and written communication.					1.38	1.38	2					
	AS501.3	Draft a formal report.					2	2	2					
Problem Solving Using Object Oriented Programming Lab	MC505.1	Construct programs using basic control structures	3	3		2								
	MC505.2	Apply objects and structures in problem solving	3	3		2								
	MC505.3	Apply arrays and pointers efficiently to solve the problems	3	3		2								
	MC505.4	Design the solutions using inheritance and polymorphism.	3	3	1	2								1
	MC505.5	Apply concepts of virtual functions, exception handling to create efficient solutions.	3	3		2								
	MC505.6	Construct the solutions using File handling and Standard Template Library	3	3	1	2								1



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Probability and Statistics	MA503.1	Apply different statistical measures on various types of data	1.5	1.5	1.5	1.5								
	MA503.2	Perform Hypothesis testing on the data given to validate the Assumptions	1.5	1.5	1.5	1.5								
	MA503.3	Illustrate basic probability axioms, rules and their applicability.	1.5	1.5	1.5	1.5								
	MA503.4	Apply probability distribution to solve given problems.	1.5	1.5	1.5	1.5								
Java Programming	MC506.1	Build programming concept using OO constructs	2	2										2
	MC506.2	Analyze real world problem for database connection and file handling using Exception handling	2	2	2	2		2		2				2
	MC506.3	Develop Web Applications using JSP and servlets	2	2	2									2
	MC506.4	Explain concept of Spring and Hibernate in advanced JAVA programming	2	2	2	2				2	2			2
Design and	MC507.1	Analyze time and space complexity of different algorithms.	1.63	1.95	0.98	1.3		0.65						
	MC507.2	Analyze various divide & conquer algorithms.	1.63	1.95	0.98	1.3		0.65						
	MC507.3	Apply greedy and dynamic method to given problem.	1.63	1.95	0.98	1.3		0.65						



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Analysis of Algorithms	MC507.4	Make use of backtracking, branch and bound techniques, graphs to solve a problem.	1.63	1.95	0.96	1.3		0.66					
	MC508.1	Explain the basics of Process Automation	2.41										
Process Automation	MC508.2	Analyze the methodologies and techniques used in Process Automation		2.6		2.7							
	MC508.3	Develop the BOTs using Process Automation		2.41	2.41		1.6		1.6				
	MC508.4	Explain different intelligent Process Automation techniques	2.41	2.6									
	MC508.5	Analyze the securities required for Process Automation		2.6	2.7								
	MC511.1	Explain basic concept and need of machine learning	2	2	1.33	1.33							
Machine Learning	MC511.2	Apply machine learning algorithms to solve the given problem	2	2	1.33	1.33	1.33	0.66					
	MC511.3	Explain various reinforcement learning techniques	2	2	1.33	1.33	1.33	0.66					
	MC511.4	Apply Dimensionality reduction techniques.	2	2	1.33	1.33	1.33	0.66					
	MC511.5	Make use of basic concepts of Python/R to solve given problems.	2	2	1.33	1.33	1.33	0.66					
			2	2	1.33	1.33							
	MC509.1	Install the ionic framework with all the dependencies					1.6	0.67					1.3



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Mobile Programming Lab	MC509.2	Create apps using the components of ionic framework and SASS stylesheet		1.5	1.6	0.67			1.3	
	MC509.3	Create apps using API's of ionic framework		1.5	1.6	0.67			1.3	
	MC509.4	Create apps with backend connectivity		1.5	1.6	0.67			1.3	
									1.3	
Communication and Presentation Skills	AS502.1	Demonstrate persuasive skills in interviews			2 1.33		1.5	0.5		
	AS502.2	Demonstrate creative and critical thinking in Group Discussions			2 1.33		1.5	0.5		
	AS502.3	Explain research, analysis and presentation skills			2 1.33		1.5	0.5		
	AS502.4	Apply data transformation skills			2 1.33		1.5	0.5		
Summer Project I	AS602.1	Conduct literature survey in the preferred domain and formulate problem statements	2 2.75	1.5 1.5		2	1.52	2.75	2 1.85	
	AS602.2	Design the prototype.	2 2.75	1.5 1.5	1.41	2	1.5	2.75	2 1.85	
	AS602.3	Test the prototype and Analyse findings from obtained results.	2 2.75	1.5 1.5	1.41	2	1.5	2.75	2 1.85	
	AS602.4	Develop research inclination to solve societal problems.	2 2.75	1.5 1.5		1.52	2	2.75	2 1.85	
	AS602.5	Communicate findings effectively to the range of audience.	2 2.75	1.58 1.5	1.41 1.52	2		2.75	2	1.85
	MCS18.1	Illustrate fundamentals of Cloud Computing.	1.7	0.85 0.85						1.7



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Cloud Computing	MC518.2	Analyze different virtualization techniques and their role in enabling the cloud computing system model.	1.7	0.85															1.7
	MC518.3	Categorize various Cloud architecture and Infrastructure.	1.7	0.85	0.85		1.7												1.7
	MC518.4	Analyze security issues and synchronization protocols of cloud.	1.7	0.85	0.85	1.7													1.7
																			1.7
Computer Graphics		Apply output primitive algorithms on a given scenario	1.53	1.33			1.98												
		Apply 2D geometric transformation functions and clipping	1.53	1.33			1.98												
		Apply basics of 3D concepts and Fractals.		1.33		0.90													
		Apply image processing techniques in a given scenario			1.4		1.98												
Software Testing	MC 514.1	Apply various Software testing Techniques and strategies to find bugs in software	1.48	1.48	1.48	2.2												0.74	1.48
	MC 514.2	Design test cases suitable in testing	1.48	1.48	1.48	2.2												0.74	1.48
	MC 514.3	Apply test management and automation in testing environment	1.48	1.48	1.48	2.2												0.74	1.48
	MC 514.4	Illustrate Agile Testing approach		1.48	1.48	2.2												0.74	1.48

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		Conduct a requirement analysis and formulate requirements in the preferred domain.	2.22	2.2	2.34	2.2		2.23		2.34	2.23	2.23	2.1	2.23	2.23
	MC601.2	Develop the solution based on the requirement analysis.	2.2	2.2	2.34	2.2	1.91	2.23	1.91	2.23	2.23	2.1	2.23	2.23	
	MC601.3	Test prototypical solution using advanced tools	2.2	2.2		2.2	1.91	2.23	1.91	2.23	2.23	2.1	2.23	2.23	
	MC601.4	Develop effective interpersonal and communication skills in project development.	2.2	2.2	2.34	2.2		2.34	2.23		2.23	2.23	2.23	2.23	
Project II	MC601.5	Understand professional, ethical, legal, industry practices and responsibilities.						2.34	2.23	2.34	2.23	2.23	2.23	2.23	
IPR	1	Perform prior art and create intellectual asset	1.63	2.3		1.72							1.34		
	2	Validate idea and evaluate opportunity		2.3		1.72		1.79					1.34		
	3	Develop Budget and Profit and Loss Statement.				1.72		1.79					1.34		
	4	Develop Business Model and Plan.				1.72		1.79					1.34		
Internship at SPIT or Other Institute / Internship with Startup at TBI															



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**PO-PSO ATTAINMENT FOR THE BATCH 2020-2022 TWO YEAR PROGRAMME (IN-DIRECT ATTAINMENT)**

<b>Course Name</b>	<b>Course Outcome number</b>	<b>Course Outcome Description</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO 5</b>	<b>PO6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO1 2</b>	<b>PS O1</b>	<b>PS O2</b>	<b>PE O1</b>	<b>PE O2</b>	<b>PE O3</b>
Linear Algebra	MA501.1	Solve a homogeneous and non-homogeneous system of linear equations using rank of a matrix.	3	3		3					3								
	MA501.2	Solve system of linear equations by Numerical Methods.	3	3		3	3				3								
	MA501.3	Solve equations in real life problems and to encode and decode messages using the concept of matrices.	3	3		3	3		3										
	MA501.4	Identify whether given structures are vector spaces and subspaces and construct a basis for them.	3	3		3	3		3										
	MA501.5	Show if a given matrix is diagonalizable or not.	3	3		3	3		3		3								
	MA501.6	Apply concepts of eigenvalues and eigenvectors to calculate functions of a square matrix, Google page rank vector and solve systems of differential equations using diagonalisation of matrices.	3	3		3	3					3							



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Data Structures	MC501.1	Apply various operations of Stack, Queue and Linked List to solve problems from different domains.	3	3					2		1	
	MC501.2	Apply various operations of Tree and Graph to solve problems from different domains.	3	3					2		1	
	MC501.3	Make use of searching and hashing techniques for efficient data retrieval and data mapping.			3				2		1	
	MC501.4	Compare efficiency of various sorting algorithms.		3					2		1	
Database Management System	MC502.1	Design ER diagram and relational database.	1.78	1				0.89	1.78	3	1.83	
	MC502.2	Apply normalization on given database.	2.6	1.78				0.89	1.78	3		
	MC502.3	Analyze transaction and concurrency control mechanism.	2.6	1.78				0.89	1.78			
	MC502.4	Illustrate emerging database systems.	2.6	1.78				0.89	1.78		1.83	
	MC502.5	Formulate SQL queries for information retrieval.	2.6	1.78		2		0.89	1.78			
	MC502.6	Demonstrate various PL/SQL queries.	2.6	1.78		2		0.89	1.78	3	1.83	
	MC503.1	Analyze requirements for relevant process model.	0.91	1.83	3	2.75		1.73	2.75		1.83	



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Software Engineering	MC503.2	Design/Construct system models with Software Requirement Specification.	0.91	1.83	3	2.75		2.75		1.83	1.73		
	MC503.3	Apply estimation techniques for software planning	0.91	1.83		2.75		1.73	2.75	1.66	1.83	1.73	
	MC503.4	Apply umbrella activities for the Software.	0.91	1.83		2.75		1.73	2.75	1.66	1.83	1.73	
Web Technology Lab	MC504.1	Create web pages using HTML5, CSS3, and Java scripting.	3	3	3								
	MC504.2	Design web pages using Angular concepts and components.	3	3	3	3							
	MC504.3	Develop dynamic web pages using Node and Express js	3	3	3	3							
	MC504.4	Develop webpages and store it in database using node js	3	3	3	3							
Writing Skills	ASS01.1	Apply the principles of business writing for professional documents					3	3	3				
	ASS01.2	Develop advance vocabulary and grammar for spoken and written communication.					3	3	3				
	ASS01.3	Draft a formal report.					3	3	3				



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Proble m Solvin g Using Object Oriente d Progra mming Lab	MC505.1	Construct programs using basic control structures	3	3			2										
	MC505.2	Apply objects and structures in problem solving	3	3			2										
	MC505.3	Apply arrays and pointers efficiently to solve the problems	3	3			2										
	MC505.4	Design the solutions using inheritance and polymorphism.	3	3	1		2									1	
	MC505.5	Apply concepts of virtual functions, exception handling to create efficient solutions.	3	3			2										
	MC505.6	Construct the solutions using File handling and Standard Template Library	3	3	1		2									1	
Probab ility and Statisti cs	MA583.1	Apply different statistical measures on various types of data	1.5	1.5	1.5	1.5											
	MA583.2	Perform Hypothesis testing on the data given to validate the Assumptions	1.5	1.5	1.5	1.5											
	MA583.3	Illustrate basic probability axioms, rules and their applicability.	1.5	1.5	1.5	1.5											
	MA583.4	Apply probability distribution to solve given problems.	1.5	1.5	1.5	1.5											
	MC506.1	Build programming concept using OO constructs	2	2												2	



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Java Programming	MC506.2	Analyze real world problem for database connection and file handling using Exception handling	2	2	2	2		2	2	2			
	MC506.3	Develop Web Applications using JSP and servlets	2	2		2					2		
	MC506.4	Explain concept of Spring and Hibernate in advanced JAVA programming	2	2		2	2			2	2	2	2
Design and Analysis of Algorithms	MC507.1	Analyze time and space complexity of different algorithms	0.83	1	0.5	0.67		0.33					
	MC507.2	Analyze various divide & conquer algorithms	0.83	1	0.5	0.67		0.33					
	MC507.3	Apply greedy and dynamic method to given problem	0.83	1	0.5	0.67		0.33					
	MC507.4	Make use of backtracking, branch and bound techniques, graphs to solve a problem	0.83	1	0.5	0.67		0.33					
Process	MC508.1	Explain the basics of Process Automation	3										
	MC508.2	Analyze the methodologies and techniques used in Process Automation	2.67		2.5								
	MC508.3	Develop the BOTs using Process Automation		3		3		2		2			
	MC508.4	Explain different intelligent Process Automation techniques	3.267										

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Process Automation	MC508.5	Analyze the securities required for Process Automation	2.67	2.5								
Machine Learning	MC511.1	Explain basic concept and need of machine learning	2	2	1.33	1.33						
	MC511.2	Apply machine learning algorithms to solve the given problem	2	2	1.33	1.33	1.33	0.66				
	MC511.3	Explain various reinforcement learning techniques	2	2	1.33	1.33			0.66			
	MC511.4	Apply Dimensionality reduction techniques.	2	2	1.33	1.33	1.33	0.66				
	MC511.5	Make use of basic concepts of Python/R to solve given problems.	2	2	1.33		1.33					
Mobile Programming Lab	MC509.1	Install the ionic framework with all the dependencies					1.6	0.67			1.3	
	MC509.2	Create apps using the components of ionic framework and SASS stylesheet			1.5		1.6	0.67			1.3	
	MC509.3	Create apps using API's of ionic framework			1.5		1.6	0.67			1.3	
	MC509.4	Create apps with backend connectivity			1.5		1.6	0.67			1.3	
	ASS01.1	Demonstrate persuasive skills in interviews					3	2	3	1		



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Communication and Presentation Skills	AS502.2	Demonstrate creative and critical thinking in Group Discussions						3	2	3	1					
	AS502.3	Explain research, analysis and presentation skills						3	2	3	1					
	AS502.4	Apply data transformation skills						3	2	3	1					
Summer Project 1	AS602.1	Conduct literature survey in the preferred domain and formulate problem statements	3	2	3	3		3		2	3	3	2.75			
	AS602.2	Design the prototype.	3	2	3	3	3	3	3	3	3	3	2.75			
	AS602.3	Test the prototype and Analyse findings from obtained results.	3	2		3	3	3	3	3	3	3	2.75			
	AS602.4	Develop research inclination to solve societal problems.	3	2	3	3		3	3		3	3	2.75			
	AS602.5	Communicate findings effectively to the range of audience.	3	2	3	3	3	3	3		3	3	2.75			
MCS18	MCS18.1	Illustrate fundamentals of Cloud Computing.	2		1	1							2			
	MCS18.2	Analyze different virtualization techniques and their role in enabling the cloud computing system model.	2		1								2			
	MCS18.3	Categorize various Cloud architecture and infrastructure.	2	1	1		2						2			



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Cloud Computing	MCS18.4	Analyze security issues and synchronization protocols of cloud.	2	1	1	2							2
Computer Graphics		Apply output primitive algorithms on a given scenario	1.33	1.33			1.78						
		Apply 2D geometric transformation functions and clipping	1.33	1.33			1.78						
		Apply basics of 3D concepts and Fractals.	1.33		1.33								
		Apply image processing techniques in a given scenario		1.33		1.78							
Software Testing	MC 514.1	Apply various Software testing Techniques and strategies to find bugs in software	2	2	2	3					1	2	
	MC 514.2	Design test cases suitable in testing	2	2	2	3					1	2	
	MC 514.3	Apply test management and automation in testing environment	2	2	2	3		3	3		1	2	
	MC 514.4	Illustrate Agile Testing approach	2	2	2	3					1	2	



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Project II	MC681.1	Conduct a requirement analysis and formulate requirements in the preferred domain.	2.28	2.28	2.25	2.28		2.27	2.38	2.27	2.27	2.25	2.27	2.27		
		Develop the solution based on the requirement analysis.	2.28	2.28	2.25	2.28	2.12	2.27	2.12	2.27	2.27	2.25	2.27	2.27		
		Test prototypical solution using advanced tools	2.28	2.28		2.28	2.12	2.27	2.12	2.27	2.27	2.25	2.27	2.27		
		Develop effective interpersonal and communication skills in project development.	2.28	2.28	2.25	2.28		2.38	2.27		2.27	2.27		2.27	2.27	
		Understand professional, ethical, legal, industry practices and responsibilities.						2.38	2.27	2.38	2.27	2.27		2.27	2.27	
	MC681.5															
IPR	Perform prior art and create intellectual asset	1.33	2		1.5								1.31			
	Validate idea and evaluate opportunity			2		1.5			1.56				1.31			1.33
	Develop Budget and Profit and Loss Statement.					1.5			1.56				1.31			
	Develop Business Model and Plan.						1.5		1.56				1.31			
Course Name	Course Outcome number	Course Outcome Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	SO1	SO2
Other Institut e																

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Internship with Startup at TBI											



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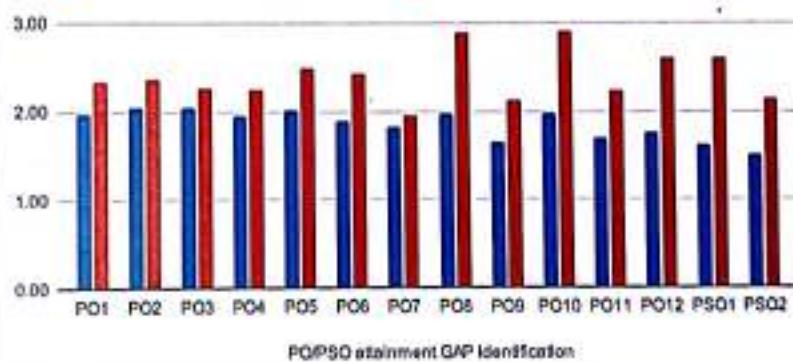
Bharatlyn Vidyabhavan  
**Sardar Patel Institute of Technology**  
 Munshi Nagar, Andheri(W), Mumbai-400058  
 (Autonomous College Affiliated to University of Mumbai)

For Batch 2019-22

PO/PSO attainment GAP identification	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
average PO/PSO (direct) 2019-22 batch	1.96	2.05	2.05	1.95	2.01	1.88	1.83	1.96	1.65	1.96	1.70	1.76	1.62	1.50
average PO/PSO (in-direct) 2019-22 batch	2.34	2.36	2.28	2.25	2.50	2.43	1.94	2.89	2.12	2.91	2.24	2.61	2.81	2.14

average PO/PSO (direct) 2019-22 batch and average PO/PSO (in-direct) 2019-22 batch

■ average PO/PSO (direct) 2019-22 batch ■ average PO/PSO (in-direct) 2019-22 batch



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**PO-PSO ATTAINMENT FOR THE BATCH 2019-2022 Three YEAR PROGRAMME (DIRECT ATTAINMENT)**

Year	Semester	Course ID	Course Name	Course Outcome number	Course Outcome Description	PO 1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PS O1	PS O2
MCA11	Object Oriented Programming	MCA11.6	Object Oriented Programming	MCA11.1	Construct programs using C++	1.11	1.67			1.11	0.56		1.11						
				MCA11.2	Make use of objects and classes	1.11	1.67			1.11	0.56		1.11						
				MCA11.3	Use arrays and pointers effectively	1.11	1.67			1.11	0.56		1.11						
				MCA11.4	Design the solutions using inheritance	1.11	1.67			1.11	0.56	0.56	1.11						
				MCA11.5	Apply concepts of virtual functions	1.11	1.67			1.11	0.56		1.11						
				MCA11.6	Construct the solutions using template library	1.11	1.67			1.11	0.56		1.11						
	Software Engineering	MCA12	Software Engineering	MCA 12.1	Identify process model for given problem	2.6									2.31	1.85			
				MCA 12.2	Design and Develop Software Project	1.8									2.31	1.85			
				MCA 12.3	Formulate Project Plan and Estimate techniques	1.85									2.31	1.85			
				MCA 12.4	Evaluate Quality of Software and its maintenance	1.85									2.31	1.85			
MCA13	Mathematics for Engineers	MCA13	Mathematics for Engineers	MCA13.1	Develop mathematical models for engineering problems	1.5	1.5	1.5	1.5										
				MCA13.2	Analyze number of logical operations	1.5	1.5	1.5	1.5										
				MCA13.3	Formulate problems of graphical representation	1.5	1.5	1.5	1.5										
				MCA13.4	Formulate problems of real life situations	1.5	1.5	1.5	1.5										
				MCA13.5	Construct Grammars, languages and automata	1.5	1.5	1.5	1.5										
				MCA13.6	Construct theoretical designs	1.5	1.5	1.5	1.5										
	Principles of Management	MCA14	Principles of Management	MCA14.1	Explain management evolution and management's role in society	2				2		2	2	2	2				
				MCA14.2	Explain social responsibility and ethical issues involved in management	2				2		2	2	2	2				
				MCA14.3	Analyze the importance and nature of planning	2				2		2	2	2	2				
				MCA14.4	Analyze how organizations adapt to an uncertain environment	2				2		2	2	2	2				
				MCA14.5	Develop leadership styles to anticipate the consequences	2				2		2	2	2	2				
				MCA14.6	Explain the changes in the organizations	2				2		2	2	2	2				
				MCA 15.1	Demonstrate broad and critical thinking	1.7								2.55	1.7				



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	MCA 15.2	Integrate technical and co	1.7					2.55	1.7				
	MCA 15.3	Analyze credit ratings in	1.7					2.55	1.7				
	MCA 15.4	Explain Deposit accounts	1.7					2.55	1.7				
	MCA 15.5	Explain various Banking	1.7					2.55	1.7				
	MCA 15.6	Analyze Lending Scheme	1.7					2.55	1.7				
MCA15.g and F													
	MCAL11.1	Demonstrate use of contr	2	2		2	2	2					
	MCAL11.2	Implement dynamic mem	2	2		2	2	2					
	MCAL11.3	Implement polymorphism	2	2		2	2	2					
	MCAL11.4	Demonstrate use of Stan	2	2		2	2	2	2				
MCAL11.ed Prog													
	MCAL16.1	Develop static web site	2.67	1	1.67	3	2						
	MCAL16.2	Develop responsive, mo	2.67	1	1.67	3	2						
	MCAL16.3	Build dynamic web site	2.67	1	1.67	3	2						
	MCAL16.4	Apply PHP framework	2.67	1	1.67	3	2	1.5					
MCAL16.technolo													
	MCAL17.1	Understand the basic sy	3	3	3	3	3	3					
	MCAL17.2	Apply Linux command	3	3	3	3	3	3					
	MCAL17.3	Demonstrate various Et	3	3	3	3	3	3					
	MCAL17.4	Implement network con	3	3	3	3	3	3					
MCAL17.linux Lab													
I	MCAP17ini Project	Formulate a real world	1.5	1.75	2.25	2	2	1.5	1.75	1.5	1.71	1.5	1.751.75
		Develop a design soluti	1.5	1.75	2.25	2	2	1.5	1.75	1.5	1.71	1.5	1.751.75
		Test the prototype again	1.5	1.75	2.25	2	2	1.5	1.75	1.5	1.71	1.5	1.751.75
		Develop effective comm	1.5	1.75	2.25	2	2	1.5	1.75	1.5	1.71	1.5	1.751.75



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		MCA21.1	To study fundamentals	2								
		MCA21.2	To analyze process management	3	3							
		MCA21.3	To analyze memory management	3	3							
		MCA21.4	To study file systems and	2								
		MCA22.1	Examine the fundamentals	2.2	2.41							
		MCA22.2	categorize different Internetwork	2.41	2.2				0.69	0.69		
		MCA22.3	Analyze various protocols , ser	2.41	2.2							
		MCA22.4	Adapt various TCP/IP Alg	2.2		2.2						
		MCA23.1	Compare Efficiency of va	2	2						1.33	
		MCA23.2	Make use of searching an	2	2						1.33	
		MCA23.3	Apply various operations	2	2						1.33	
		MCA23.4	Apply creative thinking to	2	2						1.33	
		MCA24.1	Make use of knowledge of Project Life Cycle to successfully imple	2.41	1.6	2.41	1.6					
		MCA24.2	Identify the inputs, tools and techniques to get the required Projec	2.41	1.6	2.41	1.6					
		MCA24.3	Explain the 47 Project Management Processes defined by PMBOK	2.41	1.6	2.41	1.6					
		MCA24.4	Analyze the project management processes needs to successfully	2.41	1.6	2.41	1.6					
		MCA25.1	Distinguish between quanti	1.5	1.5	1.5	1.5					
		MCA25.2	Apply different statistical	1.5	1.5	1.5	1.5					
		MCA25.3	Identify, formulate and te	1.5	1.5	1.5	1.5					
		MCA25.4	Analyze different types of	1.5	1.5	1.5	1.5					
		MCA25.5	Apply discrete probability	1.5	1.5	1.5	1.5					
		MCA25.6	Apply continuous probab	1.5	1.5	1.5	1.5					
		MCL22.1	implement error correctio	3	3			3				
		MCL22.2	Configuring various netw	3		3		3		1	1	



102  
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019-2 II	MCAP21	MCAL22er Network	MCL22.3	Use and demonstrate Networking tools	3	3			1	1	1
			MCAL23.1	Develop various sorting techniques	1		0.67			0.67	0.67
			MCAL23.2	Apply searching and hashing	1		0.67			0.67	0.67
			MCAL23.3	Develop various operations	1		0.67			0.67	0.67
			MCAL23.4	Build binary tree and its variants	1		0.67			0.67	0.67
		MCAL26 program	MCAL23.5	Develop graph traversal techniques	1		0.67			0.67	0.67
			MCAL26.1	Make use of data types	3	3		3			
			MCAL26.2	Create functions, modules	3	3	3	3			
			MCAL26.3	Apply Object oriented programming	3	3	3	3			
			MCAL26.4	Design GUI applications	3	3	3	3			
			MCAL26.5	Understand advanced Programming	3	3	3	3			1
		Mini Project II	MCAP21.1	Formulate a real world problem	2	2	2	2	2	2	2
			MCAP21.2	Develop a design solution	2	2	2	2	2	2	2
			MCAP21.3	Test the prototype again	2	2	2	2	2	2	2
			MCAP21.4	Develop effective communication	2	2	2	2	2	2	2
		Core and Advanced Java	MCA31.1	To build programming using Java	2.475	2.475	2.5				
			MCA31.2	Analyze real world problem for Java	2.475	2.475	1.66	2.5	2.55		
			MCA31.3	Develop Web Applications using Java	2.475	2.475	1.66	2.5	2.25		2.25
			MCA31.4	To develop application using EJB	2.475	2.475	1.66	2.5	2.25	2.55	
										3	2.25
		Database Management System	MCA32.1	Design ER diagram and relations	1.88	1				0.94	1.83
			MCA32.2	Apply normalization on given ER diagram	2.79	1.88				0.94	1.83
			MCA32.3	Analyze transaction and locking	2.79	1.88				0.94	
			MCA32.4	Understand storage and indexing	2.79	1.88					
			MCA32.5	Illustrate emerging database technologies	2.79	1.88					



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Operations Research	MCA23.1	Apply Operations research	1.9	1.9		
	MCA23.2	Use mathematics and mathematical methods	1.9			
	MCA23.3	To solve optimization problems	1.9			
	MCA23.4	Think of new methods for solving	1.9			
Soft Skills Development	CO1	Develop skills in communication, business correspondence and presentation	2	3		
	CO2	Apply valuable strategies and interpersonal skills there	2		3	
	CO3	Understand the importance of teamwork and learn to work in a team	2		3	
Artificial Intelligence	MCAE35B	Understand basic architecture of AI	2.12	2.12	2.12	
	MCAE35B	Apply appropriate methods to solve AI problems	2.12	2.12	2.12	2.15
	MCAE35B	Analyze the problem statement and find the solution	2.12	2.12	2.2	2.15
	MCAE35B	Apply planning techniques to solve AI problems	2.12	2.12	2.12	2.15
	MCAE35B	Design the AI application	2.12	2.12	2.12	2.15
Advanced Java Lab	MCAL31.1	Apply the basic object-oriented concepts	3	3	3	
	MCAL31.2	Implement Database connectivity	3	3	2	2
	MCAL31.3	Develop web applications using JSP	3	3	2	2
	MCAL31.4	Apply EJB, Spring and hibernate	3	3	2	2
	MCAL31.5	Apply the basic object-oriented concepts	3	3	3	
Database Management Systems	MCAL32.1	Apply SQL statements	2.6	1.73	0.87	0.87
	MCAL32.2	Apply PL/SQL concepts	2.6	1.73	0.87	0.87
	MCAL32.3	Demonstrate MongoDB	2.6	1.73	0.87	0.87



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System Lab	MCAL32.4	Demonstrate Cassandra	2.6	1.73		0.87						0.87
	MCAL36.2	Illustrate the use of UML	1.93			2.9			0.96			0.96
	MCAL36.2	Construct Behavioral diag.	1.93	1.93	1.93	2.9			0.96			0.96
	MCAL36.3	Construct Structural diag.	1.93	1.93	1.93	2.9			0.96			0.96
	MCAL36.4	Analyze real world prob.	1.93	1.93		2.9			0.96			0.96
Technology Entrepreneurship Lab												
		Identify problems world	1.33	2					2			
		Craft value proposition.			1.33					2.18		
		Prepare B-Plan		0.66	1.33					2.18		
		Draft Patent								2.18	1.83	
Mini Project 3		Register virtual company				2.75			2.18	1.83		
	MCA P31.1	Formulate a real world	2.11	2.11	2.11	2.11		2.11	2.11	2.11	2.11	2.11
	MCA P31.2	Develop a design solut	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77
	MCA P31.3	Test the prototype against id	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11
	MCA P31.4	Develop effective communication skills	2.11	2.11	2.11	2.11		2.11	2.11	2.11	2.11	2.11
Computational Intelligence I	MCA41.1	To search and plan suit	1.95	1.95	1.95	1.95						
	MCA41.2	To design Neural Netw	1.95	1.95	1.95	1.95						
	MCA41.3	To design fuzzy control	1.95	1.95	1.95	1.95	1.98					
	MCA41.4	To apply Genetic Progr	1.95	1.95	1.95	1.95	1.98					
	MCA41.5	To create hybrid model	1.95	1.95	1.95	1.95	1.98			1.98		
	MCA41.6	To apply computational	1.95	1.95	1.95	1.95				1.98	1.98	
Testing and Quality	CO1	Examine the role of Tes	1.43	1.43								
	CO2	Apply static and dynam	1.43	1.43					0.72	0.72		



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y Assur ance	CO3	Make use of test manag	1.43	1.43					0.72	0.72		
	CO4	Apply various Software	1.43	1.43					0.72	0.72		
Desig n and Analy sis of Algori thm	MCA33.1	Analyze time and space	2.06	2.06		2.06	2.06		2.13			
	MCA33.2	Demonstrate the applic	2.06	2.06		2.06	2.06		2.13			
	MCA33.3	Apply greedy and dyna	2.06	2.06		2.06	2.06		2.13			
	MCA33.4	Evaluate backtracking	2.06	2.06		2.06	2.06	2.27	2.13			
	MCA33.5	Demonstrate graph and	2.06	2.06		2.06	2.06	2.27	2.13			
	MCA33.6	Compare P and NP problems		2.47					2.13			
User Experi ence Desig n	MCA44.1	Understand HMI as bas	1.51									
	MCA44.2	Explain UX design life	1.51	1.77								
	MCA44.3	Analyze UX design process	1.77									
	MCA44.4	Analyze various parameters	1.77									
	MCA44.5	Evaluate UX design pr	1.51			1.33		1.33				
	MCA44.6	Understand UX design	1.51								1.33	
Natur al Langu age Proce ssing	MCAE45B.1	Understand the basics of	2.01	2.01		2.01						
	MCAE45B.2	Apply mathematical techn	2.01	2.01		2.01	1.85				2.01	
	MCAE45B.3	Analyze various NLP alg	2.01	2.01		2.01	1.85					
	MCAE45B.4	Analyze the text mining M	2.01	2.01		2.01						
Comp utatio nal Intelli gence I Lab	MCAL4.1	Understand the difference betw	2.8	2.8		2.8						
	MCAL4.2	To design Neural Network	2.75	2.8	2.8	2.75	2.8		1			
	MCAL4.3	To analyze the application	2.75	2.8	2.8	2.75	2.8				2	
	MCAL4.4	Understand the basics of	2.75	2.8	2.8	2.75	2.8				2	
	MCAL4.5	Appreciate the importance	2.75	2.8	2.8	2.75	2.8			1	2	
Testin g	MCAL42.1	Apply automation testing	1.84	1.84			2.7		0.92		0.92	



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<b>Assurance Lab</b>	MCAL42.2	Apply bug tracking tool	1.84	1.84		2.7			0.92			0.92
	MCAL42.3	Apply mobile testing tool	1.84	1.84		2.7			0.92			0.92
	MCAL42.4	Apply behavior testing	1.84	1.84		2.7			0.92			0.92
<b>Design and Analysis of Algorithm Lab</b>	MCAL33.1	Demonstrate the application	1.75	1.75		1.75	1.75	1.75				
	MCAL33.2	Apply greedy and dynamic programming	1.75	1.75		1.75	1.75	1.75				
	MCAL33.3	Evaluate backtracking	1.75	1.75		1.75	1.75	1.75				
	MCAL33.4	Demonstrate graph and tree search	1.75	1.75		1.75	1.75	2	1.75			
<b>Mobile Application Development Lab (NPTEL L)</b>	MC509.1	Install the ionic framework	1.5			2						
	MC509.2	Create apps using the command line	1.5	1.33		2						
	MC509.3	Create apps using API's	1.5	1.33	1.33	2						
	MC509.4	Create apps with backend	1.5	1.33	1.33	2						
			1.5	1.33								
<b>Mini Project 4</b>	MCA P41.1	Formulate a real world problem	1.94	1.34	1.34	1.39		1.39	1.36	1.34	1.39	1.39
	MCA P41.2	Develop a design solution	1.94	1.34	1.34	1.39	1.55	1.35	1.39	1.33	1.36	1.34
	MCA P41.3	Test the prototype against industry standards	1.34	1.34	1.39	1.55	1.35	1.39	1.33		1.34	1.39
	MCA P41.4	Develop effective communication skills	1.39	1.55	1.35	1.39		1.36		1.39	1.55	1.55
<b>Distributed Computing and Cloud Computing</b>	MCA51.1	Apply principles and concepts	2.87	2.98					0.99	0.99	0.99	
	MCA51.2	Apply clock synchronization	2.87	2.98	1.98				0.99	0.99	0.99	
	MCA51.3	Analyze Distributed file systems	2.87	2.98					0.99	0.99	0.99	
	MCA51.4	Illustrate the fundamentals	2.87	2.98					0.99	0.99	0.99	
	CO1	Recognize the importance of distributed computing	1.7	2.24	2.44							

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Computational Intelligence II	CO2	Build statistical models analysis	1.7	2.24	2.44	3		0.86					
	CO3	Apply machine learning	1.7	2.24	2.44	3		0.86					
	CO4	Apply machine learning	1.7	2.24	2.44	3		0.86					
	CO5	Develop awareness of science	1.7				0.99	0.86					
Internet of Things	CO1	Relate the concept of IoT	2.67	2.67		1.78	0.89	1.78					
	CO2	Design the IoT Reference	2.67	2.67		1.78	0.89	1.78					
	CO3	Compare various IoT Protocols	2.67	2.67		1.78	0.89	1.78					
	CO4	Build State of the Art – IoT	2.67	2.67		1.78	0.89	0.89	1.78				
Deep Learning	MCAE53B.1	Understanding the basic concepts of Deep Learning	1.65	1.586	1.265								
	MCAE53B.2	Analyzing Deep Feedforward Networks	1.65	1.586	1.265		1.10		1.23				
	MCAE53B.3	Applying Convolutional Neural Networks on a given scenario	1.65	1.586	1.265	0.994							
	MCAE53B.4	Analyzing Autoencoders	1.65	1.586	1.265		1.10		1.23				
	MCAE53B.5	Evaluating Deep Learning Models	1.65	1.586	1.265	0.994	1.10		1.23				
	MCAL51.1	Develop RPC and RMI on Java	1.98	2.11			2.11						
Cloud Computing Lab	MCAL51.2	Analyze Clock Synchronization	1.98	2.11		1.32	2.11						
	MCAL51.3	Apply Shared memory architecture	1.98	2.11			2.11						
	MCAL51.4	Analyze various case studies of Cloud Computing	1.98	2.11			2.11						0.83
Computational Intelligence II Lab	CO1	Apply basic concepts of Machine Learning	1.77	2.36	2.58								
	CO2	Carry out data manipulation	1.77	2.36	2.58	1.46		0.89					
	CO3	Apply Machine learning	1.77	2.36	2.58	1.46		0.89					
	CO4	Build recommendation system	1.77	2.36	2.58	1.46		0.89					
	CO5	Build responsive Layout	1.77				0.99	0.89					



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Animation and Graphic Design Lab	MCAL53.1	Install blender software	0.5			1.95						
	MCAL53.2	Demonstrate 3D space and cameras	0.85		1.95					1.4		
	MCAL53.3	Implement window types and edit	0.85		1.95					1.4		
	MCAL53.4	Implement Mesh objects using mc	0.85		1.95					1.4		
	MCAL53.5	Develop animation on the given sc	0.85		1.95					1.4	0.75	

5	Mini Project 5	MCA P51.1	Formulate a real world	1.77	1.77	1.77	1.77		1.77	1.77	1.77	1.77	1.77	
		MCA P51.2	Develop a design soluti	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	
		MCA P51.3	Test the prototype against id	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	
		MCA P51.4	Develop effective communication skills	1.77	1.77	1.77	1.77		1.77	1.77	1.77	1.77	1.77	
6	Internship Project	MCASP61.1	Apply programming conc	2		2							2	
		MCASP61.2	Apply the software engineering	2	2		2				2			2
		MCASP61.3	Apply the software project management pro	2	2			2				2	2	
		MCASP61.4	Apply technical communication effectively in the organ			2			2			2	2	
		MCASP61.5	Use professional ethics in application development			2			2			2		
		MCASP61.6	Develop skills for working in the team and for life-long learnin			2				2				
Seminar - Research paper	MCASP62.1	Understand structure of research papers					3			3				
	MCASP62.2	Identify problem to carry out research		3										
	MCASP62.3	Review and compile current/recent research to articulat			3			3	3					
	MCASP62.4	Explore and enhance research study		3	3				3	3	3		3	
	MCASP62.5	Evaluate obtained result of r	3		3				3				3	

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**PO-PSO ATTAINMENT FOR THE BATCH 2019-2022 Three YEAR PROGRAMME (IN-DIRECT ATTAINMENT)**

Year	Semester	Course ID	Course Name	Faculty In-Charge	Course Outcome number	Course Outcome Description	PO-PSO Attainment												
							PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS 01
2019-2020	Semester-I	MCA11	Object Oriented Programming	Prof. Dr. Purnima Raut	MCA11.1	Construct programs using basic control structures	1.33	2	1.33	0.67	1.33								
					MCA11.2	Make use of objects and structures in problem solving	1.33	2	1.33	0.67	1.33								
					MCA11.3	Use arrays and pointers efficiently to solve the problem	1.33	2	1.33	0.67	1.33								
					MCA11.4	Design the solutions using Inheritance and polymorphism	1.33	2	1.33	0.67	0.67	1.33							
					MCA11.5	Apply concepts of virtual functions, exception handling	1.33	2	1.33	0.67	1.33								
					MCA11.6	Construct the solutions using File handling and Standard Template Library.	1.33	2	1.33	0.67	1.33								
2019-2020	Semester-II	MCA12	Software Engineering	Dr. Shital Manek	MCA 12.1	Identify process model for given problem		3								1.67	1.67		
					MCA 12.2	Design and Develop Software Project			3							1.67	1.67		
					MCA 12.3	Formulate Project Plan and Estimate Techniques				1.34						1.67	1.67		
					MCA 12.4	Evaluate Quality of Software and its maintenance				1.34						1.67	1.67		
					MCA13.1	Develop mathematical and logical thinking	1.5	1.5	1.5	1.5									
					MCA13.2	Analyse number of logical possibilities and probabilities	1.5	1.5	1.5	1.5									
2019-2020	Semester-III	MCA13	Discrete Mathematics / Prof. Dr. S. K. Srivastava		MCA13.3	Formulate problems of graphs, trees	1.5	1.5	1.5	1.5									
					MCA13.4	Formulate problems of recursive relations	1.5	1.5	1.5	1.5									
					MCA13.5	Construct Grammars, languages	1.5	1.5	1.5	1.5									
					MCA13.6	Construct theoretical designs	1.5	1.5	1.5	1.5									
					MCA14.1	Explain management evolution and management's four functions			3		3	3	3	3					
					MCA14.2	Explain social responsibility and ethical issues involved in business situations			3		3	3	3	3					
2019-2020	Semester-IV	MCA14	Principles of Management	Dr. Mayura N. Patel	MCA14.3	Analyze the importance and nature of planning				3		3	3	3	3				
					MCA14.4	Analyze how organizations adapt to an uncertain environment				3		3	3	3	3				
					MCA14.5	Develop leadership styles to anticipate the consequences of each leader				3		3	3	3	3				
					MCA14.6	Explain the changes in the organizations				3		3	3	3	3				
					MCA 15.1	Demonstrate broad and coherent knowledge of the Financial Services Industry	2							3	2				
					MCA 15.2	Integrate technical and conceptual knowledge to work effectively within the Financial Services Industry	2							3	2				
2019-2020	Semester-V	MCA15	Financial Services	Dr. S. Chaudhary	MCA 15.3	Analyze credit ratings in India	2							3	2				
					MCA 15.4	Explain Deposit accounts and money	2							3	2				
					MCA 15.5	Explain various Banking Services	2							3	2				



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	MCA15	ing and Finance Naga	MCA 15.6	Analyze Lending Scheme and Foreign Exchange	2					3	2		
MCAL11	Object Oriented Programming	Raju	MCAL11.1	Demonstrate use of control structures and derived classes.	2	2	2	2	2				
			MCAL11.2	Implement dynamic memory management techniques, pointers, constructors, destructors etc.	2	2	2	2	2				
			MCAL11.3	Implement polymorphism and inheritance.	2	2	2	2	2				
			MCAL11.4	Demonstrate use of Standard Template Library, File exception handling.	2	2	2	2	2				
MCAL16	Web Technology	Pallavi Th	MCAL16.1	Develop static web sites using HTML5, CSS3, and Client side scripting.	2.67	1.167	3	2					
			MCAL16.2	Develop responsive, mobile-first web sites using Bootstrap.	2.67	1.167	3	2					
			MCAL16.3	Build dynamic web sites using open source technology.	2.67	1.167	3	2					
			MCAL16.4	Apply PHP framework to build dynamic website.	2.67	1.167	3	2	1.5				
MCAL17	Linux Lab	Bakira Sa	MCAL17.1	Understand the basic system configuration and administration.	3	3	3	3	3	3			
			MCAL17.2	Apply Linux commands for user administration.	3	3	3	3	3	3			
			MCAL17.3	Demonstrate various Editors and software Management.	3	3	3	3	3	3			
			MCAL17.4	Implement network configuration and server.	3	3	3	3	3	3			
I	MCA11/ini Project	I. Prachi D		Postulate a real world problem and develop its requirements.	3	3	3	3	3	3	3	3	3
				Develop a design solution for the identified requirements.	3	3	3	3	3	3	3	3	3
				Test the prototype against identified requirements.	3	3	3	3	3	3	3	3	3
				Develop effective communication skills for presentation of project related activities.	3	3	3	3	3	3	3	3	3
			MCA21.1	To study fundamentals of operating system design and system software.	2								
			MCA21.2	To analyse process management and concurrency control.	3	3							



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			MCA21.3	To analyse memory management and I/O techniques.		3	3													
			MCA21.4	To study file systems and protection & security concepts.		2														
MCA21	Operating Syst. (Parallel Th)		MCA22.1	Analyze the fundamental concepts of digital logic	3	3														
			MCA22.2	Categorize different Internetworking devices , topologies	3	3														
			MCA22.3	Analyze various protocols , services and features of the	3	3														
			MCA22.4	Adopt various TCP/IP Algorithms	3	3														
MCA22	Computer Networks (Data Netw)		MCA23.1	Compare Efficiency of various sorting algorithms.	3	3														
			MCA23.2	Make use of searching and hashing techniques to	3	3														
			MCA23.3	Apply various operations of Linear data structures	3	3														
			MCA23.4	Apply creative thinking to solve problems from diff	3	3														
MCA23	Data Structure (Serial KA)																			
			MCA24.1	Make use of knowledge of Project Life Cycle to successfully implement the projects in the corporate world.											3	2	3	2		
			MCA24.2	Identify the inputs, tools and techniques to get the required Project deliverables and product deliverables using 10 Knowledge areas of project management.											3	2	3	2		
			MCA24.3	Explain the 47 Project Management Processes defined by PMBOK											3	2	3	2		
			MCA24.4	Analyze the project management processes needs to successfully complete project in IT industry.											3	2	3	2		
MCA24	Project Manag. (NII Dev)																			
			MCA25.1	Distinguish between quantitative and categorical data	1.5	1.5	1.5	1.5												
			MCA25.2	Apply different statistical measures on variability	1.5	1.5	1.5	1.5												
			MCA25.3	Identify, formulate and test hypothesis problems	1.5	1.5	1.5	1.5												
			MCA25.4	Analyze different types of Probability and their formulae	1.5	1.5	1.5	1.5												
			MCA25.5	Apply discrete probability distribution to real problems	1.5	1.5	1.5	1.5												
			MCA25.6	Apply continuous probability distribution to real problems	1.5	1.5	1.5	1.5												
MCA25	Statistics and Stochastic / Prob		MCL22.1	Implement error correction and detection	3	3										1	1			
			MCL22.2	Configuring various network Protocols	3	3										1	1			



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2019-20	II	MCAJ21	Prachi D	Mini Project II	Pallavi Th	Harshil K	Wita M	MCAL22 User Network	MCAL23 Structures	MCAL22.3	Use and demonstrate Networking tools			3	3		1	1	1
										MCAL23.1	Develop various sorting techniques.	3		2				2	2
										MCAL23.2	Apply searching and hashing techniques for efficient data retrieval.	3		2				2	2
										MCAL23.3	Develop various operations of linear data structures i.e. stack, queue, linked list etc.	3		2				2	2
										MCAL23.4	Build binary tree and its variants.	3		2				2	2
										MCAL23.5	Develop graph traversal techniques.	3		2				2	2
										MCAL26.1	Make use of data types in Python programs.	3	3	3					
										MCAL26.2	Create functions, modules.	3	3	3	3				
										MCAL26.3	Apply Object oriented features in Python programs.	3	3	3	3				
										MCAL26.4	Design GUI application with database connectivity.	3	3	3	3				
										MCAL26.5	Understand advanced Python concepts.	3	3	3	3				1
										MCAP21.1	Formulate a real world problem and develop a solution.	3	3	3	3	3	3	3	3
										MCAP21.2	Develop a design solution for the identified requirements.	3	3	3	3	3	3	3	3
										MCAP21.3	Test the prototype against identified requirements.	3	3	3	3	3	3	3	3
										MCAP21.4	Develop effective communication skills for presentation.	3	3	3	3	3	3	3	3
										MCA31.1	To build programming using basic constructs such as data types, encapsulation, inheritance, Polymorphism and Exception handling.	3	3	3					
										MCA31.2	Analyze real world problem for Generic classes with database connection and file handling using JAVA concepts.	3	3	2	3	1			
										MCA31.3	Develop Web Applications using JSP and servlets.	3	3	2	3	1		1	1
										MCA31.4	To develop application using EJB, Spring and Hibernate.	3	3	2	3	1	1		1
										MCA32.1	Design ER diagram and relational database.	2	1					1	2
										MCA32.2	Apply normalization on given database.	3	2					1	2
										MCA32.3	Analyze transaction and concurrency control mechanism.	3	2					1	
										MCA32.4	Understand storage and security mechanism.	3	2						
										MCA32.5	Illustrate emerging database systems.	3	2						
										MCA23.1	Apply Operations research methodology to a broad range of problems.	1	1						



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Operatio- ns Research		MCA23.2	Use mathematics and mathematical modeling using computers to forecast the implications of various choices.	1							
		MCA23.3	To solve optimization problems.	1							
		MCA23.4	Think of new methods for solving optimization problem	1							
Soft Skills Develop- ment		CO1	Develop skills in communication, business correspondence, presentation, etc.	2		3					
		CO2	Apply valuable strategies and interpersonal skills thereby making themselves more effective.	2			3				
		CO3	Understand the importance of teamwork and learn to perform to the best.	2			3				
Artificial Intelli- gence		MCAE35B	Understand basic architectures of AI intelligent systems.	3	3	3					3
		MCAE35B	Apply appropriate method and knowledge representation for solving AI problems.	3	3	3	3				3
		MCAE35B	Analyze the problem using logic, inferences and reasoning.	3	3	3	3	3			3
		MCAE35B	Apply planning techniques to solve domain problems.	3	3	3	3	3			3
		MCAE35B	Design the AI applications in real world scenarios.	3	3	3	3				3
Core and Advance- d Java Lab		MCAL31.1	Apply the basic object-oriented features of JAVA and its applications.	3	3	3					3
		MCAL31.2	Implement Database connectivity and file handling concepts in JAVA.	3	3	3	3				3
		MCAL31.3	Develop web applications using servlet and JSP in JAVA.	3	3	3	3				3
		MCAL31.4	Apply EJB, Spring and hibernate framework to solve problems.	3	3	3	3				3
		MCAL31.5	Apply the basic object oriented features of JAVA and its applications.	3	3	3					
Database Manage- ment System Lab		MCAL32.1	Apply SQL statements on database.	3	3	1					1
		MCAL32.2	Apply PL/SQL concepts for processing database.	3	2	1					1
		MCAL32.3	Demonstrate MongoDB database.	3	2	1					1
		MCAL32.4	Demonstrate Cassandra Database.	3	2	1					1
Unified Modeling Languag- e Lab		MCAL36.2	Illustrate the use of UML using industrial CASE tools.	2		3	1				1
		MCAL36.2	Construct Behavioral diagrams of UML to model the system.	2	2	2	3	1			1
		MCAL36.3	Construct Structural diagrams to model the design.	2	2	2	3	1			1
		MCAL36.4	Analyze real world problems using UML diagram.	2	2	2	3	1			1
			Identify problems worth solving.	2	3						



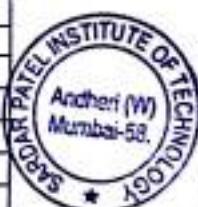
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Technolo gy Enterpre neurship Lab		Craft value proposition.		2					2.75		
		Prepare B-Plan		1	2				2.75		
		Draft Patent							2.75		
		Register virtual company					3		2.75	2	
									2.75	2	
3		MCA P31.1	Formulate a real world problem and develop its solution.	3	3	3	3	3	3	3	3
		MCA P31.2	Develop a design solution for the identified requirements.	3	3	3	3	3	3	3	3
		MCA P31.3	Test the prototype against identified requirements.	3	3	3	3	3	3	3	3
		MCA P31.4	Develop effective communication skills for presentation of project.	3	3	3	3	3	3	3	3
		Mini Project 3									
		MCA41.1	To search and plan suitability of different computing models.	2	2	2	2				
		MCA41.2	To design Neural Networks and Convolutional Neural Networks.	2	2	2	2				
		MCA41.3	To design fuzzy controllers for various applications.	2	2	2	2				
		MCA41.4	To apply Genetic Programming concept on real time problems.	2	2	2	2				
Computational Intelligence		MCA41.5	To create hybrid model using soft computing.	2	2	2	2			2	
		MCA41.6	To apply computational intelligence techniques.	2	2	2	2			2	2
		CO1	Examine the role of Testing Life Cycle and its phases.	2	2						
		CO2	Apply static and dynamic software testing techniques.	2	2				1	1	
		CO3	Make use of test management and automation tools.	2	2				1	1	
Software Testing and Quality Assurance		CO4	Apply various Software Quality Assurance Techniques.	2	2				1	1	1
		MCA33.1	Analyze time and space complexity of different algorithms.	2	2	2	2	1.8			
		MCA33.2	Demonstrate the applicability of divide & conquer algorithm.	2	2	2	2	1.8			
Design and Analysis of Algorithm		MCA33.3	Apply greedy and dynamic method to given problems.	2	2	2	2	1.8			
		MCA33.4	Evaluate backtracking and branch and bound methods.	2	2	2	2	1.8			
		MCA33.5	Demonstrate graph and string matching algorithms.	2	2	2	2	1.8			
		MCA33.6	Compare P and NP problems.			1		1.8			
		MCA44.1	Understand UI/UX as basic for UX.	2.5							
User		MCA44.2	Explain UX design life cycle.	2.5	2.66						
		MCA44.3	Analyze UX design process for users.	2.66							
		MCA44.4	Analyze various parameters for design process.	2.66							
		MCA44.5	Evaluate UX design process.	2.5		2	2				



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Experienc e Design	MCA44.6	Understand UX design for Agile development	2.5									2
	MCAE45B.1	Understand the basics of NLP and text process	3	3	3							
Natural Languag e Processing	MCAE45B.2	Apply mathematical techniques that are required for NLP	3	3	3	3						3
	MCAE45B.3	Analyze various NLP algorithms.	3	3	3	3						
	MCAE45B.4	Analyze the text mining NLP applications.	3	3	3							
	MCAL4.1	Understand the difference between learning and programming and explore practical applications of Neural Networks (NN).	3	3	3							
Computat iona l Intelligence Lab	MCAL4.2	To design Neural Networks	3	3	3	3	3		3			3
	MCAL4.3	To analyze the applications which can use fuzzy logic	3	3	3	3	3					3
	MCAL4.4	Understand the basics of genetic algorithm, use of	3	3	3	3	3					3
	MCAL4.5	Appreciate the importance of hybrid approach.	3	3	3	3	3			3		3
Testing and Quality Assurance Lab	MCAL42.1	Apply automation testing tool for web based application	2	2		3			1			1
	MCAL42.2	Apply bug tracking tool.	2	2		3			1			1
	MCAL42.3	Apply mobile testing tool.	2	2		3			1			1
	MCAL42.4	Apply behavior testing tool and test management	2	2		3			1			1
Design and Analysis of Algorithm Lab	MCAL33.1	Demonstrate the applicability of divide & conquer	1.8	1.8	1.8	1.8	1.8					
	MCAL33.2	Apply greedy and dynamic method to given problem	1.8	1.8	1.8	1.8	1.8					
	MCAL33.3	Evaluate backtracking and branch and bound	1.8	1.8	1.8	1.8	1.8					
	MCAL33.4	Demonstrate graph and string matching algorithms	1.8	1.8	1.8	1.8	1.2	1.8				
	MC509.1	Install the ionic framework with all the dependencies	2.25				3					
Mobile Programming Lab (NPTEL)	MC509.2	Create apps using the components of ionic framework	2.25	2		3						
	MC509.3	Create apps using API's of ionic framework	2.25	2	2	3						
	MC509.4	Create apps with backend connectivity	2.25	2	2	3						
	MCA P41.1	Formulate a real world problem and develop its solution	3	3	3	3	3	3	3	3	3	3
	MCA P41.2	Develop a design solution for the identified requirements	3	3	3	3	3	3	3	3	3	3
	MCA P41.3	Test the prototype against identified requirements.	3	3	3	3	3	3	3	3	3	3
	MCA P41.4	Develop effective communication skills for presentation of project	3	3	3	3	3	3	3	3	3	3



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## Department of Computer Engineering

Sardar Patel Institute of Technology

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### Under Graduate

[PO-PSO-PI Document \[PDF\]](#)

A handwritten signature in black ink, appearing to read "Dr. Bhavna Chaudhary".





Sharanya Vidya Bhawan's Sardar Patel Institute of Technology

Program: Computer Engineering

Vision	To build strong teaching and research environment to provide quality education in Computer Engineering.
Mission	1. To serve society by producing globally competent computer professionals. 2. To foster relationship with leading Institutes as well as Industries to inculcate the spirit of cooperative and collaborative learning.

#### Program Educational Objectives (PEO):

The Bachelor of Engineering in Computer Engineering program has three educational objectives. These educational objectives are the long term goals that we set for our students. Our program prepares students to achieve these objectives four to five years after graduation.

The B.E.(Computer Engineering) Graduates will be able :

PEO 1	To establish themselves in their chosen career paths by utilizing technical and professional skills with ethical standards.
PEO 2	To contribute to the development of the next generation of Information and Communication technologies enabled computing through research.
PEO 3	To demonstrate personal growth by pursuing higher studies, professional development courses, and/or engineering certification.

Program Outcomes (PO): At the end of the programme, a student will be able to

PO 1	Engineering Knowledge: apply knowledge of mathematics, science, and engineering to solve the real life problems in computer-based systems. [H]
PO 2	Problem Analysis: Identify, analyze and formulate effective engineering related problems and conduct new experiments. [H]
PO 3	Design/Development of Solutions: design computer-based systems, structures, components, or processes to meet desired needs, within realistic constraints. [H]
PO 4	Conduct Investigations of Complex Problems: design and conduct experiments to interpret data and analyze the results. [H]
PO 5	Modern Tool usage: use modern tools for engineering practice. [H]
PO 6	The Engineer and Society: understand the impact of an engineer in general and Computer Engineer in particular on societal, safety, health, legal, and cultural issues. [S,H]
PO 7	Environment and Sustainability: understand the need and impact of computer engineering solutions on environment and its sustainability. [S,H]
PO 8	Ethics: take professional decision with a sense of ethical responsibilities. [H]
PO 9	Individual and Team Work: function effectively as an individual, and as a member or leader in multidisciplinary and/or cross-cultural teams. [H]
PO 10	Communication: communicate effectively and design documentation. [H]
PO 11	Project Management and Practices: apply engineering & management principles in day-to-day life while managing projects in multidisciplinary environment. [H]
PO 12	Life-long Learning: adapt to lifelong learning process in the continuously changing technological context. [H]

Program Specific Outcomes: PSO

PSO	Program Specific Outcomes
PSO 1:	Successfully complete internship offered by industries or other institutes of repute.
PSO 2:	Develop software applications to solve real life problems.

#### Related Links

- [Internship](#)
- [Facilities](#)
- [Innovative Teaching Learning Practices](#)
- [Newsletter](#)
- [Student Awards](#)
- [FDP](#)
- [Extracurricular activities](#)

*(Signature)*



Sardar Patel Institute of Technology

Eshwarthai





## Academics Section of Computer Science and Engineering

### Table of contents

1. Vision & Mission
2. Time Table
3. Syllabus
4. Results
5. Internships
6. Placements
7. Projects

### Vision

To develop globally competent and ethical professionals in the field of Computer Science & Engineering and enable them to serve Industry and society at large.

### Mission

M0	To provide rigorous and interdisciplinary education.
M1	To foster ethical and socially responsible Computer professionals.
M2	To promote cutting-edge research and innovations.

### Program Educational Outcomes (PEOs)

The Bachelor of Technology in Computer Science and Engineering program has three educational objectives. These educational objectives are the long-term goals that we set for our students. Our program prepares students to achieve these objectives four to five years after graduation. The B.Tech(Computer Science & Engineering) Graduates will be able :

PEO 0	To engage in interdisciplinary learning recognizing the need to stay abreast of advancement in Computer Science & Engineering.
PEO 1	To provide a deeper understanding of the ethical and social impact of computer-based systems and technologies.
PEO 2	To contribute to the next generation of Computer Science & Engineering by engaging in research & development.

### Program Outcomes (POs)

At the end of the programme, a student will be able to:

PO 0	Engineering Knowledge: apply knowledge of mathematics, science, and engineering to solve the real-life problems in computer-based systems.
PO 1	Problem Analysis: identify, analyze and formulate computer science & engineering related problem and conduct new experiments
PO 2	Design/development of Solutions: design computer-based systems to meet desired needs within realistic constraints.
PO 3	Conduct Investigations of Complex Problems: design and conduct experiments to interpret data and analyze the results.
PO 4	Modern Tool usage: use modern tools for engineering practice.
PO 5	The Engineer and Society: understand the impact of an engineer in general and Computer Science Engineer in particular on societal, safety, health, legal, and cultural issues.
PO 6	Environment and Sustainability: understand the need and impact of computer science & engineering solutions on environment and its

*S. Shaudhari*



Andheri (W)  
Mumbai-58

	sustainability.
PO 7	Ethics: take professional decision with a sense of ethical responsibility.
PO 8	Individual and Team Work: function effectively as an individual, and as a member or leader in multidisciplinary and/or cross cultural teams.
PO 9	Communication: communicate effectively and design documentation.
PO 10	Project Management and Finance: apply engineering & management principles in day-to-day life while managing projects in a multidisciplinary environment.
PO 11	Life-long Learning adapts to the lifelong learning process in the continually changing technological context.

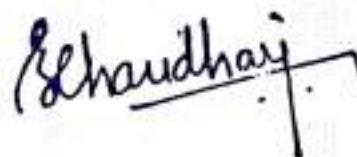
### Program Specific Outcomes (PSOs)

PSO 0	Apply the principles of artificial intelligence and data science that require problem-solving, inference, perception, and knowledge representation, which contribute to the development of open-source technologies.
PSO 1	Develop an entrepreneurial mindset and build industry-ready and socially responsible applications for solving real-world problems.

## Department of Computer Science and Engineering Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai 400 058  
Email: [hod.cse@spit.ac.in](mailto:hod.cse@spit.ac.in)

Cop




**Programme Outcomes:**

Engineering Graduates will be able to:

**PO1: Engineering Knowledge:** apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

**PO2: Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3: Design & Development of Solutions:** design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4: Conduct Investigation of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

**PO5: Modern Tools Usage:** create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6: The Engineer and Society:** apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7: Environment & Sustainability:** understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8: Ethics:** apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

**PO9: Individual & Team work:** function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings

**PO10: Communication:** communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11: Project management & Finance:** demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12: Life-long Learning:** recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

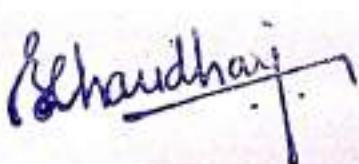
**Programme Specific Outcomes (PSO):**

At the end of the programme student will be able to:

**PSO1:** troubleshoot electronic circuits, systems and products

**PSO2:** use open source tools for engineering practice

**PSO3:** draft patent and research paper as per the publication standards



## **VISION**

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*To produce globally competent, social and ethical practicing graduates adapting technological changes to solve contemporary issues.*

## **MISSION**

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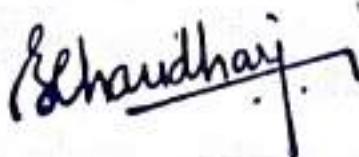
- Collaborate with global professional bodies for recognition
- Work with local NGOs to do social service.
- Design curriculum to inculcate ethical practices in technological and behavioral aspects.
- Industry collaboration to keep abreast of technology.
- Engage with stakeholders to understand contemporary issues and propose technical solutions.

## **Program Outcomes**

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*The Program Outcomes of UG in Information Technology are:*

*POs describe what students are expected to know or be able to do by the time of graduation from the program. The Program Outcomes of UG in Information Technology are:*



## **PO DESCRIPTION**

- P01 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- P02 Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
- P03 Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, and the cultural, societal, and environmental considerations.
- P04 Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- P05 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- P06 The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- P07 Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- P08 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- P09 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- P10 Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.



## **PO DESCRIPTION**

- P11 Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- P12 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



Sardar Patel Institute of Technology

## Department of Electronics & Telecommunication

### B.Tech.

#### Mission of the UG Program – PEOs matrix with justification

As per AICTE reforms suggested, revised PO-PI Competency document is drafted and is available for reference.

#### VISION

To produce Telecommunication Engineers capable of effectively using the scientific and technical knowledge for the betterment of society

#### MISSION

1. Provide high-quality teaching, state-of-the-art research and creative activity to acquire innovation and next generation technologies.
2. Develop educational and career goals, decision-making skills and job search strategies needed to manage their professional and academic pursuits.
3. Promote interaction and exchange with industry and other institutions of higher learning.

#### Programme Educational Objectives (PEOs):

1. Graduates establish themselves in their chosen career paths by utilizing technical, leadership, communication and interpersonal skills, while complying with ethical standards.
2. Graduates, through their excellence, contribute towards the next generation of telecommunication by engaging in Research and Development.
3. Graduates demonstrate personal growth by pursuing or successfully completing advanced degrees and professional development courses in the field of engineering.

#### Program Specific Outcomes (PSOs):

**PSO1:** The ability to troubleshoot hardware and software faults/ bugs in Communication systems.

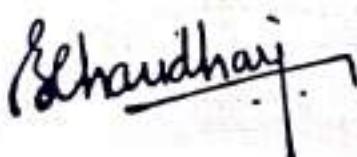
**PSO2:** The ability to apply open source tools for solving technical problems.

#### Program Outcomes:

**PO1:** Engineering Knowledge: apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

#### More Related Links

- Research & Consultancy
- Timetable & Schedules
- Faculty Activities & Achievements
- Student Activities
- Guest Lectures
- Innovative Teaching Learning
- Course Outline
- OES CSDF 2020-21 Syllabus
- Downloads
- Department Library
- Research
- Value Added Courses
- Infrastructure
- Technical Events
- ATAL RDP Report
- IEEE Report
- E-Cell Report
- Projects
- Publications
- Contact



**PO2:** Problem Analysis: identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3:** Design & Development of Solutions: design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4:** Conduct Investigation of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

**PO5:** Modern Tools Usage: create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6:** The Engineer and Society: apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7:** Environment & Sustainability: understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8:** Ethics: apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

**PO9:** Individual & Team work: function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings

**PO10:** Communication: communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11:** Project management & Finance: demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12:** Life-long Learning: recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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Department of Electronics & Telecommunication

*S. Chaudhari*



## VISION

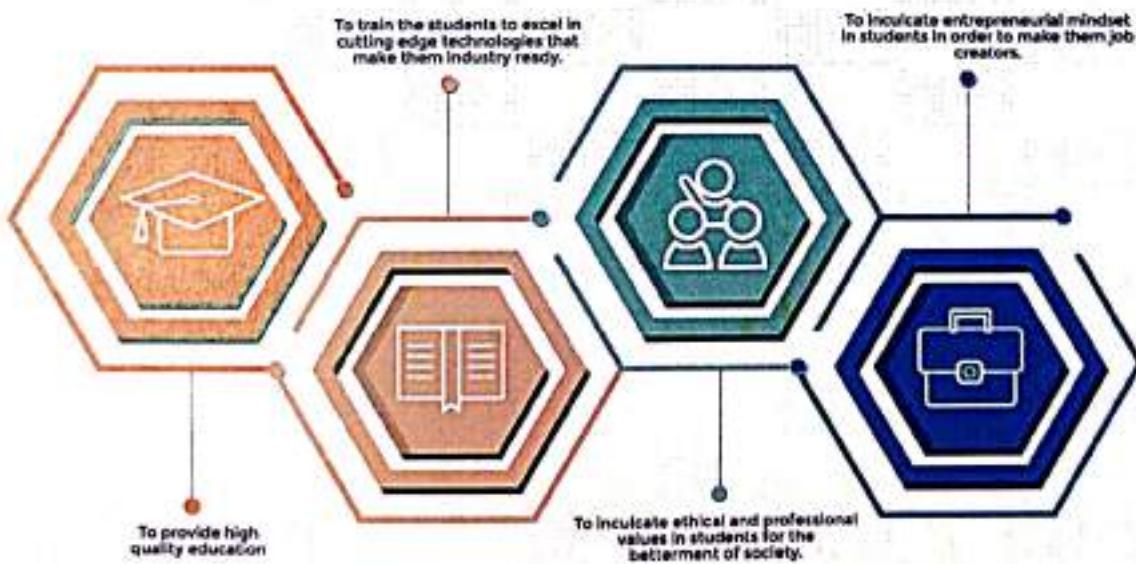
Keeping in view the growing and changing needs of industry and society, we at S.P.I.T are committed to creating an environment which will raise the intellectual and moral standards of our students. Our endeavor is to strive for the overall development of students , thereby enabling them to accept challenges.

In tune with this our vision is



To build a renowned institute which will produce world class graduate engineers with social sensitivity

## MISSION



*(Signature)*



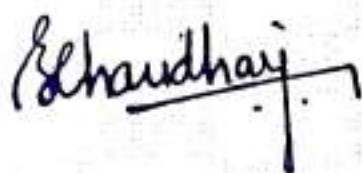
## **Program Outcomes**

1. Computational knowledge: Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for problem-solving technique to formulate solution for Information System.
2. Problem Analysis: Conceptualize knowledge and background to be able to analyze a problem and identify and define the computing requirements for its solution.
3. Design / Development of Solutions: Design a new system to meet certain specification.
4. Conduct Investigations of complex computing problems: Conduct investigations of complex problems using analysis, modelling, interpretation of data, and synthesis of information in order to reach valid conclusions.
5. Modern Tool Usage: Design, monitor, manage, test, control, evaluate an existing computer-based system, process, component or program to provide valid conclusions using software modeling, warehousing, mining and networking tools for application development.
6. Professional Ethics: Apply ethical principles and adhere to professional ethics and responsibilities and norms of Application Development.
7. Life-long Learning: Recognize the need for and an ability to engage in lifelong learning.
8. Project management and finance: Demonstrate knowledge and understanding of IT and management principles and apply these to one's own work, as a member or a leader of the team, to manage IT projects.
9. Communication Efficacy: Communicate effectively using classic and modern technology with the IT professionals and with society at large through report writing as well as technical presentations.
10. Societal and Environmental Concern: Understand the impact of the applications and services in societal and environmental contexts, and extend the knowledge of, and need for sustainable development.
11. Individual and Team Work: Function effectively as an individual, and as a member or leader of a team.
12. Innovation and Entrepreneurship: Create an opportunity to produce successful Entrepreneurs.

## **MCA Program Specific Outcomes**

Students will be able to

1. Apply standard practices and strategies required for the industry
2. Solve real-world problems using cutting-edge technology.



## Display of PO in HOD Cabin (Department of Computer Engineering)

### Program Outcome (PO) of B.E Computer Engineering

**PO1:Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2:Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3:Design/Development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, and the cultural, societal, and environmental considerations.

**PO4:Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5:Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

**PO6:The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7:Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8:Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9:Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10:Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11:Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply them to plan, monitor and evaluate projects on time and within budget.



Mumbai, Maharashtra, India  
Bhavari Campus, Old D N Nagar, Munshi Nagar, Andheri West, Mumbai, Maharashtra 400058, India  
Lat 19.123192°  
Long 72.836021°  
08/11/23 09:37 AM GMT +05:30



Display in of PO in HOD Cabin (Department of Computer Engineering)

## **Department of Computer Engineering**

### **Programme Outcomes (POs)**

**Graduates of M. Tech. in Computer Engineering will be able to**

**PO1: Independently carry out research / investigation and development work to solve practical problems.**

**PO2: Write and present a substantial technical report / document.**

**PO3: Demonstrate a degree of mastery over the area as per the specialization of the program**

### **Programme Educational Objectives (PEOs)**

**Graduates of M. Tech. in Computer Engineering will be able to**

**PEO1: Graduates will be successful professionals in their chosen fields and careers.**

**PEO2: Graduates will engage in the research and development of cutting edge technologies.**

 GPS Map Camera



Mumbai, Maharashtra, India

Bhavans Campus, Old D N Nagar, Munshi Nagar, Andheri West, Mumbai, Maharashtra 400058, India

Lat 19.123188°

Long 72.836005°

08/11/23 09:38 AM GMT +05:30



Display outside HOD Cabin (Department of Computer Engineering)

**SARDAR PATEL INSTITUTE OF TECHNOLOGY**  
Bhavans

**Sardar Patel Institute of Technology  
(Autonomous Institute)**

**Department of Computer Engineering**

**VISION**

- To build strong teaching and research environment to provide quality education in Computer Engineering.

**MISSION**

- To serve society by producing globally competent computer professionals.
- To foster relationship with leading institutes as well as industries to inculcate the spirit of cooperative and collaborative learning.

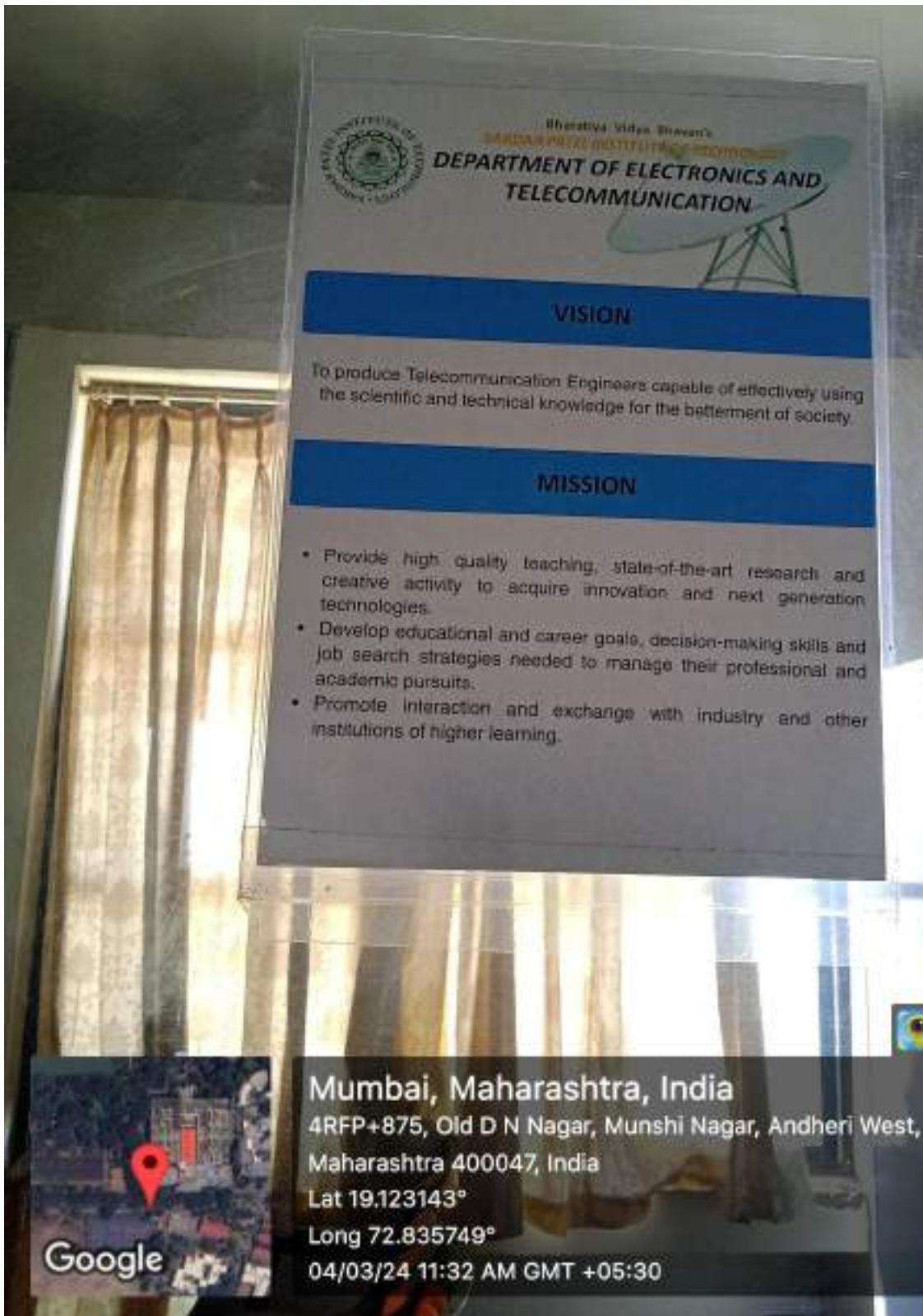
**GPS Map Camera**

Mumbai, Maharashtra, India  
Bhavans Campus, Old D N Nagar, Munshi Nagar, Andheri West, Mumbai, Maharashtra 400058, India  
Lat 19.123188°  
Long 72.836005°  
08/11/23 09:37 AM GMT +05:30

Google



## Display in HOD Cabin (Department of EXTC):



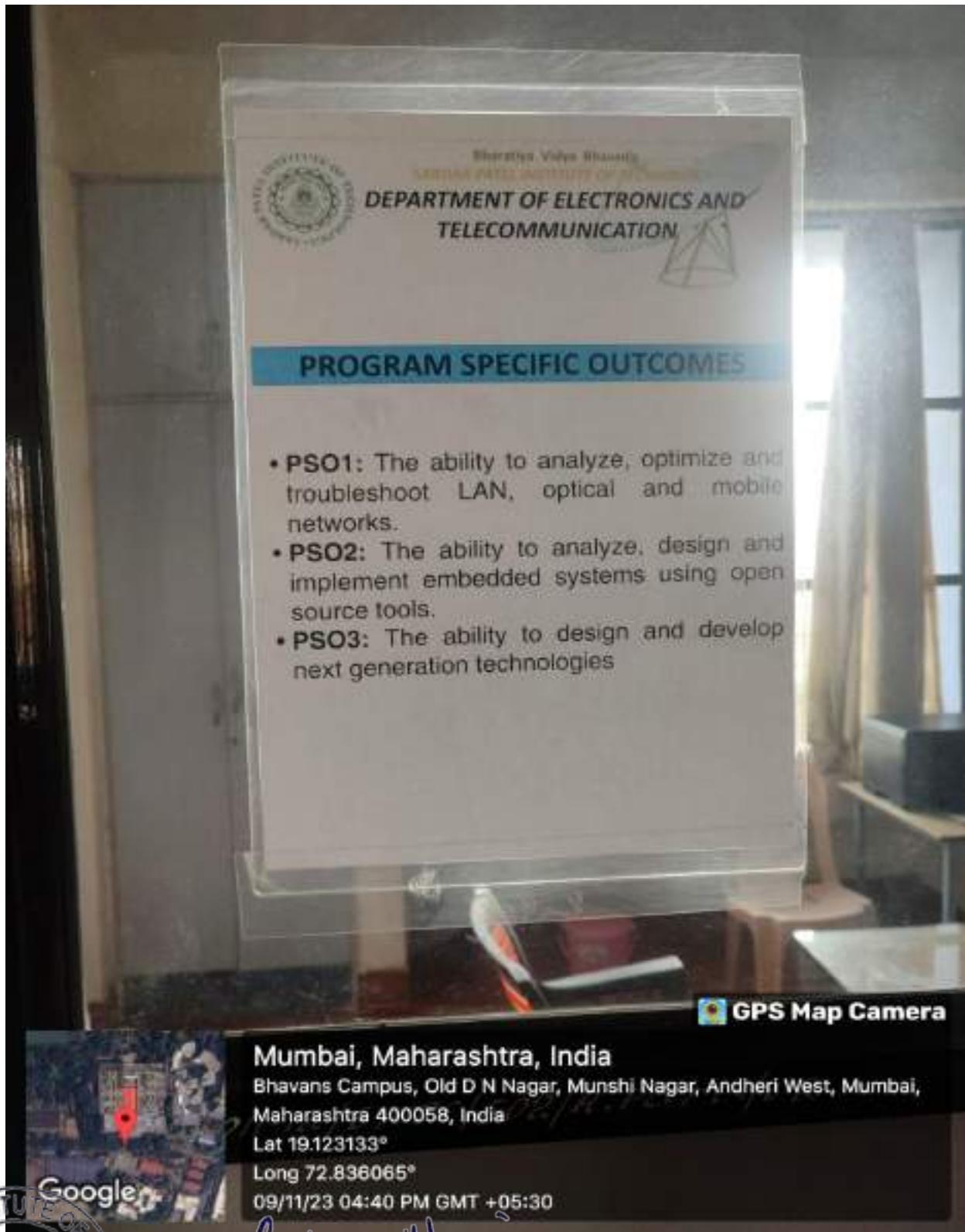
*S. Shaudhai*

## Display in HOD Cabin (Department of EXTC):



*S. Bhandari*

## Display in HOD Cabin (Department of EXTC):



*Elsaudhay*

## Display in HOD Cabin (Department of ETRX):

**Sardar Patel Institute of Technology**  
Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058 India  
Electronics Engineering Department

### VISION

To be leader in *engineering education* by providing training to the students to become *competent engineers, researchers or entrepreneurs* to realize product oriented innovative ideas with focus on enhancing the *quality of life*.

### MISSION

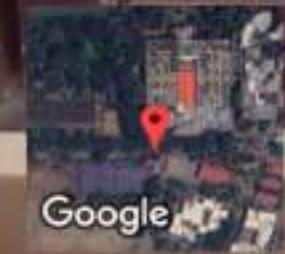
- To impart quality engineering education as per the industry need.
- To motivate students to undertake research on next generation technologies.
- To create an environment that shall foster growth of professionals capable of effectively using the scientific and technical knowledge for the betterment of mankind.

**Sardar Patel Institute of Technology**  
Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058 India  
Electronics Engineering Department

### PROGRAMME EDUCATIONAL OBJECTIVES

Within three to four years of graduation:

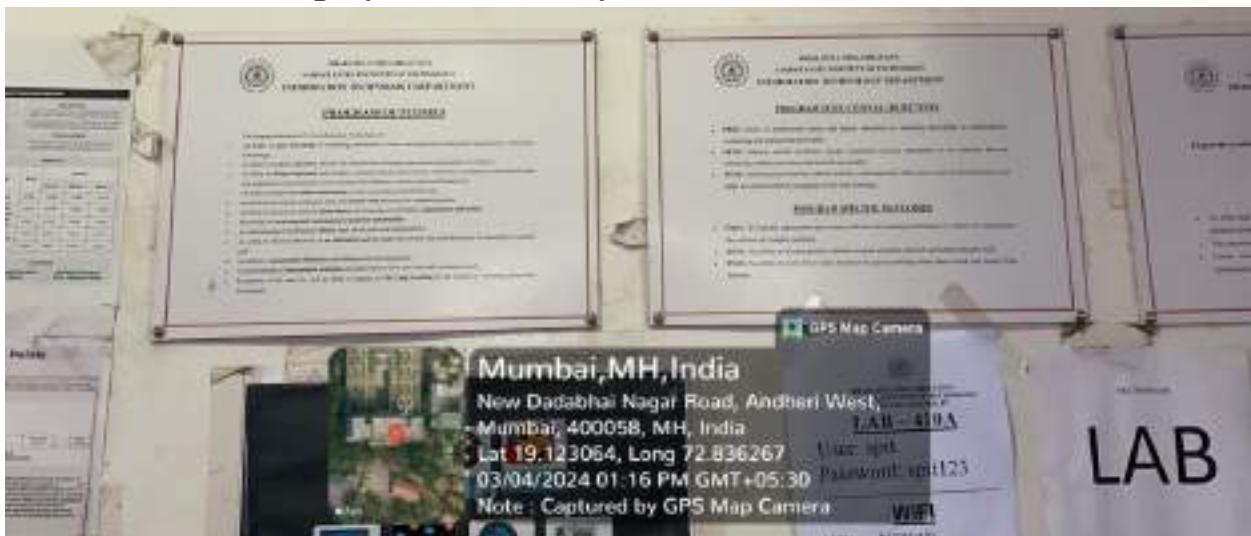
- PEO1: Graduates will have successful career in the chosen stream utilizing technical and professional skills, while complying with ethical standards.
- PEO2: Graduates will undertake research activities on next generation technologies in electronics engineering.
- PEO3: Graduates will pursue higher studies in internationally recognized institutes / universities.

 GPS Map Camera

Mumbai, Maharashtra, India 8/03  
Sardar Patel Technology Business Incubator, Bhavan's Campus, Old D N Nagar, Munshi Nagar, Andheri West, Mumbai, Maharashtra 400058, India  
Lat 19.123055° Long 72.835834°  
08/11/23 09:48 AM GMT +05:30



## Display in Laboratory (Lab 4<sup>th</sup> floor, 6<sup>th</sup> floor)

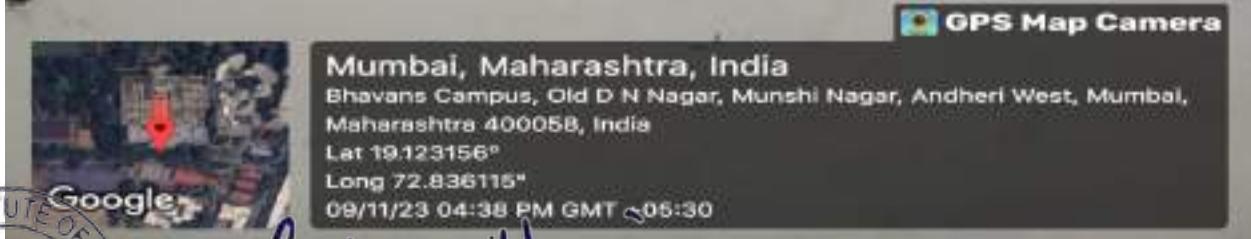


LAB

SARDAR PATEL INSTITUTE OF TECHNOLOGY  
Bhavans Campus, Munshi Nagar, Andheri (West), Mumbai - 400058  
Computer Engineering Department

**PROGRAM EDUCATION OBJECTIVES**

- PEO1: Graduate establishes themselves in their chosen career paths by utilizing technical and professional skills with ethical standards.
- PEO2: Graduate contributes to the development of the next generation of Information and Communication technologies enabled computing through research.
- PEO3: Graduate demonstrates personal growth by pursuing higher studies, professional development courses, and/or engineering certification.



*Bhavna Ray*

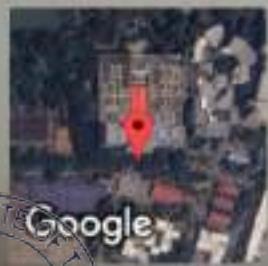


**SARDAR PATEL INSTITUTE OF TECHNOLOGY**  
Mumbai Campus, Andheri (West), Mumbai, (W.M.D.), 400058  
Computer Engineering Department

#### GRADUATE ATTRIBUTES

- Engineering knowledge
- Problem analysis
- Design and development of Solutions
- Conduct investigation for complex problems
- Modern Tool Usage
- The Engineer and Society
- Environment and sustainability
- Ethics
- Individual and Team Work
- Communication
- Project Management and Finance
- Life Long Learning

GPS Map Camera



Mumbai, Maharashtra, India

Bhavans Campus, Old D N Nagar, Munshi Nagar, Andheri West, Mumbai,  
Maharashtra 400058, India

Lat 19.123153°

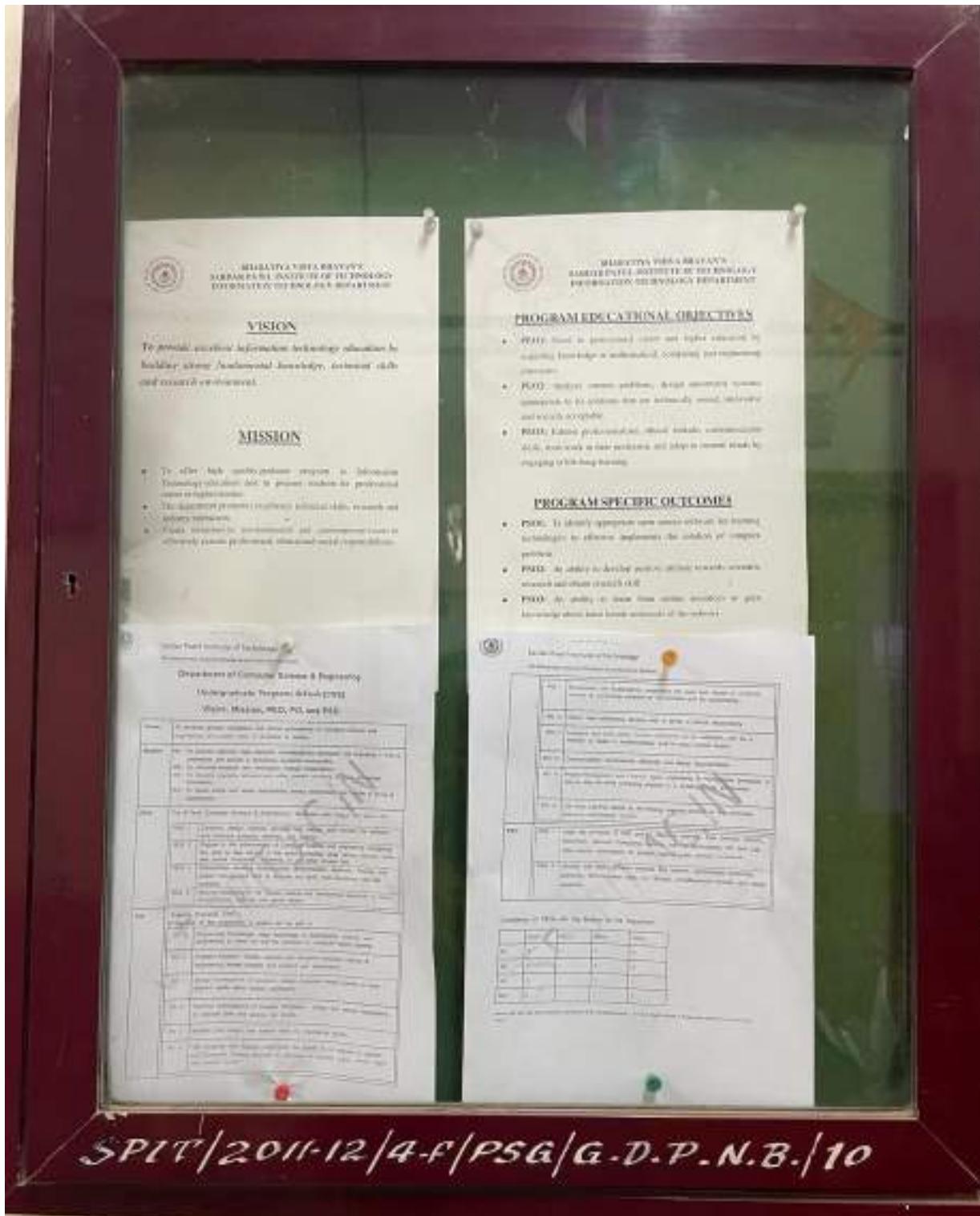
Long 72.836112°

09/11/23 04:38 PM GMT +05:30



*B. Shaudhay*

## Display in Departments Notice Boards



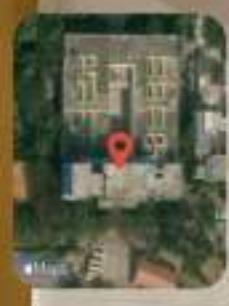
*S. Shaudhai*

## Display in Departments Notice Boards



SPII/2011-12/4-F/PSG/G.D.P.N.B./11

GPS Map Camera



Mumbai, MH, India

New Dadabhai Nagar Road, Andheri West,  
Mumbai, 400058, MH, India

Lat 19.123265, Long 72.836122

03/04/2024 01:14 PM GMT+05:30

Note : Captured by GPS Map Camera



*Elhadhai*

**Display at prominent places in the Institute**  
**a. In the corridor- 6<sup>th</sup> Floor**

Room No.  
601 to 603 ↑

 BHARATIYA VIDYA BHAVAN'S  
**SARDAR PATEL INSTITUTE OF TECHNOLOGY**  
Munshi Nagar, Andheri (WEST), Mumbai-400 058.

**PROGRAM OUTCOMES (PO)**

At the end of the programme, a student will be able to

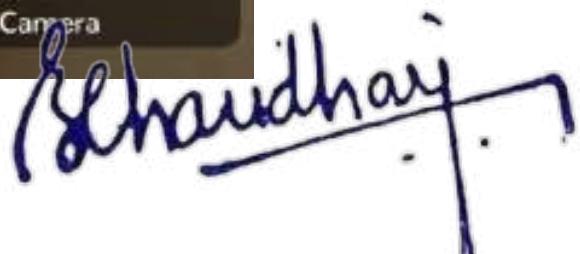
PO1	Engineering Knowledge: apply knowledge of mathematics, science, and engineering to solve the real life problems in computer-based systems. [I]
PO2	Problem Analysis: identify, analyze and formulate computer engineering related problem and conduct new experiments. [I]
PO3	Design/development of Solutions: design computer-based systems to meet desired needs within realistic constraints. [II]
PO4	Conduct Investigations of Complex Problems: design and conduct experiments to interpret data and analyze the results. [III]
PO5	Modern Tool usage: use modern tools for engineering practice. [II]
PO6	The Engineer and Society: understand the impact of an engineer in general and Computer Engineer in particular on societal, safety, health, legal, and cultural issues. [I,II,III]
PO7	Environment and Sustainability: understand the need and impact of computer engineering solutions on environment and its sustainability. [I,III]
PO8	Ethics: take professional decision with a sense of ethical responsibility. [I]
PO9	Individual and Team Work: function effectively as an individual, and as a member or leader in multidisciplinary and/or cross cultural teams. [I]
PO10	Communication: communicate effectively and design documentation. [I,II]
PO11	Project Management and Finance: apply engineering & management principles in day-to-day life while managing projects in multidisciplinary environment. [I,II]
PO12	Life-long Learning adapt to lifelong learning process in the continually changing technological context. [II,III]

**PROGRAM SPECIFIC OUTCOMES (PSO)**

PSO	Program Specific Outcomes
PSO 1	Successfully complete internship offered by industries or other institutes of repute.
PSO 2	Develop software applications to solve real life problems.

 GPS Map Camera

Mumbai, MH, India  
New Dadabhai Nagar Road, Andheri West,  
Mumbai, 400058, MH, India  
Lat 19.123383, Long 72.836101  
03/04/2024 01:22 PM GMT+05:30  
Note : Captured by GPS Map Camera



## b. In the corridor- 5<sup>th</sup> Floor





Bhavan's

Sardar Patel Institute of Technology  
(Autonomous Institute)

## Electronics and Telecommunications

### Program Outcomes (UG)

- ★ **PO1: Engineering Knowledge:** apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems
- ★ **PO2: Problem Analysis:** identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- ★ **PO3: Design & Development of Solutions:** design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
- ★ **PO4: Conduct Investigation of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions
- ★ **PO5: Modern Tools Usage:** create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
- ★ **PO6: The Engineer and Society:** apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
- ★ **PO7: Environment & Sustainability:** understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development
- ★ **PO8: Ethics:** apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice
- ★ **PO9: Individual & Team work:** function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings
- ★ **PO10: Communication:** communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
- ★ **PO11: Project management & Finance:** demonstrate knowledge and understanding of the engineering and management principles and apply them to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
- ★ **PO12: Life-long Learning:** recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

GPS Map Camera

Mumbai, Maharashtra, India

Unit No 5, 8th Floor, Sardar Patel Institute of Technology, Bhavan's Campus, Old D N Nagar, Munshi Nagar, Andheri West, Mumbai, Maharashtra 400058, India

Lat 19.123498°

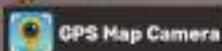
Long 72.835798°

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S. Patel

### c. In the corridor- 4<sup>th</sup> Floor



Mumbai, Maharashtra, India

4RFP+78X, Old D N Nagar, Munshi Nagar, Andheri West, Mumbai,

Maharashtra 400058, India

Lat 19.123146°

Long 72.835814°

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Bharatiya Vidya Bhavan's  
**SARDAR PATEL INSTITUTE OF TECHNOLOGY**  
Munshi Nagar, Andheri (W), Mumbai – 400 058.  
(Autonomous Institute Affiliated to University of Mumbai)

## Course Outcomes

### Department of Information Technology

Academic Year 2022-2023

Sr. No.	Course Code	Course Name	Course Outcomes	
<b>SEM III</b>				
1	MA203	Probability and Statistics	MA203.1	Familiarize with basic probability axioms, rules and their applicability.
			MA203.2	Identify the characteristics of various discrete and continuous distributions.
			MA203.3	Find unbiased and efficient estimates using estimation theory.
			MA203.4	Test the hypothesis for means and variances using 't' & F; chi-square distribution tests.
			MA203.5	Find Correlation and Regression and fit different types of curves.
2	MA202	Foundation of Mathematics-I*	MA202.1	Differentiate a function of one variable and partially differentiate a function of more than one variable.
			MA202.2	Apply the concept of partial differentiation to find extreme values of a given function.
			MA202.3	Find nth order derivative of a given function.
			MA202.4	Expand a given function as a power series.
			MA202.5	Perform operations on matrices and find inverses and determinants of them.
			MA202.6	Perform vector operations and compute dot products and cross products between them.
3	IT201	Discrete Structures and Graph Theory	IT201.1	Solve problems using set theory, logic and its various proof techniques.



			IT201.2	Apply the concepts of relations, functions, lattices and recurrence relations to solve problems
			IT201.3	Apply the concepts of graph, trees and their various types with their traversing techniques to solve problems.
			IT201.4	Apply the basics of coding theory and cryptography to solve real world problems.
4	IT202	Data Structures	IT202.1	Apply various operations of linear and non-linear data structures to given problems.
			IT202.2	Apply the concepts of Trees and Graphs to a given problem.
			IT202.3	Apply various operations of heap data structures.
			IT202.4	Apply the concepts of hashing on a given problem.
5	IT203	Computer Architecture and Organization	IT203.1	Explain basic computer structure and compare computer architecture models
			IT203.2	Design algorithms to solve ALU operations and memory mapping techniques
			IT203.3	Comprehend processor architecture with various design methods of CPU with comparative analysis
			IT203.4	Illustrate memory systems with design and analysis of mapping techniques for cache and virtual memory
			IT203.5	Analyze different parallel processing and pipelining concepts with pipelining hazards
			IT203.6	Comprehend different types of I/O buses , compare and contrast different types of data transfer methods and arbitration techniques
6	IT204	Database Management Systems	IT204.1	Demonstrate understanding of given system to construct a database model.
			IT204.2	Apply various Relational and SQL commands on the populated database.



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			IT204.3	Examine the functional dependencies to make a normalized database system.
			IT204.4	Examine transaction processing techniques on a database.
			IT204.5	Illustrate query processing and optimization method on a database.
7	SVXX/STXX	SEVA II or III /SATVA II or III	--	--
8	HSEX1	HSS-I	--	--
<b>SEM IV</b>				
1	MA201	Linear Algebra	MA201.1	Solve a homogeneous and non-homogeneous system of linear equations using rank of a matrix.
			MA201.2	Solve system of linear equations by Numerical Methods.
			MA201.3	Solve equations in real life problems and to encode and decode messages using the concept of matrices.
			MA201.4	Identify whether given structures are vector spaces and subspaces and construct a basis for them.
			MA201.5	Show if a given matrix is diagonal is able or not.
			MA201.6	Apply concepts of eigenvalues and eigenvectors to calculate functions of a square matrix, google page rank vector and solve systems of differential equations using Diagonalisation of matrices.
2	MA204	Foundation of Mathematics-II	MA204.1	Integrate a function of one variable using various techniques
			MA204.2	Sketch basic curves and solve double and triple integrals
			MA204.3	Solve basic problems using properties of complex numbers.
			MA204.4	Solve differential equations of first order.
			MA204.5	Apply the techniques of solving first order differential equations to electrical engineering problems.
			MA204.6	Solve differential equations of higher order
3	IT205	Design and Analysis of	IT205.1	Analyze time and space complexity



		Algorithms		of an algorithm.
			IT205.2	Apply divide and conquer strategy to solve problems.
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			IT206.5	Evaluates various algorithms of File Storage & I/O management for performance and quality criterion.
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			IT207.3	Identify the different types of protocols and their functions within a network.
			IT207.4	Apply the knowledge of subnetting, routing mechanisms and Software Defined Networking.
6	IT208	Mini Project-I	IT208.1	Discover potential research areas for addressing societal issues
			IT208.2	Conduct a survey of basic and contemporary literature in the preferred field of study.
			IT208.3	Formulate and propose a plan for creating a solution for the research plan identified.
			IT208.4	Exercise the team building, communication and management

Dr. Vaibhav Patel



Dr. Hemant Patil

				for design and implementation of projects.
			IT208.5	Compare and contrast the several existing solutions for research challenge.
			IT208.6	Report and present the findings of the study conducted in the preferred domain.
7	SVXX/STXX	SEVA II or III /SATVA II or III	--	--
8	HSEX1	HSS-I	--	--
9	AS201	Professional Communication Skills	AS201.1 AS201.2 AS201.3	Demonstrate the spoken and written skills for job placements. Draft professional documents. Design written communication for social media.
10	SCX1/MNX1	SCOPE-I/Minor-I	--	--

#### SEM V

1	IT301	Theory of Computation	IT301.1 IT301.2 IT301.3 IT301.4	Design finite automaton for a regular expressions and languages. Apply the properties of regular languages. Construct the grammar for a language and convert it into normal forms. Design and Evaluate Pushdown Automata and Turing Machine for a language.
2	IT302	Software Engineering	IT302.1 IT302.2 IT302.3 IT302.4 IT302.5	Analyze software requirements. Apply UML models for a project. Evaluate system architecture and develop detailed task schedule from the overall estimates and planning. Illustrate different coding principles with unit test process. Understand the need for DevOps.
3	IT303	Foundation of Signal Processing	IT303.1 IT303.2 IT303.3 IT303.4	Interpret DT signal and perform signal manipulation in Time Domain and Frequency Domain Develop FFT flow-graph Implement Fast Linear filtering algorithms Compare the DSP processor with General Purpose Processor (GPP)
4	IT304	Distributed Computing	IT304.1	Understand the principles and



				desired properties of distributed systems.
			IT304.2	Apply the various communication techniques for distributed communication.
			IT304.3	Apply the concepts of process, naming, consistency, replication and faults tolerance in distributed environment.
			IT304.4	Apply the algorithms such as clock synchronization, election, and mutual exclusion in distributed applications.
			IT304.5	Identify the challenges in developing distributed applications.
5	IT305	Internet Technology Lab	IT305.1	Develop a sophisticated web UX
			IT305.2	Create, integrate and test REST based web services
			IT305.3	Design secured web application/web services
			IT305.4	Demonstrate behaviour of web crawlers and testing of web application
6	SVXX/STXX	SEVA II or III /SATVA II or II	--	--
7	HSEX3	HSS-III	--	--
8	SCX2/MNX2	SCOPE-II/Minor-II	--	--

#### SEM VI

1	OEXXX	Open Elective-I	--	--
2	IT306	Information Security System	IT306.1	Illustrate the different types of cryptographic algorithm to secure information
			IT306.2	Classify the various attacks in each layer of TCP/IP model
			IT306.3	Apply various authentication protocols
			IT306.4	Analyze and use the system security practices
			IT306.5	select and apply the appropriate counter measures to secure the web application
3	IT307A	Big Data Analytics	IT307A.1	Apply rules of linear algebra for processing big data.
			IT307A.2	Choose appropriate storage structures to make sense out of big



				data.
			IT307A.3	Apply scalable algorithms based on Hadoop and Map Reduce to perform Big Data Analytics.
			IT307A.4	Analyze information from social network graphs.
4	IT307B	Artificial Intelligence and Machine Learning	IT307B.1	Understand AI building blocks presented in intelligent agents
			IT307B.2	Solve the problems using suitable searching methods
			IT307B.3	Solve the problems using suitable reasoning and knowledge representation methods
			IT307B.4	Apply suitable machine learning technique for a given problem
			IT307B.5	Design an intelligent system using different AIML techniques for real life problems
5	IT311	Machine Learning	IT311.1	Identify machine learning techniques suitable for a given problem
			IT311.2	Apply Dimensionality reduction techniques for appropriate feature selection
			IT311.3	Evaluate the performance of various machine learning algorithms
			IT311.4	Design an application using machine learning techniques
6	IT312	Soft Computing	IT312.1	Illustrate the basic principles of soft computing techniques. IT312.2
			IT312.2	Apply the supervised and unsupervised neural network learning algorithm for real world applications.
			IT312.3	Design a fuzzy controller system using different FIS.
			IT312.4	Apply genetic algorithms to solve optimization problems.
7	IT321	Number Theory and Cryptography	IT321.1	Explain the use of key management and its distribution.
			IT321.2	Apply various cryptographic algorithms to secure the information.
			IT321.3	Apply number theory algorithms to solve the given problem.

*Venkateshwaran**Ghanshyam*

			IT321.4	Demonstrate the different attacks involved in cryptanalysis.
8	IT322	Digital Forensics	IT322.1	Explain the principles and techniques associated with the digital forensic practices.
			IT322.2	Understand the importance of evidence handling and storage for various devices.
			IT322.3	Analyze the adequate perspectives of digital forensic investigation in various applications.
			IT322.4	Analyze the Post-mortem investigation.
9	IT331	Advanced Database Systems	IT331.1	Evaluate the performance of query.
			IT331.2	Apply NO SQL, graph databases and enhanced data model concepts for a given scenario.
			IT331.3	Apply data warehousing concepts for a given scenario.
			IT331.4	Design parallel and distributed databases.
10	IT332	Data Science	IT332.1	Make use of data to perform exploratory data analysis.
			IT332.2	Apply supervised and unsupervised learning on a dataset.
			IT332.3	Apply Association rule mining on a dataset.
			IT332.4	Develop a data science application using ethical practices.
11	IT308	Mini Project-II	IT308.1	Conduct a survey of basic and contemporary literature in the preferred field by identifying problems based on societal /research needs.
			IT308.2	Formulate the problem statement by making judgments on validity of ideas.
			IT308.3	Conclude suitable inferences from obtained results through theoretical/experimental/simulations based analysis.
			IT308.4	Develop interpersonal skills to work as member of a team.
			IT308.5	Prepare a report of the findings for the study conducted in the preferred domain.



12	SVXX/STXX	SEVA II or III /SATVA II or III	--	--
13	SCX2/MNX2	SCOPE-III/Minor-III	--	--
<b>SEM VII</b>				
1	IT413	Natural Language Processing	IT413.1	Apply the Natural language processing pipeline to solve a given problem
			IT413.2	Identify use of Natural language Models
			IT413.3	Analyze Parts-Of-Speech tagging, Parsing and Semantic Analysis models for a given scenario
			IT413.4	Develop system to solve a Natural Language Processing problem
2	IT414	Deep Learning	IT414.1	Interpret the mathematical foundations of Deep Learning architectures.
			IT414.2	Construct deep neural networks for a given problem.
			IT414.3	Analyze deep learning models for a given scenario.
			IT414.4	Develop real-world applications using various deep learning techniques.
3	IT423	Security Operations Center	IT423.1	Explain the SOC processes, procedures, technologies, and workflows.
			IT423.2	Identify the indicators of compromise by recognizing the attacker tools, tactics, and procedures.
			IT423.3	Analyze the logs and alerts from various technologies.
			IT423.4	Evaluate the use cases that are widely used across the SIEM deployment.
4	IT424	Blockchain Technology	IT424.1	Explain the basic concepts of blockchain technology, Bitcoin and Ethereum.
			IT424.2	Apply a smart contract on the Ethereum test network
			IT424.3	Build a Decentralized Application running on a decentralized peer-to-peer network
			IT424.4	Explain the General Data Protection Regulation for relevant blockchain



				application
5	IT433	Digital Image Processing	IT433.1	Evaluate the techniques for enhancing and segmenting Images.
			IT433.2	Analyze images using various transforms.
			IT433.3	Categorize various compression techniques and standards for Images and Videos.
			IT433.4	Apply image processing algorithms in practical applications.
6	IT434	Project Management	IT434.1	Align the project to the organization's strategic plans and business justification throughout its lifecycle
			IT434.2	Manage the scope, cost, timing, and quality of the project, at all times focused on project success as defined by project stakeholders
			IT434.3	Identify Project constraints and justify resource utilization.
			IT434.4	Adapt projects in response to issues that arise internally and externally
			IT434.5	Analyze the failed projects
7	OEXXX	Open Elective--III*	--	--
8	IT401	Main Project Stage-I	--	--
9	SVXX/STXX	SEVA-III/SATVA-III		
10	SCX4/MNX4 / HOXX	SCOPE-IV/Minor-IV/Honors-I		

#### SEM VIII

1	OE1	Consumer Electronics	OE1.1	List and classify devices used in consumer products based on their specifications, identify sub-systems of consumer electronic products, also choose and use proper interface standard for a given consumer electronic product
			OE1.2	Illustrate working principle of consumer electronic products and carry out basic tests to identify their correct operation.
			OE1.3	Experiment with Haptics, Multitouch devices, Device interconnects and peripherals and also suggest modification in consumer electronic product using modern tools to enhance user



				experience
			OE1.4	Assemble subsystem of Television set and analyze technology used in audio systems.
			OE1.5	Demonstrate working principal of Healthcare and home electronics consumer products.
			OE1.6	Demonstrate working principal consumer electronic products used in Occupational safety.
2	OE2	Robotic Vision	OE2.1	Discuss the fundamentals of Robotics
			OE2.2	Apply direct and inverse kinematics algorithms
			OE2.3	Justify the need of vision algorithms
3	OE3	Cyber security and Digital Forensics	OE3.1	Identify and classify various cybercrimes with respect to organizational weaknesses in order to mitigate the security risk and estimate the impact on society and world.
			OE3.2	Analyze the results of vulnerability scans of vulnerability assessment and generate report with penetration testing.
			OE3.3	Apply Information Security Standards compliance during software design and development.
			OE3.4	Interpret and apply Indian IT laws in various legal issues.
			OE3.5	Describe the concept of Digital forensics and use various tools and techniques used for digital forensics investigations.
			OE3.6	Integrate advanced security solutions and manage, provide policies, standards, procedures, guidelines, policy framework, assess and mitigate risk.
4	OE4	Internet of Things	OE4.1	Describe IoT value chain structure (device, data cloud), application areas, IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules.
			OE4.2	Explain the embedded concepts and

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				embedded system architecture and programming of ARM Cortex Microcontroller for various applications.
		OE4.3		Describe the Architectural Overview of IoT, Reference Architecture and Real World Design Constraints and various IoT Protocols (Datalink, Network, Transport, Session, Service)
		OE4.4		Apply the concepts of big data analytics, Internet of things and implement smart systems.
		OE4.5		Build the Security requirements in IoT, Cryptographic fundamentals, the authentication credentials, various types Trust models and Cloud Security.
		OE4.6		Design a complete secure IoT System for various real time applications.
5	OE5	Fundamentals of Computational Intelligence	OE5.1	Identify suitability of different learning types for different scenarios.
			OE5.2	To study Neural Networks and Convolutional Neural Networks
			OE5.3	To design fuzzy controllers for various applications.
			OE5.4	To study Natural Language Processing
			OE5.5	To apply computational intelligence technique to solve real world problems.
6	OE6	Fundamentals of Data Structures and Algorithms	OE6.1	Implement various operations of nonlinear data structures.
			OE6.2	Apply the concepts of Trees to a given problem.
			OE6.3	Analyze time and space complexity of an algorithm
			OE6.4	Apply divide and conquer strategy to solve problems
7	OE7	Software Testing	OE7.1	Analyze the principles in software testing to prevent & remove bugs.
			OE7.2	Design effective test cases suitable in testing.



			OE7.3	Describe the variety of ways to test software and indicate the trade-offs between various testing techniques.
			OE7.4	Implement various test cases.
			OE7.5	Apply the software testing techniques in commercial environments.
			OE7.6	Able to use software testing methods and modern software testing tools for their testing projects.
8	OE8	Database Management Systems	OE8.1	Design a database for real world system, choose real world problem and map it to the solution using database techniques.
			OE8.2	Construct a database using SQL.
			OE8.3	Create normalized database using functional dependencies.
			OE8.4	Analyze the effect of transaction over the database.
			OE8.5	Build secure and normalize database using SQL constructs.
			OE8.6	Apply the connectivity techniques of database.
9	IT81	Enterprise Resource Planning	IT81.1	Examine different processes of the organization and the relationship among all processes
			IT81.2	Determine the support of ERP data in CRM/SCM/Etc.
			IT81.3	Discuss typical functionalities in an ERP system
			IT81.4	Elaborate the activities done during ERP implementation
			IT81.5	Discuss case studies in real world scenario to assure ERP benefits
10	IT82	User Experience Design	IT82.1	Paraphrase UI and UX design life cycle.
			IT82.2	Analyze UX design process for users.
			IT82.3	Analyze various parameters for design process.
			IT82.4	Apply design thinking to model the prototype.
			IT82.5	Evaluate user experiences using different UX evaluation techniques.
11	HSS81	Technology	HSS81.1	Identify problems worth solving



		Entrepreneurship Lab	HSS81.2 HSS81.3 HSS81.4 HSS81.5	Craft value proposition Prepare B-Plan Draft Patent Register virtual company
12	IT402	Main Project Stage-II	--	--
13	SVXX/STXX	SEVA-IV/SATVA-IV	--	--
14	HOXX	Honors-II (Optional)	--	--





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10	SCX1/MNX1	SCOPE-I/Minor-I	--	--

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7	HSEX3	HSS-III	--	--
8	SCX2/MNX2	SCOPE-II/Minor-II	--	--

#### SEM VI

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			IT306.3	Apply various authentication protocols
			IT306.4	Analyze and use the system security practices
			IT306.5	elect and apply the appropriate counter measures to secure the web application
3	IT307A	Big Data Analytics	IT307A.1	Apply rules of linear algebra for processing big data.
			IT307A.2	Choose appropriate storage structures to make sense out of big



				data.
			IT307A.3	Apply scalable algorithms based on Hadoop and Map Reduce to perform Big Data Analytics.
			IT307A.4	Analyze information from social network graphs.
4	IT307B	Artificial Intelligence and Machine Learning	IT307B.1	Understand AI building blocks presented in intelligent agents
			IT307B.2	Solve the problems using suitable searching methods
			IT307B.3	Solve the problems using suitable reasoning and knowledge representation methods
			IT307B.4	Apply suitable machine learning technique for a given problem
			IT307B.5	Design an intelligent system using different AIML techniques for real life problems
5	IT311	Machine Learning	IT311.1	Identify machine learning techniques suitable for a given problem
			IT311.2	Apply Dimensionality reduction techniques for appropriate feature selection
			IT311.3	Evaluate the performance of various machine learning algorithms
			IT311.4	Design an application using machine learning techniques
6	IT312	Soft Computing	IT312.1	Illustrate the basic principles of soft computing techniques.
			IT312.2	Apply the supervised and unsupervised neural network learning algorithm for real world applications.
			IT312.3	Design a fuzzy controller system using different FIS.
			IT312.4	Apply genetic algorithms to solve optimization problems.
7	IT321	Number Theory and Cryptography	IT321.1	Explain the use of key management and its distribution.
			IT321.2	Apply various cryptographic algorithms to secure the information.
			IT321.3	Apply number theory algorithms to solve the given problem.

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Mr. S. D. Patel

			IT321.4	Demonstrate the different attacks involved in cryptanalysis.
8	IT322	Digital Forensics	IT322.1	Explain the principles and techniques associated with the digital forensic practices.
			IT322.2	Understand the importance of evidence handling and storage for various devices.
			IT322.3	Analyze the adequate perspectives of digital forensic investigation in various applications.
			IT322.4	Analyze the Post-mortem investigation.
9	IT331	Advanced Database Systems	IT331.1	Evaluate the performance of query.
			IT331.2	Apply NO SQL, graph databases and enhanced data model concepts for a given scenario.
			IT331.3	Apply data warehousing concepts for a given scenario.
			IT331.4	Design parallel and distributed databases.
10	IT332	Data Science	IT332.1	Make use of data to perform exploratory data analysis.
			IT332.2	Apply supervised and unsupervised learning on a dataset.
			IT332.3	Apply Association rule mining on a dataset.
			IT332.4	Develop a data science application using ethical practices.
11	IT308	Mini Project-II	IT308.1	Conduct a survey of basic and contemporary literature in the preferred field by identifying problems based on societal/research needs.
			IT308.2	Formulate the problem statement by making judgments on validity of ideas.
			IT308.3	Conclude suitable inferences from obtained results through theoretical/experimental/simulations based analysis.
			IT308.4	Develop interpersonal skills to work as member of a team.
			IT308.5	Prepare a report of the findings for the study conducted in the preferred domain.



12	SVXX/STXX	SEVA II or III /SATVA II or III	--	--
13	SCX2/MNX2	SCOPE-III/Minor-III	--	--
<b>SEM VII</b>				
1	IT413	Natural Language Processing	IT413.1	Apply the Natural language processing pipeline to solve a given problem
			IT413.2	Identify use of Natural language Models
			IT413.3	Analyze Parts-Of-Speech tagging, Parsing and Semantic Analysis models for a given scenario
			IT413.4	Develop system to solve a Natural Language Processing problem
2	IT414	Deep Learning	IT414.1	Interpret the mathematical foundations of Deep Learning architectures.
			IT414.2	Construct deep neural networks for a given problem.
			IT414.3	Analyze deep learning models for a given scenario.
			IT414.4	Develop real-world applications using various deep learning techniques.
3	IT423	Security Operations Center	IT423.1	Explain the SOC processes, procedures, technologies, and workflows.
			IT423.2	Identify the indicators of compromise by recognizing the attacker tools, tactics, and procedures.
			IT423.3	Analyze the logs and alerts from various technologies.
			IT423.4	Evaluate the use cases that are widely used across the SIEM deployment.
4	IT424	Blockchain Technology	IT424.1	Explain the basic concepts of blockchain technology, Bitcoin and Ethereum.
			IT424.2	Apply a smart contract on the Ethereum test network
			IT424.3	Build a Decentralized Application running on a decentralized peer-to-peer network
			IT424.4	Explain the General Data Protection Regulation for relevant blockchain





				application
5	IT433	Digital Image Processing	IT433.1	Evaluate the techniques for enhancing and segmenting Images.
			IT433.2	Analyze images using various transforms.
			IT433.3	Categorize various compression techniques and standards for Images and Videos.
			IT433.4	Apply image processing algorithms in practical applications.
6	IT434	Project Management	IT434.1	Align the project to the organization's strategic plans and business justification throughout its lifecycle
			IT434.2	Manage the scope, cost, timing, and quality of the project, at all times focused on project success as defined by project stakeholders
			IT434.3	Identify Project constraints and justify resource utilization.
			IT434.4	Adapt projects in response to issues that arise internally and externally
			IT434.5	Analyze the failed projects
7	OEXXX	Open Elective--III*	--	--
8	IT401	Main Project Stage-I	--	--
9	SVXX/STXX	SEVA-III/SATVA-III		
10	SCX4/MNX4 / HOXX	SCOPE-IV/Minor- IV/Honors-I		

#### SEM VIII

1	OE1	Consumer Electronics	OE1.1	List and classify devices used in consumer products based on their specifications, identify sub-systems of consumer electronic products, also choose and use proper interface standard for a given consumer electronic product
			OE1.2	Illustrate working principle of consumer electronic products and carry out basic tests to identify their correct operation.
			OE1.3	Experiment with Haptics, Multitouch devices, Device interconnects and peripherals and also suggest modification in consumer electronic product using modern tools to enhance user



				experience
			OE1.4	Assemble subsystem of Television set and analyze technology used in audio systems.
			OE1.5	Demonstrate working principal of Healthcare and home electronics consumer products.
			OE1.6	Demonstrate working principal consumer electronic products used in Occupational safety.
2	OE2	Robotic Vision	OE2.1	Discuss the fundamentals of Robotics
			OE2.2	Apply direct and inverse kinematics algorithms
			OE2.3	Justify the need of vision algorithms
3	OE3	Cyber security and Digital Forensics	OE3.1	Identify and classify various cybercrimes with respect to organizational weaknesses in order to mitigate the security risk and estimate the impact on society and world.
			OE3.2	Analyze the results of vulnerability scans of vulnerability assessment and generate report with penetration testing.
			OE3.3	Apply Information Security Standards compliance during software design and development.
			OE3.4	Interpret and apply Indian IT laws in various legal issues.
			OE3.5	Describe the concept of Digital forensics and use various tools and techniques used for digital forensics investigations.
			OE3.6	Integrate advanced security solutions and manage, provide policies, standards, procedures, guidelines, policy framework, assess and mitigate risk.
4	OE4	Internet of Things	OE4.1	Describe IoT value chain structure (device, data cloud), application areas, IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules.
			OE4.2	Explain the embedded concepts and

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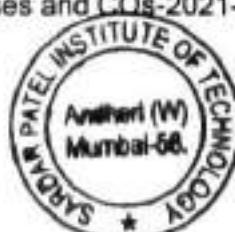
				embedded system architecture and programming of ARM Cortex Microcontroller for various applications.
		OE4.3		Describe the Architectural Overview of IoT, Reference Architecture and Real World Design Constraints and various IoT Protocols (Datalink, Network, Transport, Session, Service)
		OE4.4		Apply the concepts of big data analytics, Internet of things and implement smart systems.
		OE4.5		Build the Security requirements in IoT, Cryptographic fundamentals, the authentication credentials, various types Trust models and Cloud Security.
		OE4.6		Design a complete secure IoT System for various real time applications.
5	OES	Fundamentals of Computational Intelligence	OE5.1	Identify suitability of different learning types for different scenarios.
			OE5.2	To study Neural Networks and Convolutional Neural Networks
			OE5.3	To design fuzzy controllers for various applications.
			OE5.4	To study Natural Language Processing
			OE5.5	To apply computational intelligence technique to solve real world problems.
6	OE6	Fundamentals of Data Structures and Algorithms	OE6.1	Implement various operations of nonlinear data structures.
			OE6.2	Apply the concepts of Trees to a given problem.
			OE6.3	Analyze time and space complexity of an algorithm
			OE6.4	Apply divide and conquer strategy to solve problems
7	OE7	Software Testing	OE7.1	Analyze the principles in software testing to prevent & remove bugs.
			OE7.2	Design effective test cases suitable in testing.



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			OE7.3	Describe the variety of ways to test software and indicate the trade-offs between various testing techniques.
			OE7.4	Implement various test cases.
			OE7.5	Apply the software testing techniques in commercial environments.
			OE7.6	Able to use software testing methods and modern software testing tools for their testing projects.
8	OE8	Database Management Systems	OE8.1	Design a database for real world system, choose real world problem and map it to the solution using database techniques.
			OE8.2	Construct a database using SQL.
			OE8.3	Create normalized database using functional dependencies.
			OE8.4	Analyze the effect of transaction over the database.
			OE8.5	Build secure and normalize database using SQL constructs.
			OE8.6	Apply the connectivity techniques of database.
9	IT81	Enterprise Resource Planning	IT81.1	Examine different processes of the organization and the relationship among all processes
			IT81.2	Determine the support of ERP data in CRM/SCM/Etc.
			IT81.3	Discuss typical functionalities in an ERP system
			IT81.4	Elaborate the activities done during ERP implementation
			IT81.5	Discuss case studies in real world scenario to assure ERP benefits
10	IT82	User Experience Design	IT82.1	Paraphrase UI and UX design life cycle.
			IT82.2	Analyze UX design process for users.
			IT82.3	Analyze various parameters for design process.
			IT82.4	Apply design thinking to model the prototype.
			IT82.5	Evaluate user experiences using different UX evaluation techniques.
11	HSS81	Technology	HSS81.1	Identify problems worth solving



		Entrepreneurship Lab	HSS81.2 HSS81.3 HSS81.4 HSS81.5	Craft value proposition Prepare B-Plan Draft Patent Register virtual company
12	ITP81	Category I : Major Project I	--	--
13	ITP71	Category I : Major Project II	--	--
14	ITP71	Category II : Major Project II	--	--
15	ITP81	Category II: Major Project II	--	--

Rajabchand



Sekharia



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(Autonomous Institute Affiliated to University of Mumbai)

## **Course Outcomes**

### **Department of Information Technology**

**Academic Year 2020-2021**

<b>Sr. No.</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Course Outcomes</b>	
<b>SEM III</b>				
1	MA203	Probability and Statistics	MA203.1	Familiarize with basic probability axioms, rules and their applicability.
			MA203.2	Identify the characteristics of various discrete and continuous distributions.
			MA203.3	Find unbiased and efficient estimates using estimation theory.
			MA203.4	Test the hypothesis for means and variances using 't' & F; chi-square distribution tests.
			MA203.5	Find Correlation and Regression and fit different types of curves.
2	MA202	Foundation of Mathematics-I*	MA202.1	Differentiate a function of one variable and partially differentiate a function of more than one variable.
			MA202.2	Apply the concept of partial differentiation to find extreme values of a given function.
			MA202.3	Find nth order derivative of a given function.
			MA202.4	Expand a given function as a power series.
			MA202.5	Perform operations on matrices and find inverses and determinants of them.
			MA202.6	Perform vector operations and compute dot products and cross products between them.
3	IT201	Discrete Structures and Graph Theory	IT201.1	Solve problems using set theory, logic and its various proof techniques.
			IT201.2	Apply the concepts of relations, functions, lattices and recurrence

				relations to solve problems
			IT201.3	Apply the concepts of graph, trees and their various types with their traversing techniques to solve problems.
			IT201.4	Apply the basics of coding theory and cryptography to solve real world problems.
4	IT202	Data Structures	IT202.1	Apply various operations of linear and non-linear data structures to given problems.
			IT202.2	Apply the concepts of Trees and Graphs to a given problem.
			IT202.3	Apply various operations of heap data structures.
			IT202.4	Apply the concepts of hashing on a given problem.
5	IT203	Computer Architecture and Organization	IT203.1	Explain basic computer structure and compare computer architecture models
			IT203.2	Design algorithms to solve ALU operations and memory mapping techniques
			IT203.3	Comprehend processor architecture with various design methods of CPU with comparative analysis
			IT203.4	Illustrate memory systems with design and analysis of mapping techniques for cache and virtual memory
			IT203.5	Analyze different parallel processing and pipelining concepts with pipelining hazards
			IT203.6	Comprehend different types of I/O buses, compare and contrast different types of data transfer methods and arbitration techniques
6	IT204	Database Management Systems	IT204.1	Demonstrate understanding of given system to construct a database model.
			IT204.2	Apply various Relational and SQL commands on the populated database.
			IT204.3	Examine the functional dependencies to make a normalized database system.
			IT204.4	Examine transaction processing

				techniques on a database.
7	SVXX/STXX	SEVA II or III /SATVA II or III	IT204.5 --	Illustrate query processing and optimization method on a database. --
8	HSEX1	HSS-I	--	--
<b>SEM IV</b>				
1	MA201	Linear Algebra	MA201.1	Solve a homogeneous and non-homogeneous system of linear equations using rank of a matrix.
			MA201.2	Solve system of linear equations by Numerical Methods.
			MA201.3	Solve equations in real life problems and to encode and decode messages using the concept of matrices.
			MA201.4	Identify whether given structures are vector spaces and subspaces and construct abasis for them.
			MA201.5	Show if a given matrix is diagonalisable or not.
			MA201.6	Apply concepts of eigenvalues and eigenvectors to calculate functions of a squarematrix, google page rank vector and solve systems of differential equations using Diagonalisation of matrices.
2	MA204	Foundation of Mathematics-II	MA204.1	Integrate a function of one variable using various techniques
			MA204.2	Sketch basic curves and solve double and triple integrals
			MA204.3	Solve basic problems using properties of complex numbers.
			MA204.4	Solve differential equations of first order.
			MA204.5	Apply the techniques of solving first order differential equations to electricalengineering problems.
			MA204.6	Solve differential equations of higher order
3	IT205	Design and Analysis of Algorithms	IT205.1	Analyze time and space complexity of an algorithm.
			IT205.2	Apply divide and conquer strategy to solve problems.
			IT205.3	Apply the concept of dynamic



				programming and greedy approach to solve problems.
			IT205.4	Apply the idea of backtracking, branch and bound strategy to solve problems.
			IT205.5	Apply various string matching algorithms.
4	IT206	Operating Systems	IT206.1	Comprehend the primitive concepts of Operating System services and System Programming functionality.
			IT206.2	Articulate process scheduling algorithms in effective execution of processes.
			IT206.3	Acquaint with efficient process synchronization techniques in effective execution of programs.
			IT206.4	Analyze virtual memory management algorithms in effective allocation of main memory usage.
			IT206.5	Evaluates various algorithms of File Storage & I/O management for performance and quality criterion.
5	IT207	Computer Communications and Networks	IT207.1	Describe the fundamental concepts of Data Communication.
			IT207.2	Distinguish the different layers of the OSI model and TCP/IP.
			IT207.3	Identify the different types of protocols and their functions within a network.
			IT207.4	Apply the knowledge of subnetting, routing mechanisms and Software Defined Networking.
6	IT208	Mini Project-I	IT208.1	Discover potential research areas for addressing societal issues
			IT208.2	Conduct a survey of basic and contemporary literature in the preferred field of study.
			IT208.3	Formulate and propose a plan for creating a solution for the research plan identified.
			IT208.4	Exercise the team building, communication and management for design and implementation of projects.
			IT208.5	Compare and contrast the several existing solutions for research challenge.



			IT208.6	Report and present the findings of the study conducted in the preferred domain.
7	SVXX/STXX	SEVA II or III /SATVA II or III	--	--
8	HSEX1	HSS-I	--	--
9	AS201	Professional Communication Skills	AS201.1	Demonstrate the spoken and written skills for job placements.
			AS201.2	Draft professional documents.
			AS201.3	Design written communication for social media.
10	SCX1/MNX1	SCOPE-I/Minor-I	--	--

#### SEM V

1	IT51	Software Engineering	IT51.1	Analyze requirements and choose appropriate process model.
			IT51.2	Design system models with respect to traditional and the object oriented approach.
			IT51.3	Develop umbrella activities on system (RMMM, SQA, SCM).
			IT51.4	Evaluate system design with test cases.
2	IT52	Computer Networks	IT52.1	Explain the process of communication in computer network.
			IT52.2	Simulate the computer network.
			IT52.3	Design the subnet for the given ip address.
			IT52.4	Illustrate the protocols of TCP/IP.
3	IT53	Advanced Database Systems	IT53.1	Design parallel, distributed, Object oriented database
			IT53.2	Demonstrate the optimized query processing and indexing over the database
			IT53.3	Design the integration of database schemas using XML technology
			IT53.4	Explore Advanced Data management Techniques
4	IT54	Theoretical Computer Science*	IT54.1	Design finite automaton for a regular languages.
			IT54.2	Identify regular and non regular languages.
			IT54.3	Construct the grammar for a language and convert it into normal forms.
			IT54.4	Design pushdown automata and Turing machine for a language.



5	ITL51	Software Engineering Lab	ITL51.1	Create software requirements specification (SRS) document.
			ITL51.2	Construct data flow diagram (DFD) and UML diagrams for the case study.
			ITL51.3	Create work breakdown structure and schedule the activities using Gantt chart.
			ITL51.4	Develop Risk Mitigation, Monitoring and Management Plan.
			ITL51.5	Design test cases for a given case study.
			ITL51.6	Illustrate version of software using version control tool.
6	ITL52	Computer Networks Lab	ITL52.1	Illustrate topology.
			ITL52.2	Test various protocol for given scenario.
			ITL52.3	Build VLAN.
			ITL52.4	Experiment application layer protocol.
7	ITL53	Advanced Database Systems Lab	ITL53.1	Design Parallel, Distributed and Object Oriented database.
			ITL53.2	Analyze the effect of indexing, query processing and optimization over the database
			ITL53.3	Demonstrate working of Cloud and Multimedia Databases.
			ITL53.4	Design the integration of database schemas using XML technology.
8	ITL54	Internet Technology Lab	ITL54.1	Demonstrate the use of web engineering concepts such as class diagram, data flow diagram, requirement specification.
			ITL54.2	Create web mashups of REST based web services using AJAX, JSON.
			ITL54.3	Implement security features in web project using JSON Webtokens/ Auth2.0.
			ITL54.4	Test the deployment of web project.
9	ITP55	Minor Project I	ITP55.1	Identify the requirements for the project.
			ITP55.2	Develop a prototype to confirm technical requirement.
			ITP55.3	Design and implement the project.
			ITP55.4	Test the product.
10	MEC1	French Language	CO1	Student will be able to



		<p>Self introduction</p> <p>Introduce themselves in a meeting and converse with people from different countries. Speak about themselves, their professions, their family, family names, first names, nationalities, ages. Have a discussion on the whereabouts and identities of people they interact with such as their nationalities, the countries they come from, the languages they speakGreet people and take leave</p>
	<p>CO2 General Topics</p>	<p>Student will be able to</p> <p>Count numbers from 0 to 69 To know how to talk about dates, seasons, time of the day, days of the week and months of the year. Know how to describe a noun using qualitative adjectives. ask price of something</p>
	<p>CO3 Dialogue with professor or any other interlocutor</p>	<p>Student will be able to</p> <p>Communicate in class and understand instructions such as repeat/answer/listen/look/tick the right answer/write/underline/close/how is it pronounced/how is it written/how does one say/work in groups/I don't know/I do not understand request for directions using interrogatives like where/who speaks/to whom/why share/to give personal information: telephone numbers/ date of birth/postal address/filling out documents and ability to comprehend the details on important identity papers such as passports or registration forms.</p>
	<p>CO4 Exposure to French Culture Life and Social Norms.</p>	<p>Student will be able to</p> <p>get from the Airport in France to his destination in city. To understand directions. To move around the city understanding road signs, maps. Will be acquainted with French Culture and hence understand their behaviour and communicate appropriately with</p>



				them.
11	MEC2	German Language	CO1	Student will be able to greet the other person, say good bye, introduce oneself and the partner, to be able to talk about the others, to be able to count upto 20, make use of knowledge of numbers as regards understanding telephone numbers, to be able to recognize alphabets, speak about countries and languages
			CO2	Student will be able to speak about hobbies, take leave of someone, name the days of the week, to be able to talk about work, jobs, and office timings, to be able to count beyond 20, to be able to talk about seasons, to be able to register own data on internet site
			CO3	Student will be able to name places and important buildings like the marketplace, to be able to ask questions regarding places, to be able to relate texts to a picture story, ask for things, name the means of public transport, ask for directions
			CO4	Student will be able to identify food items and to talk about them, to be able to write a shopping list, understand conversations in a supermarket, understand W-questions
			CO5	Student will be able to understand time, plan time table as per required time, to be able to speak about family, to excuse oneself for being late, to be able to fix an appointment telephonically
			CO6	Student will be able to plan something together, to be able to speak about birthday, to understand and draft an invitation, to be able to order and pay food items in a restaurant, to be able to talk about routine events, understand event information on radio
12	SDX	SCOPE Course (Optional)	--	--
13	ABL3	Technical Presentation Skill (Noncredit)	--	--



14	CEP3	Problem solving module-II (Optional)	--	--
<b>SEM VI</b>				
1	IT61	Distributed Systems	IT61.1	Compare different distributed system architectures.
			IT61.2	Implement message communication techniques.
			IT61.3	Analyze the clock synchronization algorithm and consistency in distributed systems.
			IT61.4	Make use of CORBA components for case study
			IT61.5	Demonstrate the basic concepts of CUDA programs for performance measures.
2	IT62	Data Warehousing and Mining	IT62.1	Explain the importance of data mining and Data Warehousing.
			IT62.2	Identify the data needed for data mining algorithms in terms of attributes, class inputs, training, validating, and testing files.
			IT62.3	Apply Association mining on large data sets.
			IT62.4	Measure the performance of classification algorithms using metrics.
			IT62.5	Measure the performance of Clustering algorithms using large data sets.
3	IT63	Information and Network security	IT63.1	Identify cryptographic algorithm to secure information.
			IT63.2	Interpret concepts of security, authentication and authorization.
			IT63.3	Illustrate the software security practices.
			IT63.4	Categorize the attacks in each layer of OSI model.
			IT63.5	Explain the different ways to secure a web.
4	ITL61	Distributed Systems Lab	ITL61.1	Apply message communication technique and develop the applications.
			ITL61.2	Implement clock synchronization algorithm in distributed system.
			ITL61.3	Develop a application using CORBA.
			ITL61.4	Develop application using



				MapReduce and performance measure using CUDA.
5	ITL62	Data Warehousing and Mining Lab	ITL62.1	Identify the data needed for data mining algorithms in terms of attributes, class inputs, training, validating, and testing files.
			ITL62.2	Identify a problem having a dataset to do data visualization.
			ITL62.3	Measure the performance of classification algorithmson large data sets by applying metrics.
			ITL62.4	Measure the performance of Clusteringalgorithmsusing large data sets.
			ITL62.5	Analyze Association mining on large data sets.
6	ITL63	Information and Network security Lab	ITL63.1	Interpret the concepts of security.
			ITL63.2	Illustrate the network vulnerability scanning process.
			ITL63.3	Demonstrate the different attacks involved in a network.
			ITL63.4	Illustrate attacks involved in web security.
			ITL63.5	Use digital forensics method to recover the deleted data.
7	ITL64	Machine Learning Lab	ITL64.1	Apply Dimensionality reduction techniques to a given problem
			ITL64.2	Apply regression techniques on a large data set
			ITL64.3	Apply neural networks to solve pattern classification problems
			ITL64.4	Solve optimization problems using genetic algorithms.
			ITL64.5	Apply appropriate ML technique on a given domain
8	ITP65	Minor Project II	ITP65.1	Identify the problem that exists in the system.
			ITP65.2	List the requirements.
			ITP65.3	Select one from alternate solution.
			ITP65.4	Write survey paper.
9	HSS61	Advance Communicative English	CO1	Acquire skills for succeeding in job placements and ompetitive exams
			CO2	Encourage reading and evaluating critically
			CO3	Develop proficiency in the use of spoken and written communication



				for professional purposes
			CO4	Communicate using social media
10	OE1	Consumer Electronics	CO1	List and classify devices used in consumer products based on their specifications, identify sub-systems of consumer electronic products, also choose and use proper interface standard for a given consumer electronic product
			CO2	Illustrate working principle of consumer electronic products and carry out basic tests to identify their correct operation.
			CO3	Experiment with Haptics, Multitouch devices, Device interconnects and peripherals and also suggest modification in consumer electronic product using modern tools to enhance user experience
			CO4	Assemble subsystem of Television set and analyze technology used in audio systems.
			CO5	Demonstrate working principal of Healthcare and home electronics consumer products.
			CO6	Demonstrate working principal consumer electronic products used in Occupational safety.
11	OE2	Robotic Vision	CO1	Discuss the fundamentals of Robotics
			CO2	Apply direct and inverse kinematics algorithms
			CO3	Justify the need of vision algorithms
12	OE3	Cyber security and Digital Forensics	CO1	Identify and classify various cybercrimes with respect to organizational weaknesses in order to mitigate the security risk and estimate the impact on society and world
			CO2	Analyze the results of vulnerability scans of vulnerability assessment and generate report with penetration testing
			CO3	Apply Information Security Standards compliance during software design and development
			CO4	Interpret and apply Indian IT laws in various legal issues



			CO5	Describe the concept of Digital forensics and use various tools and techniques used for digital forensics investigations
			CO6	Integrate advanced security solutions and manage, provide policies, standards, procedures, guidelines, policy framework, assess and mitigate risk
13	OE4	Internet of Things	CO1	Describe IoT value chain structure (device, data cloud), application areas, IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules.
			CO2	Describe the Architectural Overview of IoT, Reference Architecture and Real World Design Constraints and various IoT Protocols ( Datalink, Network, Transport, Session, Service)
			CO3	Apply the concepts of big data analytics, Internet of things and implement smart systems.
14	OE5	Fundamentals of Computational Intelligence	CO1	Identify suitability of different learning types for different scenarios.
			CO2	To study Neural Networks and Convolutional Neural Networks
			CO3	To design fuzzy controllers for various applications.
			CO4	To study Natural Language Processing
			CO5	To apply computational intelligence technique to solve real world problems.
15	OE6	Fundamentals of Data Structures and Algorithms	CO1	Implement various operations of nonlinear data structures.
			CO2	Apply the concepts of Trees to a given problem.
			CO3	Analyze time and space complexity of an algorithm
			CO4	Apply divide and conquer strategy to solve problems
16	OE7	Software Testing	OE7.1	Analyze the principles in software testing to prevent & remove bugs.
			OE7.2	Design effective test cases suitable in

				testing.
			OE7.3	Describe the variety of ways to test software and indicate the trade-offs between various testing techniques.
			OE7.4	Implement various test cases.
			OE7.5	Apply the software testing techniques in commercial environments.
			OE7.6	Able to use software testing methods and modern software testing tools for their testing projects.
17	OE8	Database Management Systems	OE8.1	Design a database for real world system, choose real world problem and map it to the solution using database techniques.
			OE8.2	Construct a database using SQL.
			OE8.3	Create normalized database using functional dependencies.
			OE8.4	Analyze the effect of transaction over the database.
			OE8.5	Build secure and normalize database using SQL constructs.
			OE8.6	Apply the connectivity techniques of database.
18	MEC3	Industrial and Organizational Psychology	CO1	To impart knowledge and understanding of the basic concepts in and various facets of Industrial and Organizational Psychology
			CO2	To create awareness about the role and importance of Psychological factors and processes in the world of work
			CO3	To create a foundation for higher education and a professional career in Industrial Psychology and Organizational Behavior
19	MEC4	Law for Engineers	CO1	Student will be able to recognize the importance of the legal system, and the controls it exerts on the activities of engineers in practice.
			CO2	Student will be able to express the details of what the individual's responsibilities are to ensure legal behaviour in engineering practice.
20	SDX	SCOPE Course (Optional)	--	--
21	ABL4	Technical Paper and	--	--



		Patent Drafting (Noncredit)		
22	CEP4	Problem solving module-III (Optional)	--	--
<b>SEM VII</b>				
1	IT71	Digital Image Processing	COIT71.1	Evaluate the techniques for enhancing and segmenting Images.
			COIT71.2	Analyze images using various transforms.
			COIT71.3	Categorize and interpret various compression techniques and standards.
			COIT71.4	Apply image processing algorithms in practical applications.
2	ITE71A	Data Analytics	COITE71A.1	Choose appropriate storage structure to make sense out of data sets.
			COITE71A.2	Apply rules and theorems in statistics to analyze the data.
			COITE71A.3	Analyze the key issues in big data management and its associated applications in intelligent business and scientific computing.
			COITE71A.4	Apply different algorithms like page ranking, mining, clustering, finding similar items to get insights of the data.
3	ITE71B	Ad-hoc and Wireless Sensor Network	ITE71B.1	Analyze different protocols for Wireless Ad-hoc Networks.
			ITE71B.2	Analyze different protocols for Wireless Sensor Networks.
			ITE71B.3	Identify challenges in designing various protocols for Wireless Ad-hoc Networks.
			ITE71B.4	Choose performance metrics for Wireless Sensor Networks.
4	ITE71C	AI and Expert System	ITE71C.1	Illustrate the building blocks of AI as presented in terms of intelligent agents
			ITE71C.2	Choose an appropriate problem-solving method and knowledge-representation scheme for a given problem
			ITE71C.3	Apply the appropriate search method on a given problem
			ITE71C.4	Develop simple intelligent systems or



				classical toy problems using different AI techniques
4	ITE72A	Soft Computing	ITE72A.1	Illustrate the basic principles of soft computing techniques.
			ITE72A.2	Demonstrate the working of deep learning algorithms for neural networks.
			ITE72A.3	Model Fuzzy Inference Systems.
			ITE72A.4	Make use of neural networks to solve different problems.
			ITE72A.5	Solve optimization problems using genetic algorithms.
5	ITE72B	Cloud Computing	ITE72B.1	Illustrate the fundamentals of Cloud Computing and its challenges.
			ITE72B.2	Analyze different virtualization techniques and their role in enabling the cloud computing system model.
			ITE72B.3	Classify various architecture and infrastructure of cloud computing.
			ITE72B.4	Analyze some important cloud computing driven systems and cloud applications.
			ITE72B.5	Categorize various security related issues in cloud computing.
6	ITE72C	IT Infrastructure Management	ITE72C.1	Identify the requirements to set up an IT infrastructure.
			ITE72C.2	Identify the service delivery Processes & Service support process
			ITE72C.3	Illustrate the different component of storage network architecture
			ITE72C.4	Identify the use of Information Technology Infrastructure Library
			ITE72C.5	Design the data center infrastructure.
7	ITL71	Digital Image Processing Lab	ITL71.1	Identify the techniques to enhance the subjective quality of the image of different resolutions.
			ITL71.2	Analyze an image using Image Transform.
			ITL71.3	Extract the important features from image data to solve real life problem.
			ITL71.4	Apply the compression technique on digital images and compute its efficiency.
8	ITEL71A	Data Analytics Lab	ITEL71A.1	Apply Map Reduce on string and integers.



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			ITEL71A.2	Make use of modern tools to analyze the best practices in data science.
			ITEL71A.3	Apply map-reduce on Big data algorithms like Frequent Item set algorithm, Clustering, Data streaming algorithm.
			ITEL71A.4	Make use of software tools like Pig, Hive, Hbase etc. for data analytics.
9	ITEL71B	Ad-hoc and Wireless Sensor Network Lab	ITEL71B.1	Estimate the performance of the Network.
			ITEL71B.2	Create a Wireless Ad-hoc Network.
			ITEL71B.3	Analyze the Protocols for Personal Area Networks
			ITEL71B.4	Build a Wireless Sensor Network.
10	ITEL71C	AI and Expert System Lab	ITEL71C.1	Utilize knowledge based reasoning to solve certain problems
			ITEL71C.2	Apply different uninformed and informed search techniques to solve various problems
			ITEL71C.3	Apply adversarial search techniques to solve problems
			ITEL71C.4	Implement programs in declarative programming style using Prolog
			ITEL71C.5	Design intelligent agents for solving a particular problem
11	ITEL72A	Soft Computing Lab	ITEL72A.1	Apply supervised and unsupervised learning algorithms on various input patterns
			ITEL72A.2	Apply genetic algorithm for solving optimization problems
			ITEL72A.3	Measure the performance of deep learning algorithms using open source tools
			ITEL72A.4	Design fuzzy logic control systems
			ITEL72A.5	Choose a suitable soft computing technique for a given scenario
12	ITEL72B	Cloud Computing Lab	ITEL72B.1	Perform virtualization configuration and administration
			ITEL72B.2	Handle open source cloud implementation and administration.
			ITEL72B.3	Create and run virtual machines.
			ITEL72B.4	Install and appreciate security features for cloud.
			ITEL72B.5	Install and use cloud simulator.
13	ITEL72C	IT Infrastructure Management	ITEL72C.1	Identify the requirements for IT infrastructure



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		Lab	ITEL72C.2	Identify ITIL components for IT infrastructure
			ITEL72C.3	Design network management
			ITEL72C.4	Design data center virtualization
			ITEL72C.5	Apply security for IT infrastructure
14	ITP71	Category-,,1": Major Project-II Category-,,2": Major Project-I	--	--
15	CEPS	Problem solving module-V (Optional)		

### SEM VIII

1	OE1	Consumer Electronics	OE1.1	List and classify devices used in consumer products based on their specifications, identify sub-systems of consumer electronic products, also choose and use proper interface standard for a given consumer electronic product
			OE1.2	Illustrate working principle of consumer electronic products and carry out basic tests to identify their correct operation.
			OE1.3	Experiment with Haptics, Multitouch devices, Device interconnects and peripherals and also suggest modification in consumer electronic product using modern tools to enhance user experience
			OE1.4	Assemble subsystem of Television set and analyze technology used in audiosystems.
			OE1.5	Demonstrate working principle of Healthcare and home electronics consumer products.
			OE1.6	Demonstrate working principle of consumer electronic products used in Occupational safety.
2	OE2	Robotic Vision	OE2.1	Discuss the fundamentals of Robotics
			OE2.2	Apply direct and inverse kinematics algorithms
			OE2.3	Justify the need of vision algorithms
3	OE3	Cyber security and Digital Forensics	OE3.1	Identify and classify various cybercrimes with respect to organizational weaknesses in order to



				mitigate the security risk and estimate the impact on society and world.
		OE3.2		Analyze the results of vulnerability scans of vulnerability assessment and generate report with penetration testing.
		OE3.3		Apply Information Security Standards compliance during software design and development.
		OE3.4		Interpret and apply Indian IT laws in various legal issues.
		OE3.5		Describe the concept of Digital forensics and use various tools and techniques used for digital forensics investigations.
		OE3.6		Integrate advanced security solutions and manage, provide policies, standards, procedures, guidelines, policy framework, assess and mitigate risk.
4	OE4	Internet of Things	OE4.1	Describe IoT value chain structure (device, data cloud), application areas, IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules.
			OE4.2	Explain the embedded concepts and embedded system architecture and programming of ARM Cortex Microcontroller for various applications.
			OE4.3	Describe the Architectural Overview of IoT, Reference Architecture and Real World Design Constraints and various IoT Protocols (Datalink, Network, Transport, Session, Service)
			OE4.4	Apply the concepts of big data analytics, Internet of things and implement smart systems.
			OE4.5	Build the Security requirements in IoT, Cryptographic fundamentals, the authentication credentials, various types Trust models and Cloud Security.
			OE4.6	Design a complete secure IoT System

S.P.I.T.

IT Department Courses and CO.S. 2020-21



18

				for various real time applications.
5	OE5	Fundamentals of Computational Intelligence	OE5.1	Identify suitability of different learning types for different scenarios.
			OE5.2	To study Neural Networks and Convolutional Neural Networks
			OE5.3	To design fuzzy controllers for various applications.
			OE5.4	To study Natural Language Processing
			OE5.5	To apply computational intelligence technique to solve real world problems.
6	OE6	Fundamentals of Data Structures and Algorithms	OE6.1	Implement various operations of nonlinear data structures.
			OE6.2	Apply the concepts of Trees to a given problem.
			OE6.3	Analyze time and space complexity of an algorithm
			OE6.4	Apply divide and conquer strategy to solve problems
7	OE7	Software Testing	OE7.1	Analyze the principles in software testing to prevent & remove bugs.
			OE7.2	Design effective test cases suitable in testing.
			OE7.3	Describe the variety of ways to test software and indicate the trade-offs between various testing techniques.
			OE7.4	Implement various test cases.
			OE7.5	Apply the software testing techniques in commercial environments.
			OE7.6	Able to use software testing methods and modern software testing tools for their testing projects.
8	OE8	Database Management Systems	OE8.1	Design a database for real world system, choose real world problem and map it to the solution using database techniques.
			OE8.2	Construct a database using SQL.
			OE8.3	Create normalized database using functional dependencies.
			OE8.4	Analyze the effect of transaction over the database.
			OE8.5	Build secure and normalize database using SQL constructs.

Dr. Jayashankar



Dr. Shanti Patel

			OE8.6	Apply the connectivity techniques of database.
9	IT81	Enterprise Resource Planning	IT81.1	Examine different processes of the organization and the relationship among all processes
			IT81.2	Determine the support of ERP data in CRM/SCM/Etc.
			IT81.3	Discuss typical functionalities in an ERP system
			IT81.4	Elaborate the activities done during ERP implementation
			IT81.5	Discuss case studies in real world scenario to assure ERP benefits
10	IT82	User Experience Design	IT82.1	Paraphrase UI and UX design life cycle.
			IT82.2	Analyze UX design process for users.
			IT82.3	Analyze various parameters for design process.
			IT82.4	Apply design thinking to model the prototype.
			IT82.5	Evaluate user experiences using different UX evaluation techniques.
11	HSS81	Technology Entrepreneurship Lab	HSS81.1	Identify problems worth solving
			HSS81.2	Craft value proposition
			HSS81.3	Prepare B-Plan
			HSS81.4	Draft Patent
			HSS81.5	Register virtual company
12	ITP81	Category I :Major Project I	--	--
13	ITP71	Category I : Major Project II	--	--
14	ITP71	Category II : Major Project II	--	--
15	ITP81	Category II: Major Project II	--	--





Bharatiya Vidya Bhavan's  
**SARDAR PATEL INSTITUTE OF TECHNOLOGY**  
Munshi Nagar, Andheri (W), Mumbai – 400 058.  
(Autonomous Institute Affiliated to University of Mumbai)

## Course Outcomes

### Department of Information Technology

Academic Year 2019-2020

Sr. No.	Course Code	Course Name	Course Outcomes		
<b>SEM III</b>					
1	BS31	Applied Mathematics I*	CO1	Check analyticity of function of complex variables	
			CO2	Find Laplace and Inverse Laplace Transforms	
			CO3	Apply Laplace and Laplace Inverse methods to solve differential equations with initial conditions	
			CO4	Expand functions in terms of sine and cosine series on the given interval	
			CO5	Evaluate Z-transform and Inverse Z-transform	
			CO6	Formulate and solve Linear Programming Problem arising in engineering	
2	IT31	Advanced Data Structures*	CO1	Implement various operations using non linear data structures.	
			CO2	Apply concepts of Trees and Graphs to a given problem.	
			CO3	Build various Heap Structure	
			CO4	Illustrate the hashing and collision resolution techniques.	
3	IT32	Digital Logic Design and Analysis*	CO1	Design of digital circuits using SOP & POS forms.	
			CO2	Construct combinational circuits using given MSI devices.	
			CO3	Apply the knowledge of flip-flops and MSI to design counters and Shift registers.	
			CO4	Design state machines for given state diagrams after state reduction.	
			CO5	Describe different types of	

S.P.I.T.

IT Department Courses and Fees - 2019-20

1



				programmable logic devices like PAL, PLA, CPLD and FPGA.
4	IT33	Discrete Structures	CO1	Make use of logic and various proof techniques to solve problems.
			CO2	Apply the concepts of set, relations to solve problems
			CO3	Apply the concepts of functions to various technical domains.
			CO4	Solve problems using graphs and trees.
			CO5	Use fundamental concepts of algebraic structures, lattice to solve problems
5	IT34	Object Oriented Programming*	CO1	Demonstrate object oriented programming paradigm.
			CO2	Solve problems using inheritance & package.
			CO3	Use file handling concepts in Java for data input and output.
			CO4	Apply concepts of multithreading and exception handling to create efficient program.
			CO5	Make use of string and collection classes.
6	ITL31	Advanced Data Structures Lab	CO1	Implement various Linked List Operations.
			CO2	Implement various Operations of Trees and Graphs.
			CO3	Construct different Heap structures.
			CO4	Analyze different hashing and collision resolution techniques.
			CO5	Choose an appropriate data structure to solve a given problem.
7	ITL32	Digital Logic Design and Analysis Lab	CO1	Construct and test logic circuits using logic gates to realize given function.
			CO2	Construct and Test logic circuits using MSI ICs to realize given function.
			CO3	Construct and test the design of combinational and sequential logic circuits by hardware implementation.
			CO4	Construct and test design of counters/shift registers.
8	ITL34	Object Oriented Programming Lab	CO1	Demonstrate object oriented programming concepts for a scenario.
			CO2	Apply static and dynamic binding.
			CO3	Apply concept of input, output and



				JDBC.
			CO4	Apply multi threading and exception handling for a scenario.
			CO5	Design a java application using J2EE, Swing etc
9	ITL35	Web Programming Lab-1	ITL35.1	Design basic web page layout using HTML
			ITL35.2	Use CSS for designing attractive web pages
			ITL35.3	Apply client side scripting to static web pages
			ITL35.4	Create responsive web pages using Bootstrap
10	ITL36	Open Source Operating System Lab	ITL36.1	Distinguish the concept of open Source Software, close software and proprietary software
			ITL36.2	Demonstrate the installation process of open source operating systems based on the Linux kernel.
			ITL36.3	Demonstrate responsibilities performed by the system administrator
			ITL36.4	Identify and use UNIX/Linux utilities to create and manage Linux Processes
			ITL36.5	Use common decision constructs in shell scripts effectively
11	BS32	Human Health Systems Approach	CO1	Physiology as integrated interdisciplinary Science
			CO2	Physiological significance of balanced diet and exercise in health
			CO3	Significance of cleanliness and hygiene in daily routine
			CO4	Dynamics and homeostasis of human health
12	SDX	SCOPE Course (Optional)	--	--
13	ABL1	Building Automation, Fire Safety and Electronic Security (Noncredit)	--	--
14	CEP1	Introduction to CEP (Optional)	--	--
15	BC	Fundamentals of Mathematics (only for direct second year students)	CO1	To find basic derivatives, Integration and limits.
			CO2	To find rank of a matrix and solve system of linear equations using rank.

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IT Department Courses and CO's for 2019-20



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			CO3	To find partial derivative of a function and apply it to extremise functions.
			CO4	To solve differential equations of first and higher order.
			CO5	To find roots & logarithm of a complex number.
<b>SEM IV</b>				
1	BS41	Applied Mathematics II*	CO1	Check if matrix is diagonalizable, derogatory & to calculate functions of a square matrix.
			CO2	Find Correlation between two variables.
			CO3	Find the measures of central tendency
			CO4	Solve a problem by identifying the appropriate distribution.
			CO5	Test the hypothesis for means and variances for single and multiple samples using 't' & chi-square distribution tests.
2	IT41	Design and Analysis of Algorithms*	CO1	Analyze time and space complexity of an algorithm
			CO2	Apply divide and conquer strategy to solve problems
			CO3	Design an algorithm to illustrate the concept of dynamic programming
			CO4	Apply the concept of greedy approach to solve problems
			CO5	Describe the idea of backtracking, branch and bound strategy to solve problems.
			CO6	Apply the concept of linear programming to optimize the solution
3	IT42	Computer Organization and Architecture*	CO1	Describe basic structure of computer.
			CO2	Apply arithmetic algorithm for solving problems.
			CO3	Compare different processor architectures.
			CO4	Describe the memory mapping techniques.
			CO5	Apply I/O concept for simulating I/O device operations.
			CO6	Analyze different parallel processing and pipelining concepts.
4	IT43	Database Management Systems*	CO1	Design effective database systems, leading to development of elegant Information System.



			CO2	Analyze the real world problem and construct a relational database.
			CO3	Construct a secure database.
			CO4	Design a relation database using concept of functional dependencies.
			CO5	Analyze the effect of concurrency control for transaction processing.
5	IT44	Operating Systems*	CO1	Explain the basic functions of operating systems
			CO2	Make use of various process scheduling and disk scheduling algorithm
			CO3	Experiment inter process communication solution
			CO4	Categorize various memory management techniques
			CO5	Explain file systems
			CO6	Discover functions of operating systems in different environment
6	ITL41	Design and Analysis of Algorithms Lab	CO1	Compare time and space complexity of different sorting and searching techniques
			CO2	Solve various problems using dynamic programming approach
			CO3	Illustrate the concepts of greedy approach
			CO4	Demonstrate the applicability of backtracking, branch and bound strategies to solve problems in different domains
			CO5	Demonstrate various string matching algorithms
			CO1	Identify the components of Computers and Assemble the computer system.
7	ITL42	Computer Organization and Architecture Lab	CO2	Design ALU operations using LabView and VHDL tool.
			CO3	Apply data arithmetic algorithms for implementing arithmetic operations
			CO4	Apply various memory management technique for memory allocation and page replacement algorithms
			CO5	Demonstrate I/O operations
			CO6	Analyze the performance of the systems.
			CO1	Design a relational database for real world system.
S.P.I.T. Department Courses and COs 2019-20				

Dr. Laxmi Chaitanya



Mr. S. B. Shinde

			CO2	Apply SQL commands on database.
			CO3	Execute various transaction and recovery commands over database.
			CO4	To examine effect of concurrency control on database.
9	ITL44	Operating Systems Lab	CO1	Illustrate process/file system call in Unix – Understanding.
			CO2	Illustrate multi threading – Understanding.
			CO3	Apply various process scheduling/disk scheduling algorithm- Applying.
			CO4	Develop inter process communication – Applying.
			CO5	Examine memory management strategy – Analyzing.
10	ITL45	Web Programming Lab-II	ITL45.1	Build dynamic web pages using server side scripting
			ITL45.2	Apply session control over web pages
			ITL45.3	Demonstrate web database connectivity via scripting language
			ITL45.4	Develop the server side of a web application using web development frameworks
11	LA1	Yoga Vidya	CO1	Perform various techniques of Yoga
			CO2	Follow healthy habits to improve immune system
			CO3	Describe the importance of Yoga in one's life
			CO4	Make resolution to practice techniques of Yoga
12	LA2	Music Appreciation	CO1	Appreciate various processes of Music composition
			CO2	Appreciate the role of engineers in sound recording
13	LA3	Dramatics	CO1	Understand an Art of Theatre.
			CO2	Express their thoughts.
			CO3	Create and visualize new ideas.
			CO4	Perform impressively.
14	SDX	SCOPE Course (Optional)	--	--
15	ABL2	Occupational Safety and Legal Studies for Engineers (Noncredit)	--	--
16	CEP2	Problem solving module-I (Optional)	--	--

SEM V				
1	IT51	Software Engineering	IT51.1	Analyze requirements and choose appropriate process model.
			IT51.2	Design system models with respect to traditional and the object oriented approach.
			IT51.3	Develop umbrella activities on system (RMMM, SQA, SCM).
			IT51.4	Evaluate system design with test cases.
2	IT52	Computer Networks	IT52.1	Explain the process of communication in computer network.
			IT52.2	Simulate the computer network.
			IT52.3	Design the subnet for the given ip address.
			IT52.4	Illustrate the protocols of TCP/IP.
3	IT53	Advanced Database Systems	IT53.1	Design parallel, distributed, Object oriented database
			IT53.2	Demonstrate the optimized query processing and indexing over the database
			IT53.3	Design the integration of database schemas using XML technology
			IT53.4	Explore Advanced Data management Techniques
4	IT54	Theoretical Computer Science*	IT54.1	Design finite automaton for a regular languages.
			IT54.2	Identify regular and non regular languages.
			IT54.3	Construct the grammar for a language and convert it into normal forms.
			IT54.4	Design pushdown automata and Turing machine for a language.
5	ITL51	Software Engineering Lab	ITL51.1	Create software requirements specification (SRS) document.
			ITL51.2	Construct data flow diagram (DFD) and UML diagrams for the case study.
			ITL51.3	Create work breakdown structure and schedule the activities using Gantt chart.
			ITL51.4	Develop Risk Mitigation, Monitoring and Management Plan.
			ITL51.5	Design test cases for a given case study.
			ITL51.6	Illustrate version of software using



				version control tool.
6	ITL52	Computer Networks Lab	ITL52.1	Illustrate topology.
			ITL52.2	Test various protocol for given scenario.
			ITL52.3	Build VLAN.
			ITL52.4	Experiment application layer protocol.
7	ITL53	Advanced Database Systems Lab	ITL53.1	Design Parallel, Distributed and Object Oriented database.
			ITL53.2	Analyze the effect of indexing, query processing and optimization over the database
			ITL53.3	Demonstrate working of Cloud and Multimedia Databases.
			ITL53.4	Design the integration of database schemas using XML technology.
8	ITL54	Internet Technology Lab	ITL54.1	Demonstrate the use of web engineering concepts such as class diagram, data flow diagram, requirement specification.
			ITL54.2	Create web mashups of REST based web services using AJAX, JSON.
			ITL54.3	Implement security features in web project using JSON Webtokens/ Auth2.0.
			ITL54.4	Test the deployment of web project.
9	ITP55	Minor Project I	ITP55.1	Identify the requirements for the project.
			ITP55.2	Develop a prototype to confirm technical requirement.
			ITP55.3	Design and implement the project.
			ITP55.4	Test the product.
10	MEC1	French Language	CO1  Self introduction	Student will be able to  Introduce themselves in a meeting and converse with people from different countries. Speak about themselves, their professions, their family, family names, first names, nationalities, ages. Have a discussion on the whereabouts and identities of people they interact with such as their nationalities, the countries they come from, the languages they speakGreet people and take leave
			CO2	Student will be able to



			General Topics	Count numbers from 0 to 69 To know how to talk about dates, seasons, time of the day, days of the week and months of the year. Know how to describe a noun using qualitative adjectives. ask price of something
			CO3	Student will be able to  Dialogue with professor or any other interlocutor  Communicate in class and understand instructions such as repeat/answer/listen/look/tick the right answer/write/underline/close/how is it pronounced/how is it written/how does one say/work in groups/I don't know/I do not understand request for directions using interrogatives like where/who speaks/to whom/why share /to give personal information: telephone numbers/ date of birth/postal address/filling out documents and ability to comprehend the details on important identity papers such as passports or registration forms.
			CO4	Student will be able to  Exposure to French Culture Life and Social Norms.  get from the Airport in France to his destination in city. To understand directions. To move around the city understanding road signs, maps. Will be acquainted with French Culture and hence understand their behaviour and communicate appropriately with them.
11	MEC2	German Language	CO1	Student will be able to greet the other person, say good bye, introduce oneself and the partner, to be able to talk about the others, to be able to count upto 20, make use of knowledge of numbers as regards understanding telephone numbers, to be able to recognize alphabets, speak about countries and languages
			CO2	Student will be able to speak about hobbies, take leave of someone, name



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				the days of the week, to be able to talk about work, jobs, and office timings, to be able to count beyond 20, to be able to talk about seasons, to be able to register own data on internet site
			CO3	Student will be able to name places and important buildings like the marketplace, to be able to ask questions regarding places, to be able to relate texts to a picture story, ask for things, name the means of public transport, ask for directions
			CO4	Student will be able to identify food items and to talk about them, to be able to write a shopping list, understand conversations in a supermarket, understand W-questions
			CO5	Student will be able to understand time, plan time table as per required time, to be able to speak about family, to excuse oneself for being late, to be able to fix an appointment telephonically
			CO6	Student will be able to plan something together, to be able to speak about birthday, to understand and draft an invitation, to be able to order and pay food items in a restaurant, to be able to talk about routine events, understand event information on radio
12	SDX	SCOPE Course (Optional)	--	--
13	ABL3	Technical Presentation Skill (Noncredit)	--	--
14	CEP3	Problem solving module-II (Optional)	--	--

#### SEM VI

1	IT61	Distributed Systems	IT61.1	Compare different distributed system architectures.
			IT61.2	Implement message communication techniques.
			IT61.3	Analyze the clock synchronization algorithm and consistency in distributed systems.
			IT61.4	Make use of CORBA components for case study

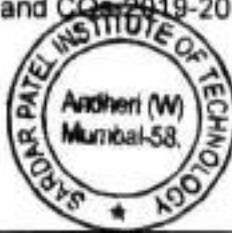


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			IT61.5	Demonstrate the basic concepts of CUDA programs for performance measures.
2	IT62	Data Warehousing and Mining	IT62.1	Explain the importance of data mining and Data Warehousing.
			IT62.2	Identify the data needed for data mining algorithms in terms of attributes, class inputs, training, validating, and testing files.
			IT62.3	Apply Association mining on large data sets.
			IT62.4	Measure the performance of classification algorithms using metrics.
			IT62.5	Measure the performance of Clustering algorithms using large data sets.
3	IT63	Information and Network security	IT63.1	Identify cryptographic algorithm to secure information.
			IT63.2	Interpret concepts of security, authentication and authorization.
			IT63.3	Illustrate the software security practices.
			IT63.4	Categorize the attacks in each layer of OSI model.
			IT63.5	Explain the different ways to secure a web.
4	ITL61	Distributed Systems Lab	ITL61.1	Apply message communication technique and develop the applications.
			ITL61.2	Implement clock synchronization algorithm in distributed system.
			ITL61.3	Develop a application using CORBA.
			ITL61.4	Develop application using MapReduce and performance measure using CUDA.
5	ITL62	Data Warehousing and Mining Lab	ITL62.1	Identify the data needed for data mining algorithms in terms of attributes, class inputs, training, validating, and testing files.
			ITL62.2	Identify a problem having a dataset to do data visualization.
			ITL62.3	Measure the performance of classification algorithms on large data sets by applying metrics.
			ITL62.4	Measure the performance of

				Clustering algorithms using large data sets.
			ITL62.5	Analyze Association mining on large data sets.
6	ITL63	Information and Network security Lab	ITL63.1	Interpret the concepts of security.
			ITL63.2	Illustrate the network vulnerability scanning process.
			ITL63.3	Demonstrate the different attacks involved in a network.
			ITL63.4	Illustrate attacks involved in web security.
			ITL63.5	Use digital forensics method to recover the deleted data.
7	ITL64	Machine Learning Lab	ITL64.1	Apply Dimensionality reduction techniques to a given problem
			ITL64.2	Apply regression techniques on a large data set
			ITL64.3	Apply neural networks to solve pattern classification problems
			ITL64.4	Solve optimization problems using genetic algorithms.
			ITL64.5	Apply appropriate ML technique on a given domain
8	ITP65	Minor Project II	ITP65.1	Identify the problem that exists in the system.
			ITP65.2	List the requirements.
			ITP65.3	Select one from alternate solution.
			ITP65.4	Write survey paper.
9	HSS61	Advance Communicative English	CO1	Acquire skills for succeeding in job placements and competitive exams
			CO2	Encourage reading and evaluating critically
			CO3	Develop proficiency in the use of spoken and written communication for professional purposes
			CO4	Communicate using social media
10	OE1	Consumer Electronics	CO1	List and classify devices used in consumer products based on their specifications, identify sub-systems of consumer electronic products, also choose and use proper interface standard for a given consumer electronic product
			CO2	Illustrate working principle of consumer electronic products and carry out basic tests to identify their



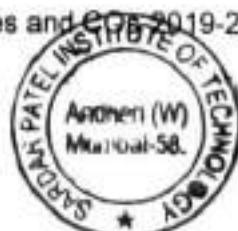
				correct operation.
11	OE2	Robotic Vision	CO3	Experiment with Haptics, Multitouch devices, Device interconnects and peripherals and also suggest modification in consumer electronic product using modern tools to enhance user experience
			CO4	Assemble subsystem of Television set and analyze technology used in audio systems.
			CO5	Demonstrate working principal of Healthcare and home electronics consumer products.
			CO6	Demonstrate working principal consumer electronic products used in Occupational safety.
			CO1	Discuss the fundamentals of Robotics
			CO2	Apply direct and inverse kinematics algorithms
12	OE3	Cyber security and Digital Forensics	CO3	Justify the need of vision algorithms
			CO1	Identify and classify various cybercrimes with respect to organizational weaknesses in order to mitigate the security risk and estimate the impact on society and world
			CO2	Analyze the results of vulnerability scans of vulnerability assessment and generate report with penetration testing
			CO3	Apply Information Security Standards compliance during software design and development
			CO4	Interpret and apply Indian IT laws in various legal issues
			CO5	Describe the concept of Digital forensics and use various tools and techniques used for digital forensics investigations
13	OE4	Internet of Things	CO6	Integrate advanced security solutions and manage, provide policies, standards, procedures, guidelines, policy framework, assess and mitigate risk
			CO1	Describe IoT value chain structure (device, data cloud), application areas, IoT sensors and technological



				challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules.
			CO2	Describe the Architectural Overview of IoT, Reference Architecture and Real World Design Constraints and various IoT Protocols ( Datalink, Network, Transport, Session, Service)
			CO3	Apply the concepts of big data analytics, Internet of things and implement smart systems.
14	OE5	Fundamentals of Computational Intelligence	CO1	Identify suitability of different learning types for different scenarios.
			CO2	To study Neural Networks and Convolutional Neural Networks
			CO3	To design fuzzy controllers for various applications.
			CO4	To study Natural Language Processing
			CO5	To apply computational intelligence technique to solve real world problems.
15	OE6	Fundamentals of Data Structures and Algorithms	CO1	Implement various operations of nonlinear data structures.
			CO2	Apply the concepts of Trees to a given problem.
			CO3	Analyze time and space complexity of an algorithm
			CO4	Apply divide and conquer strategy to solve problems
16	OE7	Software Testing	OE7.1	Analyze the principles in software testing to prevent & remove bugs.
			OE7.2	Design effective test cases suitable in testing.
			OE7.3	Describe the variety of ways to test software and indicate the trade-offs between various testing techniques.
			OE7.4	Implement various test cases.
			OE7.5	Apply the software testing techniques in commercial environments.
			OE7.6	Able to use software testing methods and modern software testing tools for their testing projects.
17	OE8	Database Management Systems	OE8.1	Design a database for real world system, choose real world problem and map it to the solution using

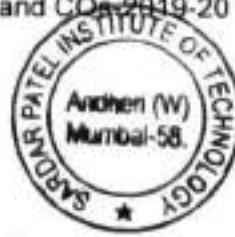
				database techniques.
			OE8.2	Construct a database using SQL.
			OE8.3	Create normalized database using functional dependencies.
			OE8.4	Analyze the effect of transaction over the database.
			OE8.5	Build secure and normalize database using SQL constructs.
			OE8.6	Apply the connectivity techniques of database.
18	MEC3	Industrial and Organizational Psychology	CO1	To impart knowledge and understanding of the basic concepts in and various facets of Industrial and Organizational Psychology
			CO2	To create awareness about the role and importance of Psychological factors and processes in the world of work
			CO3	To create a foundation for higher education and a professional career in Industrial Psychology and Organizational Behavior
19	MEC4	Law for Engineers	CO1	Student will be able to recognize the importance of the legal system, and the controls it exerts on the activities of engineers in practice.
			CO2	Student will be able to express the details of what the individual's responsibilities are to ensure legal behaviour in engineering practice.
20	SDX	SCOPE Course (Optional)	--	--
21	ABL4	Technical Paper and Patent Drafting (Noncredit)	--	--
22	CEP4	Problem solving module-III (Optional)	--	--
<b>SEM VII</b>				
1	IT71	Digital Image Processing	COIT71.1	Evaluate the techniques for enhancing and segmenting Images.
			COIT71.2	Analyze images using various transforms.
			COIT71.3	Categorize and interpret various compression techniques and standards.
			COIT71.4	Apply image processing algorithms in

Dr. B. V. Thakker



Dr. S. B. Shinde

				practical applications.
2	ITE71A	Data Analytics	COITE71A.1 COITE71A.2 COITE71A.3 COITE71A.4	Choose appropriate storage structure to make sense out of data sets. Apply rules and theorems in statistics to analyze the data. Analyze the key issues in big data management and its associated applications in intelligent business and scientific computing. Apply different algorithms like page ranking, mining, clustering, finding similar items to get insights of the data.
3	ITE71B	Ad-hoc and Wireless Sensor Network	ITE71B.1 ITE71B.2 ITE71B.3 ITE71B.4	Analyze different protocols for Wireless Ad-hoc Networks. Analyze different protocols for Wireless Sensor Networks. Identify challenges in designing various protocols for Wireless Ad-hoc Networks. Choose performance metrics for Wireless Sensor Networks.
4	ITE71C	AI and Expert System	ITE71C.1 ITE71C.2 ITE71C.3 ITE71C.4	Illustrate the building blocks of AI as presented in terms of intelligent agents Choose an appropriate problem-solving method and knowledge-representation scheme for a given problem Apply the appropriate search method on a given problem Develop simple intelligent systems or classical toy problems using different AI techniques
4	ITE72A	Soft Computing	ITE72A.1 ITE72A.2 ITE72A.3 ITE72A.4 ITE72A.5	Illustrate the basic principles of soft computing techniques. Demonstrate the working of deep learning algorithms for neural networks. Model Fuzzy Inference Systems. Make use of neural networks to solve different problems. Solve optimization problems using genetic algorithms.
5	ITE72B	Cloud Computing	ITE72B.1	Illustrate the fundamentals of Cloud



				Computing and its challenges.
			ITE72B.2	Analyze different virtualization techniques and their role in enabling the cloud computing system model.
			ITE72B.3	Classify various architecture and infrastructure of cloud computing.
			ITE72B.4	Analyze some important cloud computing driven systems and cloud applications.
			ITE72B.5	Categorize various security related issues in cloud computing.
6	ITE72C	IT Infrastructure Management	ITE72C.1	Identify the requirements to set up an IT infrastructure.
			ITE72C.2	Identify the service delivery Processes & Service support process
			ITE72C.3	Illustrate the different component of storage network architecture
			ITE72C.4	Identify the use of Information Technology Infrastructure Library
			ITE72C.5	Design the data center infrastructure.
7	ITL71	Digital Image Processing Lab	ITL71.1	Identify the techniques to enhance the subjective quality of the image of different resolutions.
			ITL71.2	Analyze an image using Image Transform.
			ITL71.3	Extract the important features from image data to solve real life problem.
			ITL71.4	Apply the compression technique on digital images and compute its efficiency.
8	ITEL71A	Data Analytics Lab	ITEL71A.1	Apply Map Reduce on string and integers.
			ITEL71A.2	Make use of modern tools to analyze the best practices in data science.
			ITEL71A.3	Apply map-reduce on Big data algorithms like Frequent Item set algorithm, Clustering, Data streaming algorithm.
			ITEL71A.4	Make use of software tools like Pig, Hive, Hbase etc. for data analytics.
9	ITEL71B	Ad-hoc and Wireless Sensor Network Lab	ITEL71B.1	Estimate the performance of the Network.
			ITEL71B.2	Create a Wireless Ad-hoc Network.
			ITEL71B.3	Analyze the Protocols for Personal Area Networks



			ITEL71B.4	Build a Wireless Sensor Network.
10	ITEL71C	AI and Expert System Lab	ITEL71C.1	Utilize knowledge based reasoning to solve certain problems
			ITEL71C.2	Apply different uninformed and informed search techniques to solve various problems
			ITEL71C.3	Apply adversarial search techniques to solve problems
			ITEL71C.4	Implement programs in declarative programming style using Prolog
			ITEL71C.5	Design intelligent agents for solving a particular problem
11	ITEL72A	Soft Computing Lab	ITEL72A.1	Apply supervised and unsupervised learning algorithms on various input patterns
			ITEL72A.2	Apply genetic algorithm for solving optimization problems
			ITEL72A.3	Measure the performance of deep learning algorithms using open source tools
			ITEL72A.4	Design fuzzy logic control systems
			ITEL72A.5	Choose a suitable soft computing technique for a given scenario
12	ITEL72B	Cloud Computing Lab	ITEL72B.1	Perform virtualization configuration and administration
			ITEL72B.2	Handle open source cloud implementation and administration.
			ITEL72B.3	Create and run virtual machines.
			ITEL72B.4	Install and appreciate security features for cloud.
			ITEL72B.5	Install and use cloud simulator.
13	ITEL72C	IT Infrastructure Management Lab	ITEL72C.1	Identify the requirements for IT infrastructure
			ITEL72C.2	Identify ITIL components for IT infrastructure
			ITEL72C.3	Design network management
			ITEL72C.4	Design data center virtualization
			ITEL72C.5	Apply security for IT infrastructure
14	ITP71	Category-,,1'': Major Project-II Category-,,2'': Major Project-I	--	--
15	CEPS	Problem solving module-V (Optional)	--	--
<b>SEM VIII</b>				
1	OE1	Consumer Electronics	OE1.1	List and classify devices used in



				consumer products based on their specifications, identify sub-systems of consumer electronic products, also choose and use proper interface standard for a given consumer electronic product
			OE1.2	Illustrate working principle of consumer electronic products and carry out basic tests to identify their correct operation.
			OE1.3	Experiment with Haptics, Multitouch devices, Device interconnects and peripherals and also suggest modification in consumer electronic product using modern tools to enhance user experience
			OE1.4	Assemble subsystem of Television set and analyze technology used in audiosystems.
			OE1.5	Demonstrate working principle of Healthcare and home electronics consumer products.
			OE1.6	Demonstrate working principle of consumer electronic products used in Occupational safety.
2	OE2	Robotic Vision	OE2.1	Discuss the fundamentals of Robotics
			OE2.2	Apply direct and inverse kinematics algorithms
			OE2.3	Justify the need of vision algorithms
3	OE3	Cyber security and Digital Forensics	OE3.1	Identify and classify various cybercrimes with respect to organizational weaknesses in order to mitigate the security risk and estimate the impact on society and world.
			OE3.2	Analyze the results of vulnerability scans of vulnerability assessment and generate report with penetration testing.
			OE3.3	Apply Information Security Standards compliance during software design and development.
			OE3.4	Interpret and apply Indian IT laws in various legal issues.
			OE3.5	Describe the concept of Digital forensics and use various tools and



				techniques used for digital forensics investigations.
			OE3.6	Integrate advanced security solutions and manage, provide policies, standards, procedures, guidelines, policy framework, assess and mitigate risk.
4	OE4	Internet of Things	OE4.1	Describe IoT value chain structure (device, data cloud), application areas, IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules.
			OE4.2	Explain the embedded concepts and embedded system architecture and programming of ARM Cortex Microcontroller for various applications.
			OE4.3	Describe the Architectural Overview of IoT, Reference Architecture and Real World Design Constraints and various IoT Protocols (Datalink, Network, Transport, Session, Service)
			OE4.4	Apply the concepts of big data analytics, Internet of things and implement smart systems.
			OE4.5	Build the Security requirements in IoT, Cryptographic fundamentals, the authentication credentials, various types Trust models and Cloud Security.
			OE4.6	Design a complete secure IoT System for various real time applications.
5	OE5	Fundamentals of Computational Intelligence	OE5.1	Identify suitability of different learning types for different scenarios.
			OE5.2	To study Neural Networks and Convolutional Neural Networks
			OE5.3	To design fuzzy controllers for various applications.
			OE5.4	To study Natural Language Processing
			OE5.5	To apply computational intelligence technique to solve real world



				problems.
6	OE6	Fundamentals of Data Structures and Algorithms	OE6.1	Implement various operations of nonlinear data structures.
			OE6.2	Apply the concepts of Trees to a given problem.
			OE6.3	Analyze time and space complexity of an algorithm
			OE6.4	Apply divide and conquer strategy to solve problems
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			OE7.3	Describe the variety of ways to test software and indicate the trade-offs between various testing techniques.
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			OE7.6	Able to use software testing methods and modern software testing tools for their testing projects.
8	OE8	Database Management Systems	OE8.1	Design a database for real world system, choose real world problem and map it to the solution using database techniques.
			OE8.2	Construct a database using SQL.
			OE8.3	Create normalized database using functional dependencies.
			OE8.4	Analyze the effect of transaction over the database.
			OE8.5	Build secure and normalize database using SQL constructs.
			OE8.6	Apply the connectivity techniques of database.
9	IT81	Enterprise Resource Planning	IT81.1	Examine different processes of the organization and the relationship among all processes
			IT81.2	Determine the support of ERP data in CRM/SCM/Etc.
			IT81.3	Discuss typical functionalities in an ERP system
			IT81.4	Elaborate the activities done during ERP implementation
			IT81.5	Discuss case studies in real world scenario to assure ERP benefits

Dr. Ravinder Singh



Dr. Shanti Singh

10	IT82	User Experience Design	IT82.1	Paraphrase UI and UX design life cycle.
			IT82.2	Analyze UX design process for users.
			IT82.3	Analyze various parameters for design process.
			IT82.4	Apply design thinking to model the prototype.
			IT82.5	Evaluate user experiences using different UX evaluation techniques.
11	HSS81	Technology Entrepreneurship Lab	HSS81.1	Identify problems worth solving
			HSS81.2	Craft value proposition
			HSS81.3	Prepare B-Plan
			HSS81.4	Draft Patent
			HSS81.5	Register virtual company
12	ITP81	Category I :Major Project I	--	--
13	ITP71	Category I : Major Project II	--	--
14	ITP71	Category II : Major Project II	--	--
15	ITP81	Category II: Major Project II	--	--







Bharatiya Vidya Bhavan's  
**SARDAR PATEL INSTITUTE OF TECHNOLOGY**  
 Munshi Nagar, Andheri (W), Mumbai – 400 058.  
 (Autonomous Institute Affiliated to University of Mumbai)

## Course Outcomes

### Department of Information Technology

Academic Year 2018-2019

Sr. No.	Course Code	Course Name	Course Outcomes	
<b>SEM III</b>				
1	BS31	Applied Mathematics I*	CO1	Check analyticity of function of complex variables
			CO2	Find Laplace and Inverse Laplace Transforms
			CO3	Apply Laplace and Laplace Inverse methods to solve differential equations with initial conditions
			CO4	Expand functions in terms of sine and cosine series on the given interval
			CO5	Evaluate Z-transform and Inverse Z-transform
			CO6	Formulate and solve Linear Programming Problem arising in engineering
2	IT31	Advanced Data Structures*	CO1	Implement various operations using non linear data structures.
			CO2	Apply concepts of Trees and Graphs to a given problem.
			CO3	Build various Heap Structure
			CO4	Illustrate the hashing and collision resolution techniques.
3	IT32	Digital Logic Design and Analysis*	CO1	Design of digital circuits using SOP & POS forms.
			CO2	Construct combinational circuits using given MSI devices.
			CO3	Apply the knowledge of flip-flops and MSI to design counters and Shift registers.
			CO4	Design state machines for given state diagrams after state reduction.

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IT Department Courses and COs 2018-19



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			CO5	Describe different types of programmable logic devices like PAL, PLA, CPLD and FPGA.
4	IT33	Discrete Structures	CO1	Make use of logic and various proof techniques to solve problems.
			CO2	Apply the concepts of set, relations to solve problems
			CO3	Apply the concepts of functions to various technical domains.
			CO4	Solve problems using graphs and trees.
			CO5	Use fundamental concepts of algebraic structures, lattice to solve problems
5	IT34	Object Oriented Programming*	CO1	Demonstrate object oriented programming paradigm.
			CO2	Solve problems using inheritance & package.
			CO3	Use file handling concepts in Java for data input and output.
			CO4	Apply concepts of multithreading and exception handling to create efficient program.
			CO5	Make use of string and collection classes.
6	ITL31	Advanced Data Structures Lab	CO1	Implement various Linked List Operations.
			CO2	Implement various Operations of Trees and Graphs.
			CO3	Construct different Heap structures.
			CO4	Analyze different hashing and collision resolution techniques.
			CO5	Choose an appropriate data structure to solve a given problem.
7	ITL32	Digital Logic Design and Analysis Lab	CO1	Construct and test logic circuits using logic gates to realize given function.
			CO2	Construct and Test logic circuits using MSI ICs to realize given function.
			CO3	Construct and test the design of combinational and sequential logic circuits by hardware implementation.
			CO4	Construct and test design of counters/shift registers.
8	ITL34	Object Oriented Programming Lab	CO1	Demonstrate object oriented programming concepts for a scenario.
			CO2	Apply static and dynamic binding.

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IT Department Courses and COs 2018-19



			CO3	Apply concept of input, output and JDBC.
			CO4	Apply multi threading and exception handling for a scenario.
			CO5	Design a java application using J2EE, Swing etc
9	ITL35	Web Programming Lab-I	ITL35.1	Design basic web page layout using HTML
			ITL35.2	Use CSS for designing attractive web pages
			ITL35.3	Apply client side scripting to static web pages
			ITL35.4	Create responsive web pages using Bootstrap
10	ITL36	Open Source Operating System Lab	ITL36.1	Distinguish the concept of open Source Software, close software and proprietary software
			ITL36.2	Demonstrate the installation process of open source operating systems based on the Linux kernel.
			ITL36.3	Demonstrate responsibilities performed by the system administrator
			ITL36.4	Identify and use UNIX/Linux utilities to create and manage Linux Processes
			ITL36.5	Use common decision constructs in shell scripts effectively
11	BS32	Human Health Systems Approach	CO1	Physiology as integrated interdisciplinary Science
			CO2	Physiological significance of balanced diet and exercise in health
			CO3	Significance of cleanliness and hygiene in daily routine
			CO4	Dynamics and homeostasis of human health
12	SDX	SCOPE Course (Optional)	--	--
13	ABLI	Building Automation, Fire Safety and Electronic Security (Noncredit)	--	--
14	CEP1	Introduction to CEP (Optional)	--	--
15	BC	Fundamentals of Mathematics (only for direct second year students)	CO1	To find basic derivatives, Integration and limits.
			CO2	To find rank of a matrix and solve system of linear equations using rank.
			CO3	To find partial derivative of a function

S.P.I.T.

IT Department Courses and COs-2018-19

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				and apply it to extremise functions.
			CO4	To solve differential equations of first and higher order.
			CO5	To find roots & logarithm of a complex number.
<b>SEM IV</b>				
1	BS41	Applied Mathematics II*	CO1	Check if matrix is diagonalizable, derogatory & to calculate functions of a square matrix.
			CO2	Find Correlation between two variables.
			CO3	Find the measures of central tendency
			CO4	Solve a problem by identifying the appropriate distribution.
			CO5	Test the hypothesis for means and variances for single and multiple samples using 't' & chi-square distribution tests.
2	IT41	Design and Analysis of Algorithms*	CO1	Analyze time and space complexity of an algorithm
			CO2	Apply divide and conquer strategy to solve problems
			CO3	Design an algorithm to illustrate the concept of dynamic programming
			CO4	Apply the concept of greedy approach to solve problems
			CO5	Describe the idea of backtracking, branch and bound strategy to solve problems.
			CO6	Apply the concept of linear programming to optimize the solution
3	IT42	Computer Organization and Architecture*	CO1	Describe basic structure of computer.
			CO2	Apply arithmetic algorithm for solving problems.
			CO3	Compare different processor architectures.
			CO4	Describe the memory mapping techniques.
			CO5	Apply I/O concept for simulating I/O device operations.
			CO6	Analyze different parallel processing and pipelining concepts.
4	IT43	Database Management Systems*	CO1	Design effective database systems, leading to development of elegant Information System.
			CO2	Analyze the real world problem and

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IT Department Courses and COs: 2018-19

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				construct a relational database.
			CO3	Construct a secure database.
			CO4	Design a relation database using concept of functional dependencies.
			CO5	Analyze the effect of concurrency control for transaction processing.
5	IT44	Operating Systems*	CO1	Explain the basic functions of operating systems
			CO2	Make use of various process scheduling and disk scheduling algorithm
			CO3	Experiment inter process communication solution
			CO4	Categorize various memory management techniques
			CO5	Explain file systems
			CO6	Discover functions of operating systems in different environment
6	ITL41	Design and Analysis of Algorithms Lab	CO1	Compare time and space complexity of different sorting and searching techniques
			CO2	Solve various problems using dynamic programming approach
			CO3	Illustrate the concepts of greedy approach
			CO4	Demonstrate the applicability of backtracking, branch and bound strategies to solve problems in different domains
			CO5	Demonstrate various string matching algorithms
7	ITL42	Computer Organization and Architecture Lab	CO1	Identify the components of Computers and Assemble the computer system.
			CO2	Design ALU operations using LabView and VHDL tool.
			CO3	Apply data arithmetic algorithms for implementing arithmetic operations
			CO4	Apply various memory management technique for memory allocation and page replacement algorithms
			CO5	Demonstrate I/O operations
			CO6	Analyze the performance of the systems.
8	ITL43	Database Management Systems Lab	CO1	Design a relational database for real world system.
			CO2	Apply SQL commands on database.

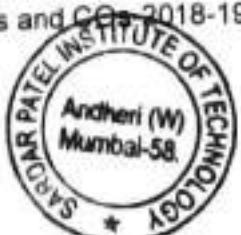


			CO3	Execute various transaction and recovery commands over database.
			CO4	To examine effect of concurrency control on database.
9	ITL44	Operating Systems Lab	CO1	Illustrate process/file system call in Unix – Understanding.
			CO2	Illustrate multi threading – Understanding.
			CO3	Apply various process scheduling/disk scheduling algorithms – Applying.
			CO4	Develop inter process communication – Applying.
			CO5	Examine memory management strategy – Analyzing.
10	ITL45	Web Programming Lab-II	ITL45.1	Build dynamic web pages using server side scripting
			ITL45.2	Apply session control over web pages
			ITL45.3	Demonstrate web database connectivity via scripting language
			ITL45.4	Develop the server side of a web application using web development frameworks
11	LA1	Yoga Vidya	CO1	Perform various techniques of Yoga
			CO2	Follow healthy habits to improve immune system
			CO3	Describe the importance of Yoga in one's life
			CO4	Make resolution to practice techniques of Yoga
12	LA2	Music Appreciation	CO1	Appreciate various processes of Music composition
			CO2	Appreciate the role of engineers in sound recording
13	LA3	Dramatics	CO1	Understand an Art of Theatre.
			CO2	Express their thoughts.
			CO3	Create and visualize new ideas.
			CO4	Perform impressively.
14	SDX	SCOPE Course (Optional)	--	--
15	ABL2	Occupational Safety and Legal Studies for Engineers (Noncredit)	--	--
16	CEP2	Problem solving module-I (Optional)	--	--

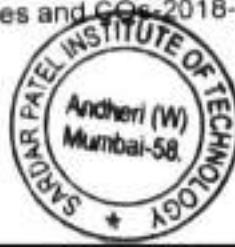
**SEM V**

S.P.I.T.

IT Department Courses and CGPA-2018-19



1	IT51	Software Engineering	IT51.1	Analyze requirements and choose appropriate process model.
			IT51.2	Design system models with respect to traditional and the object oriented approach.
			IT51.3	Develop umbrella activities on system (RMMM, SQA, SCM).
			IT51.4	Evaluate system design with test cases.
2	IT52	Computer Networks	IT52.1	Explain the process of communication in computer network.
			IT52.2	Simulate the computer network.
			IT52.3	Design the subnet for the given ip address.
			IT52.4	Illustrate the protocols of TCP/IP.
3	IT53	Advanced Database Systems	IT53.1	Design parallel, distributed, Object oriented database
			IT53.2	Demonstrate the optimized query processing and indexing over the database
			IT53.3	Design the integration of database schemas using XML technology
			IT53.4	Explore Advanced Data management Techniques
4	IT54	Theoretical Computer Science*	IT54.1	Design finite automaton for a regular languages.
			IT54.2	Identify regular and non regular languages.
			IT54.3	Construct the grammar for a language and convert it into normal forms.
			IT54.4	Design pushdown automata and Turing machine for a language.
5	ITL51	Software Engineering Lab	ITL51.1	Create software requirements specification (SRS) document.
			ITL51.2	Construct data flow diagram (DFD) and UML diagrams for the case study.
			ITL51.3	Create work breakdown structure and schedule the activities using Gantt chart.
			ITL51.4	Develop Risk Mitigation, Monitoring and Management Plan.
			ITL51.5	Design test cases for a given case study.
			ITL51.6	Illustrate version of software using version control tool.
6	JTL52	Computer Networks Lab	ITL52.1	Illustrate topology.



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			ITL52.2	Test various protocol for given scenario.
			ITL52.3	Build VLAN.
			ITL52.4	Experiment application layer protocol.
7	ITL53	Advanced Database Systems Lab	ITL53.1	Design Parallel, Distributed and Object Oriented database.
			ITL53.2	Analyze the effect of indexing, query processing and optimization over the database
			ITL53.3	Demonstrate working of Cloud and Multimedia Databases.
			ITL53.4	Design the integration of database schemas using XML technology.
8	ITL54	Internet Technology Lab	ITL54.1	Demonstrate the use of web engineering concepts such as class diagram, data flow diagram, requirement specification.
			ITL54.2	Create web mashups of REST based web services using AJAX, JSON.
			ITL54.3	Implement security features in web project using JSON Webtokens/ Auth2.0.
			ITL54.4	Test the deployment of web project.
9	ITP55	Minor Project I	ITP55.1	Identify the requirements for the project.
			ITP55.2	Develop a prototype to confirm technical requirement.
			ITP55.3	Design and implement the project.
			ITP55.4	Test the product.
10	MEC1	French Language	CO1  Self introduction	Student will be able to  Introduce themselves in a meeting and converse with people from different countries. Speak about themselves, their professions, their family, family names, first names, nationalities, ages. Have a discussion on the whereabouts and identities of people they interact with such as their nationalities, the countries they come from, the languages they speakGreet people and take leave
			CO2  General Topics	Student will be able to  Count numbers from 0 to 69 To know how to talk about dates,

S.P.I.T.

IT Department Courses and CSE 2018-19

8



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				seasons, time of the day, days of the week and months of the year. Know how to describe a noun using qualitative adjectives. ask price of something
		CO3	Dialogue with professor or any other interlocutor	Student will be able to  Communicate in class and understand instructions such as :repeat/answer/listen/look/tick the right answer/write/underline/close/how is it pronounced/how is it written/how does one say/work in groups/I don't know/I do not understand request for directions using interrogatives like where/who speaks/to whom/why share /to give personal information: telephone numbers/ date of birth/postal address/filling out documents and ability to comprehend the details on important identity papers such as passports or registration forms.
		CO4	Exposure to French Culture Life and Social Norms.	Student will be able to  get from the Airport in France to his destination in city. To understand directions. To move around the city understanding road signs, maps. Will be acquainted with French Culture and hence understand their behaviour and communicate appropriately with them.
11	MEC2	German Language	CO1	Student will be able to greet the other person, say good bye, introduce oneself and the partner, to be able to talk about the others, to be able to count upto 20, make use of knowledge of numbers as regards understanding telephone numbers, to be able to recognize alphabets, speak about countries and languages
			CO2	Student will be able to speak about hobbies, take leave of someone, name the days of the week, to be able to talk about work, jobs, and office timings, to be able to count beyond 20, to be



				able to talk about seasons, to be able to register own data on internet site
			CO3	Student will be able to name places and important buildings like the marketplace, to be able to ask questions regarding places, to be able to relate texts to a picture story, ask for things, name the means of public transport, ask for directions
			CO4	Student will be able to identify food items and to talk about them, to be able to write a shopping list, understand conversations in a supermarket, understand W-questions
			CO5	Student will be able to understand time, plan time table as per required time, to be able to speak about family, to excuse oneself for being late, to be able to fix an appointment telephonically
			CO6	Student will be able to plan something together, to be able to speak about birthday, to understand and draft an invitation, to be able to order and pay food items in a restaurant, to be able to talk about routine events, understand event information on radio
12	SDX	SCOPE Course (Optional)	--	--
13	ABL3	Technical Presentation Skill (Noncredit)	--	--
14	CEP3	Problem solving module-II (Optional)	--	--

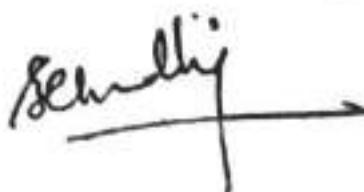
#### SEM VI

1	IT61	Distributed Systems	IT61.1	Compare different distributed system architectures.
			IT61.2	Implement message communication techniques.
			IT61.3	Analyze the clock synchronization algorithm and consistency in distributed systems.
			IT61.4	Make use of CORBA components for case study
			IT61.5	Demonstrate the basic concepts of CUDA programs for performance measures.
2	IT62	Data Warehousing and Mining	IT62.1	Explain the importance of data mining

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				and Data Warehousing.
			IT62.2	Identify the data needed for data mining algorithms in terms of attributes, class inputs, training, validating, and testing files.
			IT62.3	Apply Association mining on large data sets.
			IT62.4	Measure the performance of classification algorithms using metrics.
			IT62.5	Measure the performance of Clustering algorithms using large data sets.
3	IT63	Information and Network security	IT63.1	Identify cryptographic algorithm to secure information.
			IT63.2	Interpret concepts of security, authentication and authorization.
			IT63.3	Illustrate the software security practices.
			IT63.4	Categorize the attacks in each layer of OSI model.
			IT63.5	Explain the different ways to secure a web.
4	ITL61	Distributed Systems Lab	ITL61.1	Apply message communication technique and develop the applications.
			ITL61.2	Implement clock synchronization algorithm in distributed system.
			ITL61.3	Develop a application using CORBA.
			ITL61.4	Develop application using MapReduce and performance measure using CUDA.
5	ITL62	Data Warehousing and Mining Lab	ITL62.1	Identify the data needed for data mining algorithms in terms of attributes, class inputs, training, validating, and testing files.
			ITL62.2	Identify a problem having a dataset to do data visualization.
			ITL62.3	Measure the performance of classification algorithms on large data sets by applying metrics.
			ITL62.4	Measure the performance of Clustering algorithms using large data sets.
			ITL62.5	Analyze Association mining on large data sets.



6	ITL63	Information and Network security Lab	ITL63.1	Interpret the concepts of security.
			ITL63.2	Illustrate the network vulnerability scanning process.
			ITL63.3	Demonstrate the different attacks involved in a network.
			ITL63.4	Illustrate attacks involved in web security.
			ITL63.5	Use digital forensics method to recover the deleted data.
7	ITL64	Machine Learning Lab	ITL64.1	Apply Dimensionality reduction techniques to a given problem
			ITL64.2	Apply regression techniques on a large data set
			ITL64.3	Apply neural networks to solve pattern classification problems
			ITL64.4	Solve optimization problems using genetic algorithms.
			ITL64.5	Apply appropriate ML technique on a given domain
8	ITP65	Minor Project II	ITP65.1	Identify the problem that exists in the system.
			ITP65.2	List the requirements.
			ITP65.3	Select one from alternate solution.
			ITP65.4	Write survey paper.
9	HSS61	Advance Communicative English	CO1	Acquire skills for succeeding in job placements and competitive exams
			CO2	Encourage reading and evaluating critically
			CO3	Develop proficiency in the use of spoken and written communication for professional purposes
			CO4	Communicate using social media
10	OE1	ConsumerElectronics	CO1	List and classify devices used in consumer products based on their specifications, identify sub-systems of consumer electronic products, also choose and use proper interface standard for a given consumer electronic product
			CO2	Illustrate working principle of consumer electronic products and carry out basic tests to identify their correct operation.
			CO3	Experiment with Haptics, Multitouch devices, Device interconnects and peripherals and also suggest



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				modification in consumer electronic product using modern tools to enhance user experience
			CO4	Assemble subsystem of Television set and analyze technology used in audio systems.
			CO5	Demonstrate working principal of Healthcare and home electronics consumer products.
			CO6	Demonstrate working principal consumer electronic products used in Occupational safety.
11	OE2	Robotic Vision	CO1	Discuss the fundamentals of Robotics
			CO2	Apply direct and inverse kinematics algorithms
			CO3	Justify the need of vision algorithms
12	OE3	Cyber security and Digital Forensics	CO1	Identify and classify various cybercrimes with respect to organizational weaknesses in order to mitigate the security risk and estimate the impact on society and world
			CO2	Analyze the results of vulnerability scans of vulnerability assessment and generate report with penetration testing
			CO3	Apply Information Security Standards compliance during software design and development
			CO4	Interpret and apply Indian IT laws in various legal issues
			CO5	Describe the concept of Digital forensics and use various tools and techniques used for digital forensics investigations
			CO6	Integrate advanced security solutions and manage, provide policies, standards, procedures, guidelines, policy framework, assess and mitigate risk
13	OE4	Internet of Things	CO1	Describe IoT value chain structure (device, data cloud), application areas, IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules.
			CO2	Describe the Architectural Overview

S.P.I.T.

IT Department Courses and COs 2018-19



13

				of IoT, Reference Architecture and Real World Design Constraints and various IoT Protocols ( Datalink, Network, Transport, Session, Service)
			CO3	Apply the concepts of big data analytics, Internet of things and implement smart systems.
14	OE5	Fundamentals of Computational Intelligence	CO1	Identify suitability of different learning types for different scenarios.
			CO2	To study Neural Networks and Convolutional Neural Networks
			CO3	To design fuzzy controllers for various applications.
			CO4	To study Natural Language Processing
			CO5	To apply computational intelligence technique to solve real world problems.
15	OE6	Fundamentals of Data Structures and Algorithms	CO1	Implement various operations of nonlinear data structures.
			CO2	Apply the concepts of Trees to a given problem.
			CO3	Analyze time and space complexity of an algorithm
			CO4	Apply divide and conquer strategy to solve problems
16	OE7	Software Testing	OE7.1	Analyze the principles in software testing to prevent & remove bugs.
			OE7.2	Design effective test cases suitable in testing.
			OE7.3	Describe the variety of ways to test software and indicate the trade-offs between various testing techniques.
			OE7.4	Implement various test cases.
			OE7.5	Apply the software testing techniques in commercial environments.
			OE7.6	Able to use software testing methods and modern software testing tools for their testing projects.
17	OE8	Database Management Systems	OE8.1	Design a database for real world system, choose real world problem and map it to the solution using database techniques.
			OE8.2	Construct a database using SQL.
			OE8.3	Create normalized database using functional dependencies.



			OE8.4	Analyze the effect of transaction over the database.
			OE8.5	Build secure and normalize database using SQL constructs.
			OE8.6	Apply the connectivity techniques of database.
18	MEC3	Industrial and Organizational Psychology	CO1	To impart knowledge and understanding of the basic concepts in and various facets of Industrial and Organizational Psychology
			CO2	To create awareness about the role and importance of Psychological factors and processes in the world of work
			CO3	To create a foundation for higher education and a professional career in Industrial Psychology and Organizational Behavior
19	MEC4	Law for Engineers	CO1	Student will be able to recognize the importance of the legal system, and the controls it exerts on the activities of engineers in practice.
			CO2	Student will be able to express the details of what the individual's responsibilities are to ensure legal behaviour in engineering practice.
20	SDX	SCOPE Course (Optional)	--	--
21	ABL4	Technical Paper and Patent Drafting (Noncredit)	--	--
22	CEP4	Problem solving module-III (Optional)	--	--

#### SEM VII

1	ITC701	Software Project Management	CO1	Outline the business case of their project and find MOV
			CO2	Schematize the software project using WBS and network diagrams
			CO3	Measure the effectiveness of project progress by doing earned value analysis
			CO4	Demonstrate the ability to communicate and collaborate with team members in extreme project management style
			CO5	Carry out the cost effectiveness to keep the cost under control
2	ITC702	Cloud Computing	CO1	Differentiate between different cloud



				computing techniques.
			CO2	Compare various cloud computing providers/software.
			CO3	Handle open source cloud implementation and administration.
			CO4	Understand risks involved in cloud computing.
3	ITC703	Intelligent System	CO1	Describe the building blocks of AI as presented in terms of intelligent agents.
			CO2	Choose an appropriate problem solving method and knowledge representation scheme for a given problem.
			CO3	Analyze and formalize the problem and select the appropriate search method.
			CO4	Develop simple intelligent system or classical toy problems using different AI techniques.
4	ITC704	Wireless Technology	CO1	Identify the characteristics/fundamentals of Wireless communication Channel.
			CO2	Discuss various new trends in wireless communication and their technologies.
			CO3	Generalize various protocols and topologies used in new wireless communication technologies.
			CO4	Associate the need of security and economics in wireless system.
5	ITC7051	Image Processing	CO1	Improve subjective quality of images.
			CO2	Extract important features from image data.
			CO3	Represent an image to transform and describe Image.
			CO4	Identify compression algorithm to reduce the size of the Image
			CO5	Apply the concept of image processing in various applications.
6	ITC7052	Software Architecture	CO1	Recognize major software architectural styles, design patterns and frameworks.
			CO2	Design software architecture for large scale software systems.
			CO3	Describe various documentation

				approaches and architectural description languages.
			CO4	Apply architectural patterns to quickly generate architectural alternatives and choose between them.
7	ITC7053	E-Commerce and E-Business	CO1	Analyze, design and implement e-commerce system.
			CO2	Understand the marketing and business strategies.
			CO3	Understand the concept of payment system done in e-commerce.
			CO4	Identify the challenges of e-business and define the e-business structure.
8	ITC7054	Multimedia Systems	CO1	Identify the relevance and underlying infrastructure of multimedia systems.
			CO2	Apply multimedia system to indicate the current requirements of multimedia products.
			CO3	Apply the knowledge in developing the multimedia system as per industry standards.
9	ITC7055	Usability Engineering	CO1	Create useful usable and used interface.
10	ITC7056	Ubiquitous Computing	CO1	Explain objectives and the historical development of the field of ubiquitous computing.
			CO2	Describe fundamentals of sensor technology and sensor networks
			CO3	Apply middleware techniques to implement ubiquitous computing systems
			CO4	Design of new (often embedded) interactive artifacts
			CO5	Compare the usability of alternative design of interactions for specific ubiquitous computing systems
11	ITL701	Software Project Management lab	CO1	Demonstrate the factors that lead to the failure of a project- case-study
			CO2	Determine the values/benefits the project if done would bring to the organizations
			CO3	Formulate the sequencing of task (network) to optimize the use of resources
			CO4	Examine the deviation of planned



				schedule and cost with actual cost and schedule.
			CO5	Make use of a modern tool for communication and collaboration with project team members
12	ITL702	Cloud Computing lab	CO1	Perform virtualization configuration and administration
			CO2	Handle open source cloud implementation and administration.
			CO3	Create and run virtual machines.
			CO4	Install and appreciate security features for cloud.
13	ITL703	Intelligent System lab	CO1	Design intelligent agents for solving a particular problem.
			CO2	Utilize knowledge based reasoning to solve certain problems.
			CO3	Apply different uninformed and informed search techniques to solve various problems.
			CO4	Apply adversarial search techniques to solve various problems.
			CO5	Construct programs in declarative programming style using Prolog.
14	ITL704	Wireless Technology lab	CO1	Understand the characteristics/fundamentals of Wireless communication Channel
			CO2	Understand various new trends in wireless communication and their technologies
			CO3	Understand various protocols and topologies used in new wireless communication technologies.
			CO4	Understand the need of security and economics in wireless system
15	ITT7051	Image Processing Lab	CO1	Improve subjective quality of images.
			CO2	Represent an image to transform image.
			CO3	Demonstrate and extract important features from image data.
			CO4	Implement compression to reduce the size of the Image
16	ITT7052	Software Architecture Lab	CO1	Design and program Modelling and Visualization
			CO2	Program Integrate Software Component
			CO3	Implement Connectors using

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IT Department Courses and COs 2018-19





				middleware
			CO4	Design and Program Wrapper to connect two applications with different architectures
			CO5	Design and Program for Creating web service
			CO6	Program and Design Architecture for any specific domain
17	ITI7053	E-Commerce & E-Business Lab	CO1	Analyze the method to design and implement an e-commerce system.
			CO2	Differentiate the marketing and business strategies.
			CO3	Relate the concept of finance in e-commerce
			CO4	Identify the challenges of e-business and define the e-business structure.
18	ITP706	Project (Stage I)	--	--
<b>SEM VIII</b>				
1	ITC801	Storage network management & Retrieval	CO1	Identify key challenges in managing information and analyze different storage networking technologies
			CO2	Illustrate the different component of storage network architecture.
			CO3	Describe the components and the implementation of NAS and storage virtualization
			CO4	Recognize the need of Backup to recover Information
			CO5	Use the concepts information retrieval in storage network.
2	ITC802	Big Data Analytics	CO1	Analyze the key issues in big data management and its associated applications in intelligent business and scientific computing
			CO2	Experiment with fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics
			CO3	Interpret business models and scientific computing paradigms
			CO4	Apply software tools for big data analytics
			CO5	Apply big data analytics in various applications like recommender systems, social media applications etc
3	ITC803	Computer Simulation and	CO1	Explain Modeling, Simulation and the



		Modeling		use of Statistical models in simulation
			CO2	Analyze the system and develop a Queuing model
			CO3	Analyze the system and develop an Inventory model
			CO4	Test the performance of Simulation
			CO5	Design a simulation system for real-life scenario using modern tools
4	ITC8041	Enterprise Resource Planning	CO1	Relate with ERP related technologies
			CO2	Examine ERP development concepts and its key modules
			CO3	Analyze the ERP implementation lifecycle and the importance of its process in E-business
			CO4	Compare ERP tools and its business benefits.
5	ITC8042	Wireless Sensor Networks	CO1	Summarize the architecture of wireless sensor networks.
			CO2	Identify applications of wireless sensor networks.
			CO3	Discuss the challenges in designing MAC and routing protocols for wireless sensor networks.
			CO4	Compare different operating systems and its performance issues.
			CO5	Summarize WSN standards and future trends in WSN.
6	ITC8043	Geographical Information Systems	CO1	Apply the knowledge of science for real world applications in GIS.
			CO2	Design and conduct experiments as well as analyze, interpret the geospatial data using GIS tools
			CO3	Function with multidisciplinary Teams.
			CO4	Use the techniques, skills and modern engineering tools necessary for engineering practice.
			CO5	Adapt to Open source standards
7	ITC8044	Robotics	CO1	Describe kinematics and dynamics of stationary and mobile robots.
			CO2	Describe trajectory planning for rigid robot and mobile robots.
			CO3	Implement trajectory generation and path planning algorithms.
			CO4	Design interdisciplinary projects .
8	ITC8045	Soft Computing	CO1	Explain the basic ideas of soft

Dr. B. V. Shanks



S. M. Shinde

				computing techniques.
			CO2	Design fuzzy inference system.
			CO3	Apply neural networks to solve pattern classification problems
			CO4	Illustrate the concept of hybrid systems.
			CO5	Solve optimization problems using genetic algorithms.
9	ITC8046	Software Testing & Quality Assurance	CO1	Identify the reasons for bugs & analyze the principles in software testing to prevent & remove bugs.
			CO2	Implement various test processes for quality improvement.
			CO3	Apply the software testing techniques in commercial environments.
			CO4	Describing the variety of ways to test software and indicate the trade-offs between various testing techniques.
			CO5	Identify the open source testing tools.
10	ITL801	Storage network management & Retrieval lab	CO1	Implement Storage Provisioning using Logical Volume Number
			CO2	Implement Storage Area Network using Sim SAN and Samba Server
			CO3	Summarize the concept of Storage Network Backup and Recovery
			CO4	Implement Information retrieval.
11	ITL802	Big Data Analytics lab	CO1	Demonstrate use of Map Reduce algorithms.
			CO2	Choose appropriate NO SQL Database in big data analytics.
			CO3	Apply map-reduce on Big data algorithms like Frequent Item set algorithm, Clustering, Data streaming algorithm.
			CO4	Make use of software tools like Pig, Hive, Hbaseetc for big data analytics.
			CO5	Create an application of big data analytics like recommender systems, social media applications etc.
12	ITL803	Computer Simulation and Modeling lab	CO1	Explain system elements, data collection, model done from research paper
			CO2	Solve a queuing problem using Excel sheet, GPSS, Extend Sim
			CO3	Solve a inventory problem using Excel sheet, GPSS, Extend Sim



			CO4	Demonstrate the use of simulation on real world system as group project
13	ITL8041	Enterprise Resource Planning Lab	CO1	Relate with ERP related technologies
			CO2	Examine ERP development concepts and it's key modules
			CO3	Analyze the ERP implementation life cycle and the importance of its process in E-business
			CO4	Compare ERP tools and its business benefits.
14	ITL8045	Soft Computing Lab	CO1	Design fuzzy logic control systems
			CO2	Apply supervised learning algorithms on various input patterns
			CO3	Apply unsupervised learning algorithms on various input patterns
			CO4	Design simple genetic algorithms for solving optimization problems
			CO5	Make use of available open source toolboxes for a particular soft computing technique
9	ITP805	Project (Stage II)	--	--





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Munshi Nagar, Andheri (W), Mumbai – 400 058.  
(Autonomous Institute Affiliated to University of Mumbai)  
Department of Electronics and Telecommunication

Batch (2019-2023)

Sr. no	Course Code	Course Name	Course Outcomes
<b>I and II Sem</b>			
1.	ES21	Basic Electrical Technology	<ol style="list-style-type: none"><li>Compute various electrical quantities of a given dc circuit using circuit simplification techniques and various network theorems.</li><li>Describe the concept of ac circuit and its resonance phenomena for a given RL, RC and RLC circuit.</li><li>Analyze the series and parallel magnetic circuit.</li><li>Describe characteristics of single phase, three phase ac circuits and transformer equivalent circuit theoretically and graphically.</li><li>Describe the constructional details and working principle of given AC and DC machines.</li></ol>
2.	ESL21	Basic Electrical Technology Lab	<ol style="list-style-type: none"><li>Compute electrical parameters for the given circuit using network theorem.</li><li>Verify the resonance phenomenon for a given RLC circuit.</li><li>Compare single phase and three phase circuits for various terminologies.</li><li>Identify different parts of given ac and dc machines and implement circuits to control speed of motors in clockwise and anticlockwise direction.</li><li>Implement any application using electronic components.</li></ol>
3.	ES22	Digital Circuits	<ol style="list-style-type: none"><li>Explain various logic gates, SOP, POS forms and their minimization with kmap for given combinational circuits.</li><li>Construct combinational circuits using given MSI devices.</li><li>Discuss different types of programmable logic devices like PROM, PAL and PLA.</li><li>Apply the knowledge of flip-flops and MSI to design sequential circuits.</li><li>Design state machines for given state diagrams after state reduction.</li><li>Compare the logic families based on their characteristics.</li></ol>
4.	ESL22	Digital Circuits Lab	<ol style="list-style-type: none"><li>Construct logic circuits using gates to realize a given function.</li><li>Construct logic circuits using MSI ICs to realize a given function.</li><li>Validate the design of combinational and sequential logic circuits by hardware implementation.</li><li>Test and troubleshoot given logic circuits.</li><li>Create an application using concepts of digital circuits.</li></ol>





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Department of Electronics and Telecommunication

III sem			
1.	MA201	Linear Algebra	<ol style="list-style-type: none"><li>1. Solve a homogeneous and non-homogeneous system of linear equations using rank of matrix.</li><li>2. Solve systems of linear equations by Numerical Methods.</li><li>3. Solve equations in real life problems and to encode and decode messages using the concept of matrices.</li><li>4. Identify whether given structures are vector spaces and subspaces and construct a basis for them.</li><li>5. Show if a given matrix is diagonalizable or not.</li><li>6. Apply concepts of Eigenvalues and eigenvectors to calculate functions of a square matrix, Google page rank vector and solve systems of differential equations using diagonalization of matrices.</li></ol>
2.	MA202	Foundations of Mathematics-I	<ol style="list-style-type: none"><li>1. Differentiate a function of one variable and partially differentiate a function of more than one Variable.</li><li>2. Apply the concept of partial differentiation to find extreme values of a given function.</li><li>3. Find the nth order derivative of a given function.</li><li>4. Expand a given function as a power series.</li><li>5. Perform operations on matrices and find inverses and determinants of them.</li><li>6. Perform vector operations and compute dot products and cross products between them.</li></ol>
3.	EC201	Computer Architecture & Organization	<ol style="list-style-type: none"><li>1. Describe basic computer structure and compare computer architecture models</li><li>2. Design algorithms to solve ALU operations and memory mapping techniques</li><li>3. Comprehend processor architecture with various design methods of CPU with comparative analysis</li><li>4. Describe memory systems with design and analysis of mapping techniques for cache and virtual memory</li><li>5. Analyze different parallel processing and pipelining concepts with pipelining hazards</li><li>6. Comprehend different types of I/O buses, compare and contrast different types of data transfer methods and arbitration techniques</li></ol>
4.	EC202	Electronic Devices	<ol style="list-style-type: none"><li>1. Discuss device physics and characteristics of semiconductor devices.</li><li>2. Discuss working principle and characteristics of BJT</li><li>3. Discuss working principle and characteristics of FET</li><li>4. Analyze single stage BJT and FET amplifier circuits</li></ol>





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			<ul style="list-style-type: none"> <li>5. Discuss semiconductor device fabrication process</li> <li>6. Discuss construction, working principle and characteristics of advance semiconductor devices HEMT, MESFET and HBT</li> </ul>
5.	EC203	Network Theory	<ul style="list-style-type: none"> <li>1. Analyze the given circuits using theorems and transformation techniques</li> <li>2. Analyze the given circuit using Graph Theory</li> <li>3. Analyze the given RL, RC and RLC circuits in time domain</li> <li>4. Analyze the given RL, RC and RLC circuits in frequency domain</li> <li>5. Predict the circuits using Foster and Cauer realization methods</li> <li>6. Explain the concept of two port network, relation between the parameters and their interconnection</li> </ul>
6.	EC204	Electronics Instruments and Measurement Lab	<ul style="list-style-type: none"> <li>1. Describe the working of measuring instruments available in the lab</li> <li>2. Find out and verify the manufacturers, make, models, market cost and specifications of the given instrument</li> <li>3. Select the suitable test and measuring instrument for the given circuit</li> <li>4. Operate the instrument for observing and recording the given signal in time domain and frequency domain</li> <li>5. Recognize the importance of calibration of instruments</li> <li>6. Design signal conditioning circuit for measurement of various parameters</li> </ul>
7.	AS201	Professional Communication Skills	<ul style="list-style-type: none"> <li>1. Demonstrate the spoken and written skills for job placements.</li> <li>2. Draft professional documents.</li> <li>3. Design written communication for social media.</li> </ul>
<b>IV sem</b>			
1.	MA203	Probability and Stochastic Processes	<ul style="list-style-type: none"> <li>1. Apply concepts of mathematics to set operations and probability theory</li> <li>2. Apply concepts of probability theory to single random variables</li> <li>3. Apply theorems to multiple random variables and investigate significance of Central Limit Theorem</li> <li>4. Determine solutions to various characteristics of random variables/distributions/processes</li> <li>5. Investigate characteristics of random processes</li> <li>6. To interpret use of probability distributions in real world and illustrate Markov Theory application to Queuing theory.</li> </ul>
2.	MA204	Foundations of Mathematics-II	<ul style="list-style-type: none"> <li>1. Integrate a function of one variable using various techniques</li> <li>2. Sketch basic curves and solve double and triple integrals.</li> <li>3. Solve basic problems using properties of complex numbers.</li> </ul>





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Department of Electronics and Telecommunication

			<ol style="list-style-type: none"><li>4. Solve differential equations of first order.</li><li>5. Apply the techniques of solving first order differential equations to electrical engineering problems.</li><li>6. Solve differential equations of higher order.</li></ol>
3.	EC205	Analog Circuits	<ol style="list-style-type: none"><li>1. Apply the concept of negative and positive feedback</li><li>2. Discuss differential amplifier and power amplifier circuits.</li><li>3. Discuss fundamentals of operational amplifier IC</li><li>4. Design linear and non-linear applications using operational amplifier IC</li><li>5. Discuss various data conversion techniques</li><li>6. Design applications with special purpose ICs</li></ol>
4.	EC206	Microcontrollers	<ol style="list-style-type: none"><li>1. Compare and contrast traditional microprocessor with traditional microcontroller 8051</li><li>2. Understand and describe architectural features of microcontrollers like PIC and ARM</li><li>3. Comprehend ARM core model and classify different modes of operation with justification</li><li>4. Classify various instructions with addressing modes of microcontrollers like PIC and ARM</li><li>5. Analyze the given problem statement and apply the programming concepts to solve the problem through program in PIC and ARM</li><li>6. Illustrate and utilize the integrated peripherals of 16- and 32-bit microcontrollers</li></ol>
5.	EC207	Signals and Systems	<ol style="list-style-type: none"><li>1. Classify and illustrate various operations on signals and systems.</li><li>2. Analyze the properties of a continuous time signal in the frequency domain and observe the spectrum.</li><li>3. Apply Laplace Transform on continuous time signals.</li><li>4. Evaluate Linear Time Invariant system response using Laplace Transform.</li><li>5. Design analog Butterworth and Chebyshev filter.</li><li>6. Interpret system using state space model.</li></ol>
6.	EC208	Mini Project-I	<ol style="list-style-type: none"><li>1. Discover potential research areas for addressing societal issues</li><li>2. Conduct a survey of basic and contemporary literature in the preferred field of study.</li><li>3. Formulate and propose a plan for creating a solution for the research plan identified</li><li>4. Exercise the team building, communication and management for design and implementation of projects.</li><li>5. Compare and contrast the several existing solutions for research challenge</li></ol>





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Department of Electronics and Telecommunication

			<ol style="list-style-type: none"><li>6. Report and present the findings of the study conducted in the preferred domain.</li></ol>
V sem			
1.	EC301	Analog and Digital Communication	<ol style="list-style-type: none"><li>1. Describe various entities of analog, pulse, and digital communication systems.</li><li>2. Apply concepts of signals and systems to analyze behavior of modulated signals in time domain, frequency domain and signal space.</li><li>3. Analyze and compute system performance measures such as efficiency, bit rate and bandwidth of various analog, pulsed and digital modulation methods.</li><li>4. Analyze the behavior of various analog, pulse, and digital modulation schemes in presence of noise.</li><li>5. Compare various modulation and demodulation techniques.</li><li>6. Examine various wired and wireless applications and further infer health, safety, and environment aspects of wired and wireless systems.</li></ol>
2.	EC302	Control Systems	<ol style="list-style-type: none"><li>1. Classify different types of control systems, components of control systems and formulate mathematical modeling of the given system.</li><li>2. Apply various methods for representation of the given control system.</li><li>3. Analyze the transient and steady state behavior of a given system for standard test inputs.</li><li>4. Analyze the stability of systems in the time domain and frequency domain.</li><li>5. Discuss the concept of controllability and observability using state variable models.</li><li>6. Evaluate the system performance with the use of compensators &amp; controllers.</li></ol>
3.	EC303	Digital Signal Processing	<ol style="list-style-type: none"><li>1. Classify and perform various operations on signals and systems.</li><li>2. Apply DFT properties and illustrate FFT algorithms.</li><li>3. Apply Z Transform on discrete time signals.</li><li>4. Analyze LTI System using Z Transform.</li><li>5. Design and Realize Digital filters.</li><li>6. Analyze Multirate Signal Processing.</li></ol>
4.	EC304	Electromagnetic Engineering	<ol style="list-style-type: none"><li>1. Apply basic laws of electromagnetic and Maxwell's equations.</li><li>2. Illustrate the behavior of EM waves and travelling of waves in free space as well as media.</li><li>3. Solve problems related to the propagation of electromagnetic</li></ol>





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 (Autonomous Institute Affiliated to University of Mumbai)  
 Department of Electronics and Telecommunication

			waves. 4. Discuss the types of antennas and their parameters. 5. Discuss types of radio wave propagation. 6. Design applications using Electromagnetic Waves theory.
5.	EC305	Java Programming Lab	1. Demonstrate programming using basic constructs of JAVA. 2. Apply Inheritance and polymorphism for a given scenario. 3. Apply abstraction and exception handling to create an efficient program. 4. Use Generic classes and collections for solving problems. 5. Develop a mini project based on the real-world problem.
VI sem			
1.	EC306	Fundamentals of Antenna	1. Calculate the fundamental parameters of Antenna. 2. Describe fundamental theory of antennas 3. Select antenna based on applications 4. Evaluate antenna based on applications. 5. Design Antenna Arrays. 6. Design antenna based on given requirements.
2.	EC307	Computer Communication Networks	1. Apply Conceptual understanding and functional aspects of computer communication and telecom networks. 2. Analyze design and configure small and medium sized computer networks that meet a specific need for communications. 3. Simulate computer networks and analyze the simulation results including troubleshoot connectivity problems occurring at layers of TCP/IP model. 4. Apply the principles behind the Modern Network approaches such as SDN NFV and IoT and security issues.
3.	EC31T11	Mobile and Wireless Communication	1. Demonstrate the ability to discuss wireless communication concepts, system capacity and service provided. 2. Evaluate various path loss and fading effects. 3. Analyze losses, multipath effects, architecture, and protocols of 3G, 4G and 5G systems. 4. Compare various operational aspects of Wireless Personal Area Networks.
4.	EC31T12	Microwave Communication	Apply EM Wave theory to understand the nature of Microwave Signals and their corresponding guiding structures. Identify Passive Waveguide Components, Sources and Detectors Analyze Passive Waveguide Components, Sources and Detectors. Compute amplifier and filter design parameters on the basis of





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**Department of Electronics and Telecommunication**

			application/requirement. Justify choice of amplifier and filter design parameter. Design Microwave System components.
5.	EC31T21	Speech and Audio Processing	<ol style="list-style-type: none"> <li>1. Apply concepts of speech coding.</li> <li>2. Analyze Audio Perception &amp; psycho-acoustic model.</li> <li>3. Demonstrate parametric representation, time domain &amp; frequency domain representation of Speech.</li> <li>4. Analysis of predictive methods of speech.</li> <li>5. Develop systems for various applications of speech &amp; audio processing.</li> </ol>
6.	EC31X	Information theory and coding	<ol style="list-style-type: none"> <li>1. Interpret information theory concepts and compute the capacity of various types of Channels.</li> <li>2. Construct various source codes and error correction codes.</li> <li>3. Examine information theory and coding algorithms.</li> <li>4. Estimate various performance parameters of information theory and error correction coding algorithms.</li> <li>5. Survey various error correction codes used in wired and wireless applications.</li> </ol>
7.	EC31Y	Optical Fiber Communication	<ol style="list-style-type: none"> <li>1. Apply EM Wave theory to understand the nature of Optical Signal and their corresponding guiding structures.</li> <li>2. Identify Passive Optical Components, Sources and Detectors.</li> <li>3. Analyze Passive Optical Components, Sources and Detectors.</li> <li>4. Evaluate losses in the optical systems.</li> <li>5. Compare different Optical Networks</li> <li>6. Design optical Link Budget system.</li> </ol>
<b>VII and VIII sem</b>			
1.	PE-IV EC41T24	Principles of Soft Computing	<ol style="list-style-type: none"> <li>1. Identify soft computing techniques and their roles in building intelligent Machines.</li> <li>2. Apply fuzzy logic reasoning to build models for solving various engineering problems.</li> <li>3. Analyze optimization issues using Genetic Algorithm.</li> <li>4. Design various hybrid soft computing models by using different techniques.</li> </ol>
2.	EC41T1P	Artificial Intelligence and Machine Learning	<ol style="list-style-type: none"> <li>1. Describe the basic concepts and techniques of Machine Learning.</li> <li>2. Evaluate Supervised and Unsupervised Machine Learning Algorithms based on applications.</li> <li>3. Analyze the deep learning algorithms for various types of learning tasks in various domains.</li> <li>4. Apply knowledge representation, reasoning, and machine</li> </ol>





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**Department of Electronics and Telecommunication**

			learning techniques to real world problems.
3.	OE	Robotic Vision	<ol style="list-style-type: none"><li>1. Discuss the fundamentals of Robotics</li><li>2. Apply direct and inverse kinematics algorithms</li><li>3. Justify the need of vision algorithms</li></ol>
4.	OE	Cyber Security and Digital Forensics	<ol style="list-style-type: none"><li>1. Identify and classify various cybercrimes with respect to organizational weaknesses in order to mitigate the security risk and estimate the impact on society and world</li><li>2. Analyze the results of vulnerability scans of vulnerability assessment and generate report with penetration testing</li><li>3. Apply Information Security Standards compliance during software design and development</li><li>4. Interpret and apply Indian IT laws in various legal issues</li><li>5. Describe the concept of Digital forensics and use various tools and techniques used for digital forensics investigations</li><li>6. Integrate advanced security solutions and manage, provide policies, standards, procedures, guidelines, policy framework, assess and mitigate risk</li></ol>
5.	OECS4	Human Machine Interaction	<ol style="list-style-type: none"><li>1. Identify the various design principles used for interacting between human and machine.</li><li>2. Apply human psychology of everyday actions and UI design process for real world applications.</li><li>3. Implement mobile, windows and web based applications.</li><li>4. Evaluate and justify UI design.</li><li>5. Create applications for social and technical tasks.</li></ol>
6.	OECS1	Cloud Computing	<ol style="list-style-type: none"><li>1. Illustrate cloud service models, deployment models and mobile cloud computing.</li><li>2. Compare different virtualization technologies.</li><li>3. Use different cloud computing services for a given scenario.</li><li>4. Analyze the components of open stack and Google Cloud platform.</li></ol>
7.	OECS3	Data Structures and Algorithms	<ol style="list-style-type: none"><li>1. Apply various operations of linear and non-linear data structures to given problems.</li><li>2. Apply the concepts of Trees and Graphs to a given problem.</li><li>3. Analyze the algorithm for a given Problem statement.</li><li>4. Apply the Divide and Conquer, Greedy method, Dynamic Programming strategy to solve given problems.</li><li>5. problems.</li></ol>
8.	OEIT4	Database Management Systems	<ol style="list-style-type: none"><li>1. Analyze a given system to construct a database model..</li><li>2. Apply various SQL commands for data manipulation.</li><li>3. Apply normalization on relational databases.</li></ol>





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Department of Electronics and Telecommunication

			<ol style="list-style-type: none"><li>4. Illustrate transaction processing and query processing techniques on a database.</li></ol>
9.	OEIT6	Data Analytics	<ol style="list-style-type: none"><li>1. Apply different techniques of data preprocessing.</li><li>2. Apply rules and theorems in statistics to analyze the data.</li><li>3. Apply different algorithms like regression, classification on a given data.</li><li>4. Apply different algorithms like clustering and Association Rule Mining on a given data.</li></ol>

Head of the Department  
Dr. Reena Sonkusare

*Reena*





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Department of Electronics and Telecommunication

**Batch (2018-2022)**

Sr. no	Course code	Course name	Course outcomes
<b>I and II Sem</b>			
1.	ES21	Basic Electrical Technology	<ol style="list-style-type: none"><li>Compute various electrical quantities of a given dc circuit using circuit simplification techniques and various network theorems.</li><li>Describe the concept of ac circuit and its resonance phenomena for a given RL, RC and RLC circuit.</li><li>Analyze the series and parallel magnetic circuit.</li><li>Describe characteristics of single phase, three phase ac circuits and transformer equivalent circuit theoretically and graphically.</li><li>Describe the constructional details and working principle of given AC and DC machines.</li></ol>
<b>III sem</b>			
1.	BS31	Applied Mathematics-I	<ol style="list-style-type: none"><li>Evaluate Laplace and Inverse Laplace transform of functions using various properties.</li><li>Solve differential equations with given initial conditions using Laplace and Laplace Inverse.</li><li>Expand functions in terms of sine and cosine series on the given interval.</li><li>Find Fourier transforms by applying its various properties</li><li>Check for a function being analytic using Cauchy-Riemann equations and construct analytic functions.</li><li>Construct Bilinear Transformations and find images</li></ol>





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Department of Electronics and Telecommunication

			under Conformal mappings
2.	ET31	Electronic Devices and Circuits	<ol style="list-style-type: none"><li>1. Apply the concept of basic diodes.</li><li>2. Analyze BJT circuits and carry out the small signal analysis of BJT amplifiers.</li><li>3. Describe the working and carry out the small signal analysis of JFET &amp; MOSFET amplifiers.</li><li>4. Analyze and design single and multistage JFET and MOSFET amplifiers.</li><li>5. Differentiate between discrete and integrated biasing techniques.</li><li>6. Understand the concept of feedback amplifiers.</li></ol>
3.	ET32	Circuit Theory	<ol style="list-style-type: none"><li>1. Analyse the given circuits using theorems and transformation techniques</li><li>2. Analyse the given circuit using Graph Theory</li><li>3. Analyse the given RL, RC and RLC circuits in time domain</li><li>4. Analyse the given RL, RC and RLC circuits in frequency domain</li><li>5. Predict the circuits using Foster and Cauer realization methods</li><li>6. Explain the concept of two port network, relation between the parameters and their interconnection</li></ol>
4.	ET33	Digital Circuits	<ol style="list-style-type: none"><li>1. Explain various logic gates, SOP, POS forms and their minimization with kmap for given combinational circuits.</li><li>2. Construct combinational circuits using given MSI devices.</li><li>3. Discuss different types of programmable logic devices like PAL, PLA, CPLD and FPGA.</li><li>4. Apply the knowledge of flip-flops and MSI to design counters</li><li>5. Design state machines for given state diagrams after state reduction</li><li>6. Discuss fault models and testing methods for digital circuits</li></ol>
5.	ET34	Electromagnetic Wave Propagation	<ol style="list-style-type: none"><li>1. Ability to comprehend the physical significance of static and dynamic field theory.</li><li>2. Ability to interpret the behaviour of Electromagnetic wave in various media and Interfaces by applying Maxwell's Equation</li></ol>





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(Autonomous Institute Affiliated to University of Mumbai)  
Department of Electronics and Telecommunication

			<ol style="list-style-type: none"><li>3. Ability to determine the energy flow and Polarization by applying the Maxwell's equation.</li><li>4. Ability to calculate and analyse the parameters for wave propagation in Transmission Line through theoretical calculations and Smith Chart</li><li>5. Ability to evaluate the degradation in the performance of a device and system or subsystem compatibility based on radiated emission.</li></ol>
6.	ETL31	Electronic Devices and Circuits Lab	<ol style="list-style-type: none"><li>1. To analyse wave shaping circuits.</li><li>2. To demonstrate the working of a BJT amplifier.</li><li>3. To verify the working, biasing and small signal analysis of JFET amplifiers.</li><li>4. To analyze and design single and multistage JFET amplifiers.</li><li>5. To analyze current mirror circuits through simulation.</li><li>6. To design and simulate feedback amplifiers.</li></ol>
7.	ETL32	Digital Circuits Lab	<ol style="list-style-type: none"><li>1. Follow the given instructions for performing an experiment on the breadboard</li><li>2. Construct logic circuits using gates to realize a given function.</li><li>3. Construct logic circuits using MSI ICs to realize given function</li><li>4. Validate the design of combinational and sequential logic circuits by hardware implementation</li><li>5. Test and troubleshoot given logic circuits using testing instruments</li><li>6. Develop an application using concepts of digital circuits</li></ol>
8.	ELL33	HDL Programming Lab	<ol style="list-style-type: none"><li>1. Write VHDL code to build the given hardware</li><li>2. Verify the behavior of given hardware with VHDL simulation tool</li><li>3. Write synthesizable VHDL code and perform physical verification on FPGA and CPLD device</li><li>4. Write, simulate, synthesize and implement VHDL code with behavioral, dataflow and structural modeling style</li><li>5. Interface the external peripherals with FPGA and design hardware to create an application.</li><li>6. Interpret the RTL, synthesis, Floorplan report and optimally utilize the internal resources of given FPGA</li></ol>

*Shrawan*



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Munshi Nagar, Andheri (W), Mumbai – 400 058.  
(Autonomous Institute Affiliated to University of Mumbai)  
Department of Electronics and Telecommunication

9.	ELL34	Object Oriented Programming Lab	<ol style="list-style-type: none"><li>1. Use object oriented programming concepts for a scenario.</li><li>2. Apply concept of input output and string handling</li><li>3. Demonstrate polymorphism, static and dynamic binding.</li><li>4. Apply Inheritance, Abstract Class and Interface to implement scenario.</li><li>5. Apply the concept of multithreading and exception handling for a scenario.</li></ol>
<b>IV sem</b>			
1.	BS41	Applied Mathematics II	<ol style="list-style-type: none"><li>1. To diagonalise a given matrix and calculate functions of a square matrix</li><li>2. To reduce a given quadratic form to simpler forms</li><li>3. To apply the concept of complex analysis to evaluate integrals</li><li>4. To evaluate line integrals and surface integrals</li><li>5. To calculate expectation, variance and moments of a random variable</li><li>6. To apply the concepts of matrices to real life problems</li></ol>
2.	ET41	Fundamentals of Communication Engineering	<ol style="list-style-type: none"><li>1. Infer principle of working of various sub systems of analog communication</li><li>2. Analyze the performance parameters of analog and pulse modulations</li><li>3. Apply concepts of Signals and systems to Analog Communication</li><li>4. Analyze the principle of working of receivers.</li><li>5. Characterize noise and interpret effect of noise on modulations</li><li>6. Compare the different analog communication systems.</li></ol>
3.	ET42	Signals and Systems	<ol style="list-style-type: none"><li>1. Classify and illustrate various operations on signals and systems.</li><li>2. Analyze the properties of a continuous time signal in the frequency domain and observe the spectrum.</li><li>3. Apply Laplace Transform on continuous time signals</li><li>4. Evaluate Linear Time Invariant system response using Laplace Transform</li><li>5. Design analog Butterworth and Chebyshev filter</li><li>6. Interpret system using state space model.</li></ol>

*S. Chaudhary*





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Munshi Nagar, Andheri (W), Mumbai – 400 058.

(Autonomous Institute Affiliated to University of Mumbai)  
Department of Electronics and Telecommunication

4.	ET43	Principles of Control System	<ol style="list-style-type: none"><li>1. Classify different types of Control systems and formulate mathematical modeling of the given system</li><li>2. Illustrate the Transient and steady state behavior of given system for standard test inputs</li><li>3. Analyze the stability of systems in time domain and frequency domain</li><li>4. Justify the concept of Controllability and observability using State variable model</li><li>5. Apply the control theory to design the compensators to enhance stability of system</li><li>6. Evaluate the system performance with the use of Compensators &amp; Controllers</li></ol>
5.	ET44	Integrated Circuits	<ol style="list-style-type: none"><li>1. Describe the fundamentals of Op-Amp.</li><li>2. Analyze and design applications of Op-Amp.</li><li>3. Design different applications using IC 555.</li><li>4. Illustrate the function of Special Purpose ICs such as VCO, PLL, Power amplifier and DAC/ADC conversion technique.</li><li>5. Design DC power supply like LVLC, LVHC, HVLC and HVHC using Regulator ICs.</li></ol>
6.	ETL41	Fundamentals of Communication Engineering Lab	<ol style="list-style-type: none"><li>1. Implement the circuit and observe the working principle of analog modulation techniques</li><li>2. Implement the circuit and analyze the working principle of analog demodulators</li><li>3. Make use of simulation software to study given communication circuits</li><li>4. Implement circuits for analog pulse modulation techniques like PAM, PPM and PWM to observe modulated waveforms</li><li>5. Implement the circuit for generation of natural sampling and its effect on reconstruction of the wave.</li><li>6. Work in a team to implement the given communication circuit</li></ol>
7.	ETL43	Principles of Control Systems Lab	<ol style="list-style-type: none"><li>1. Examine working principle and application of given control system components.</li><li>2. Develop a program using a suitable programming language for time and frequency domain analysis of a given system.</li><li>3. Demonstrate the dynamic behavior of the system in time domain and frequency domain.</li><li>4. Experiment the effect of the compensator on the</li></ol>

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Munshi Nagar, Andheri (W), Mumbai – 400 058.

(Autonomous Institute Affiliated to University of Mumbai)  
Department of Electronics and Telecommunication

			<p>performance of the control system.</p> <p>5. Identify and demonstrate any control system for real life application.</p>
8.	ETL44	Integrated Circuit Lab	<p>1. To measure different parameters of Op-Amp.</p> <p>2. Identify, Analyze and design applications of Op-Amp.</p> <p>3. Implement different applications using special purpose ICs.</p> <p>4. Design DC power supply for given specification/s.</p> <p>5. Design, simulate and implement different applications using integrated circuits.</p>
9.	ETL45	Computer Methods for Circuit Simulation Lab	<p>1. Illustrate a network in terms algebraic equations</p> <p>2. Apply Numerical techniques to solve linear and nonlinear algebraic equations</p> <p>3. Perform DC and Transient analysis on Electrical networks</p> <p>4. Analyze the given circuit using Monte Carlo.</p>
<b>V sem</b>			
1.	ET51	Digital Communication	<p>1. Ability to describe various entities of digital communication system</p> <p>2. Solve problems to interpret various concepts</p> <p>3. Analyze mathematically various source coding methods/modulation/demodulation /error correction codes</p> <p>4. Compare various modulation/demodulation /error correction codes</p> <p>5. Determine the behavior of signals in time and frequency domain at various stages of digital communication system</p> <p>6. Justify modulation/demodulation/Bit rate/ Bandwidth requirements in various applications</p>
2.	ET52	Microprocessors and Microcontrollers	<p>1. Describe the architecture, modes and interrupt structure of 16 bit microprocessors</p> <p>2. Discuss various mechanisms of computer architectures that include virtual memory address translation, protection with multitasking and task switching.</p> <p>3. Comprehend the principles of memory systems with cache memory and its design</p> <p>4. Explain the architecture and utilize the Instruction set</p>





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Munshi Nagar, Andheri (W), Mumbai – 400 058.

(Autonomous Institute Affiliated to University of Mumbai)  
Department of Electronics and Telecommunication

			<p>of 16 bit Microcontrollers</p> <p>5. Illustrate and utilize the integrated peripherals of 16 bit microcontrollers</p>
3.	ET53	Fundamentals of Antenna	<p>1. Ability to calculate the fundamental parameters of Antenna</p> <p>2. Ability to describe fundamental theory of antennas</p> <p>3. Ability to evaluate and select antenna on the basis of applications</p> <p>4. Ability to design Antenna Arrays</p>
4.	ET54	Random Signal Analysis	<p>1. Apply theory of probability in identifying and solving relevant problems.</p> <p>2. Analyze statistical behavior of single and multiple random variables and manipulate them.</p> <p>3. Apply transformations of random variables; random sequences &amp; Central limit theorem to solve engineering problems and interpret the significance.</p> <p>4. Evaluate random variables, random process, Markov chains and Queuing theory using probabilistic approach.</p>
5.	ETL51	Digital Communication Lab	<p>1. Ability to implement various concepts of digital communication.</p> <p>2. Ability to troubleshoot hardware circuits</p> <p>3. Ability to take measurements</p> <p>4. Ability to write and debug software programs</p>
6.	ETL52	Microprocessors & Microcontrollers Laboratory	<p>1. Use hardware and software tools for microprocessors and microcontrollers like 8086, 80386 and PIC</p> <p>2. Analyze the problem statement and write and execute an assembly language program for 8086/80386/PIC</p> <p>3. Debug an assembly language program for 8086/80386/PIC</p> <p>4. Document the procedure and analyze the result of an experiment.</p>
7.	ETL53	Antenna Lab	<p>1. Install and use modern tools available for antenna design.</p> <p>2. Ability to analyze the antenna fundamental parameters.</p> <p>3. Ability to analyze and design a given antenna.</p> <p>4. Debate the results of modern tools and test them.</p>
8.	ETL54	Statistical and	<p>1. To handle the different data types.</p>





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		Computational Lab	<ul style="list-style-type: none"> <li>2. To compute the statistical parameters</li> <li>3. To compute cdf and pdf</li> <li>4. To plot and interpret from data visualization</li> <li>5. To Analyse the data</li> </ul>
9.	ETL55	Photovoltaic Laboratory	<ul style="list-style-type: none"> <li>1. Design DC - AC Conversion.</li> <li>2. Test and analyze PV cell characteristics and connections.</li> <li>3. Investigate PV cells based on environmental conditions.</li> <li>4. Measure different parameters of PV Cells.</li> </ul>
10.	ETP56	Product Design-I	<ul style="list-style-type: none"> <li>1. Understand the basic knowledge of functions of an electronic product development processes</li> <li>2. Finding out Electrical and Physical specifications from datasheets</li> <li>3. To learn schematic design.</li> <li>4. To learn Layout design.</li> <li>5. To learn Technical documentation such as Schematic and layout sheets, PCB and schematic foot prints, bills of material, gerber files etc.</li> </ul>
<b>VI sem</b>			
1.	ET61	Digital Time Signal Processing	<ul style="list-style-type: none"> <li>1. Ability to compute various Transform analysis of LTI systems</li> <li>2. Ability to apply DFT Properties and Illustrate FFT algorithms</li> <li>3. Ability to Design and Realize Digital Filters</li> <li>4. Ability to apply engineering problem solving strategies to DSP problems</li> <li>5. Ability to design and test signal processing algorithms for various applications</li> </ul>
2.	ET62	Computer Communication Networks	<ul style="list-style-type: none"> <li>1. Conceptual understanding and functional aspects of computer communication and telecom networks.</li> <li>2. Design and configure small/medium sized computer networks that meet specific needs for communications.</li> <li>3. Simulate computer networks and analyze the simulation results including troubleshoot connectivity problems occurring at layers of TCP/IP model.</li> </ul>
3.	ET63	Embedded Systems & RTOS	<ul style="list-style-type: none"> <li>1. Understand the embedded concepts and architecture models</li> </ul>

*Renuka*





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			<ol style="list-style-type: none"><li>2. Describe ARM architecture</li><li>3. Comprehend the open source RTOS and its usage</li><li>4. Design programming models for embedded systems applications</li></ol>
4.	ETL61	Discrete Time Signal Processing Lab	<ol style="list-style-type: none"><li>1. Explores the ability to develop programs for various DSP concepts.</li><li>2. Explores the ability to debug programs for various DSP concepts</li><li>3. Ability to design and analyze the frequency response of digital IIR and FIR filters.</li><li>4. Ability to analyse the result and document the experiment.</li></ol>
5.	ETL63	Embedded Systems & Operating System Laboratory	<ol style="list-style-type: none"><li>1. Use hardware and software tools for processors like ARM series.</li><li>2. Analyze the problem statement and write and execute an assembly language program for ARM series processors and Real Time OS</li><li>3. Debug an assembly language program for ARM series and Real Time OS</li><li>4. Document the procedure and analyze the result of an experiment.</li></ol>
6.	ETL62	Computer Communication Networks Laboratory	<ol style="list-style-type: none"><li>1. Assemble the components of a PC and install one or more network operating systems resulting in a functioning</li><li>2. Design a small or medium sized computer network including media types, end devices, and interconnecting devices that meets a customer's specific needs.</li><li>3. Perform basic configurations on routers and Ethernet switches.</li><li>4. Demonstrate knowledge of programming for network communications</li><li>5. Learn to simulate computer networks and analyze the simulation results</li><li>6. Troubleshoot connectivity problems in a host occurring at multiple layers of the OSI model</li><li>7. Develop knowledge and skills necessary to gain employment as computer network engineer and network administrator.</li></ol>
7.	ETL64	RF systems and	<ol style="list-style-type: none"><li>1. Ability to analyse and compute RF system</li></ol>





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		Design Laboratory	<ul style="list-style-type: none"> <li>requirement.</li> <li>2. Ability to use modern tools for designing RF system components.</li> <li>3. Ability to test RF system components.</li> </ul>
8.	ETP65	Product Design-II	<ul style="list-style-type: none"> <li>1. Understand the concepts of reliability.</li> <li>2. Learn control panel layout design for various industrial products</li> <li>3. Thermal design consideration for component level, board level, system level Design</li> <li>4. Conduct a study on testing of a electronic product</li> <li>5. Document the product in the form of IPR and Copyright format.</li> </ul>
VII sem			
1.	ET71	Mobile and Wireless Technologies	<ul style="list-style-type: none"> <li>1. Comprehend wireless communication concepts, system capacity and service provided.</li> <li>2. Evaluate various path loss and fading effects</li> <li>3. Analyze losses, multipath effects, architecture and protocols of 3G, 4G and 5G systems</li> <li>4. Compare various aspects of cellular and wireless systems such as pathloss, fading, architecture and protocols</li> </ul>
2.	ET72	Microwave and Optical Fiber Communication	<ul style="list-style-type: none"> <li>1. Apply EM Wave theory and Ray theory to understand nature of Microwave and Optic Signal and their corresponding guiding structures</li> <li>2. Identify and Analyze System Components including Sources and Detectors</li> <li>3. Compare different Optical Networks</li> <li>4. Design tuning networks and optical Link Budget system</li> </ul>
3.	ETL71	Mobile and Wireless Technologies Lab	<ul style="list-style-type: none"> <li>1. Comprehend hardware components of Mobile Communications Systems using AT Command and Python Scripting.</li> <li>2. Simulate and analyze Modulation Techniques using GNU Radio, Mobile Tx/Rx using USRP</li> <li>3. Understand the Protocol Architecture and Operation of LTE, 5G and WiFi using NS3 and Omnet++</li> </ul>
4.	ETL72	Microwave and	<ul style="list-style-type: none"> <li>1. Distinguish, Characterise and measure the basic</li> </ul>





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		Optical Fiber Communication Lab	<ul style="list-style-type: none"> <li>parameters of Microwave Communication using Microwave Measurement Setups and Techniques.</li> <li>2. Use Modern Tools to design and analyze Microwave Components</li> <li>3. Analyze different parameters of optical fiber, optical sources and detectors</li> <li>4. Use Modern Tools to design and analyze Optical Network</li> </ul>
5.	ETEL71A	Machine Learning and AI Lab	<ul style="list-style-type: none"> <li>1. Make use of data sets in implementing the machine learning algorithms</li> <li>2. Build linear model and evaluate performance analysis of model</li> <li>3. Evaluate Supervised and Unsupervised Machine Learning Algorithms</li> <li>4. Implement the machine learning concepts and algorithms in any suitable language of choice.</li> </ul>
6.	ETEL72A	Cryptography and Network Security Lab	<ul style="list-style-type: none"> <li>1. List and describe types of Cryptography and Cryptanalysis</li> <li>2. Demonstrate the symmetric and asymmetric cryptography, cryptographic hash functions, digital signature, digital certificate and certificate authority (CA), CA structure.</li> <li>3. Build and implement cryptosystems using python</li> <li>4. Install and configure and optimize the firewall, IDS, Authentication system</li> </ul>
<b>VIII sem</b>			
1.	HSS81	Technology Entrepreneurship Lab	<ul style="list-style-type: none"> <li>1. Identify problems worth solving</li> <li>2. Craft value proposition</li> <li>3. Prepare B-Plan</li> <li>4. Draft Patent</li> <li>5. Register virtual company</li> </ul>
2.	OE	Robotic Vision	<ul style="list-style-type: none"> <li>1. Discuss the fundamentals of Robotics</li> <li>2. Apply direct and inverse kinematics algorithms</li> <li>3. Justify the need of vision algorithms</li> </ul>
3.	OE	Cyber Security and Digital Forensics	<ul style="list-style-type: none"> <li>1. Identify and classify various cybercrimes with respect to organizational weaknesses in order to mitigate the security risk and estimate the impact on society and world</li> <li>2. Analyze the results of vulnerability scans of</li> </ul>

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Batch (2017-2021)

Sr. no	Course code	Course name	Course outcomes
<b>I and II Sem</b>			
1.	ES21	Basic Electrical Technology	<ol style="list-style-type: none"><li>Compute various electrical quantities of a given dc circuit using circuit simplification techniques and various network theorems.</li><li>Describe the concept of ac circuit and its resonance phenomena for a given RL, RC and RLC circuit.</li><li>Analyze the series and parallel magnetic circuit.</li><li>Describe characteristics of single phase, three phase ac circuits and transformer equivalent circuit theoretically and graphically.</li><li>Describe the constructional details and working principle of given AC and DC machines.</li></ol>
<b>III sem</b>			
1.	BS31	Applied Mathematics-I	<ol style="list-style-type: none"><li>Evaluate Laplace and Inverse Laplace transform of functions using various properties.</li><li>Solve differential equations with given initial conditions using Laplace and Laplace Inverse.</li><li>Expand functions in terms of sine and cosine series on the given interval.</li><li>Find Fourier transforms by applying its various properties</li><li>Check for a function being analytic using Cauchy-Reimann equations and construct analytic functions.</li><li>Construct Bilinear Transformations and find images</li></ol>





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			under Conformal mappings
2.	ET31	Electronic Devices and Circuits	<ol style="list-style-type: none"><li>1. Apply the concept of basic diodes.</li><li>2. Analyze BJT circuits and carry out the small signal analysis of BJT amplifiers.</li><li>3. Describe the working and carry out the small signal analysis of JFET &amp; MOSFET amplifiers.</li><li>4. Analyze and design single and multistage JFET and MOSFET amplifiers.</li><li>5. Differentiate between discrete and integrated biasing techniques.</li><li>6. Understand the concept of feedback amplifiers.</li></ol>
3.	ET32	Circuit Theory	<ol style="list-style-type: none"><li>1. Analyse the given circuits using theorems and transformation techniques</li><li>2. Analyse the given circuit using Graph Theory</li><li>3. Analyse the given RL, RC and RLC circuits in time domain</li><li>4. Analyse the given RL, RC and RLC circuits in frequency domain</li><li>5. Predict the circuits using Foster and Cauer realization methods</li><li>6. Explain the concept of two port network, relation between the parameters and their interconnection</li></ol>
4.	ET33	Digital Circuits	<ol style="list-style-type: none"><li>1. Explain various logic gates, SOP, POS forms and their minimization with kmap for given combinational circuits.</li><li>2. Construct combinational circuits using given MSI devices.</li><li>3. Discuss different types of programmable logic devices like PAL, PLA, CPLD and FPGA.</li><li>4. Apply the knowledge of flip-flops and MSI to design counters</li><li>5. Design state machines for given state diagrams after state reduction</li><li>6. Discuss fault models and testing methods for digital circuits</li></ol>
5.	ET34	Electromagnetic Wave Propagation	<ol style="list-style-type: none"><li>1. Ability to comprehend the physical significance of static and dynamic field theory.</li><li>2. Ability to interpret the behaviour of Electromagnetic wave in various media and Interfaces by applying Maxwell's Equation</li></ol>





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			<ol style="list-style-type: none"><li>3. Ability to determine the energy flow and Polarization by applying the Maxwell's equation.</li><li>4. Ability to calculate and analyse the parameters for wave propagation in Transmission Line through theoretical calculations and Smith Chart</li><li>5. Ability to evaluate the degradation in the performance of a device and system or subsystem compatibility based on radiated emission.</li></ol>
6.	ETL31	Electronic Devices and Circuits Lab	<ol style="list-style-type: none"><li>1. To analyse wave shaping circuits.</li><li>2. To demonstrate the working of a BJT amplifier.</li><li>3. To verify the working, biasing and small signal analysis of JFET amplifiers.</li><li>4. To analyze and design single and multistage JFET amplifiers.</li><li>5. To analyze current mirror circuits through simulation.</li><li>6. To design and simulate feedback amplifiers.</li></ol>
7.	ETL32	Digital Circuits Lab	<ol style="list-style-type: none"><li>1. Follow the given instructions for performing an experiment on the breadboard</li><li>2. Construct logic circuits using gates to realize a given function.</li><li>3. Construct logic circuits using MSI ICs to realize given function.</li><li>4. Validate the design of combinational and sequential logic circuits by hardware implementation</li><li>5. Test and troubleshoot given logic circuits using testing instruments</li><li>6. Develop an application using concepts of digital circuits</li></ol>
8.	ELL33	HDL Programming Lab	<ol style="list-style-type: none"><li>1. Write VHDL code to build the given hardware</li><li>2. Verify the behavior of given hardware with VHDL simulation tool</li><li>3. Write synthesizable VHDL code and perform physical verification on FPGA and CPLD device</li><li>4. Write, simulate, synthesize and implement VHDL code with behavioral, dataflow and structural modeling style</li><li>5. Interface the external peripherals with FPGA and design hardware to create an application.</li><li>6. Interpret the RTL, synthesis, Floorplan report and optimally utilize the internal resources of given FPGA</li></ol>

*Shweta*



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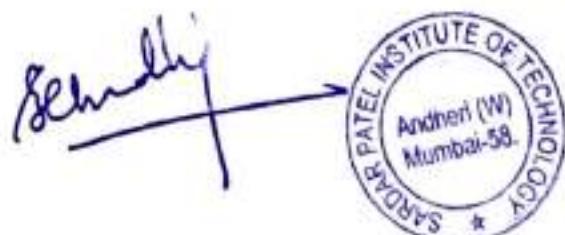


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9.	ELL34	Object Oriented Programming Lab	<ol style="list-style-type: none"><li>1. Use object oriented programming concepts for a scenario.</li><li>2. Apply concept of input output and string handling</li><li>3. Demonstrate polymorphism, static and dynamic binding.</li><li>4. Apply Inheritance, Abstract Class and Interface to implement scenario.</li><li>5. Apply the concept of multithreading and exception handling for a scenario.</li></ol>
<b>IV sem</b>			
1.	BS41	Applied Mathematics II	<ol style="list-style-type: none"><li>1. To diagonalise a given matrix and calculate functions of a square matrix</li><li>2. To reduce a given quadratic form to simpler forms</li><li>3. To apply the concept of complex analysis to evaluate integrals</li><li>4. To evaluate line integrals and surface integrals</li><li>5. To calculate expectation, variance and moments of a random variable</li><li>6. To apply the concepts of matrices to real life problems</li></ol>
2.	ET41	Fundamentals of Communication Engineering	<ol style="list-style-type: none"><li>1. Infer principle of working of various sub systems of analog communication</li><li>2. Analyze the performance parameters of analog and pulse modulations</li><li>3. Apply concepts of Signals and systems to Analog Communication</li><li>4. Analyze the principle of working of receivers.</li><li>5. Characterize noise and interpret effect of noise on modulations</li><li>6. Compare the different analog communication systems.</li></ol>
3.	ET42	Signals and Systems	<ol style="list-style-type: none"><li>1. Classify and illustrate various operations on signals and systems.</li><li>2. Analyze the properties of a continuous time signal in the frequency domain and observe the spectrum.</li><li>3. Apply Laplace Transform on continuous time signals</li><li>4. Evaluate Linear Time Invariant system response using Laplace Transform</li><li>5. Design analog Butterworth and Chebyshev filter</li><li>6. Interpret system using state space model.</li></ol>





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4.	ET43	Principles of Control System	<ol style="list-style-type: none"><li>1. Classify different types of Control systems and formulate mathematical modeling of the given system</li><li>2. Illustrate the Transient and steady state behavior of given system for standard test inputs</li><li>3. Analyze the stability of systems in time domain and frequency domain</li><li>4. Justify the concept of Controllability and observability using State variable model</li><li>5. Apply the control theory to design the compensators to enhance stability of system</li><li>6. Evaluate the system performance with the use of Compensators &amp; Controllers</li></ol>
5.	ET44	Integrated Circuits	<ol style="list-style-type: none"><li>1. Describe the fundamentals of Op-Amp.</li><li>2. Analyze and design applications of Op-Amp.</li><li>3. Design different applications using IC 555.</li><li>4. Illustrate the function of Special Purpose ICs such as VCO, PLL, Power amplifier and DAC/ADC conversion technique.</li><li>5. Design DC power supply like LVLC, LVHC, HVLC and HVHC using Regulator ICs.</li></ol>
6.	ETL41	Fundamentals of Communication Engineering Lab	<ol style="list-style-type: none"><li>1. Implement the circuit and observe the working principle of analog modulation techniques</li><li>2. Implement the circuit and analyze the working principle of analog demodulators</li><li>3. Make use of simulation software to study given communication circuits</li><li>4. Implement circuits for analog pulse modulation techniques like PAM, PPM and PWM to observe modulated waveforms</li><li>5. Implement the circuit for generation of natural sampling and its effect on reconstruction of the wave.</li><li>6. Work in a team to implement the given communication circuit</li></ol>
7.	ETL43	Principles of Control Systems Lab	<ol style="list-style-type: none"><li>1. Examine working principle and application of given control system components.</li><li>2. Develop a program using a suitable programming language for time and frequency domain analysis of a given system.</li><li>3. Demonstrate the dynamic behavior of the system in time domain and frequency domain.</li><li>4. Experiment the effect of the compensator on the</li></ol>

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			performance of the control system. 5. Identify and demonstrate any control system for real life application.
8.	ETL44	Integrated Circuit Lab	1. To measure different parameters of Op-Amp. 2. Identify, Analyze and design applications of Op-Amp. 3. Implement different applications using special purpose ICs. 4. Design DC power supply for given specification/s. 5. Design, simulate and implement different applications using integrated circuits.
9.	ETL45	Computer Methods for Circuit Simulation Lab	1. Illustrate a network in terms algebraic equations 2. Apply Numerical techniques to solve linear and nonlinear algebraic equations 3. Perform DC and Transient analysis on Electrical networks 4. Analyze the given circuit using Monte Carlo.

V sem

1.	ET51	Digital Communication	1. Ability to describe various entities of digital communication system 2. Solve problems to interpret various concepts 3. Analyzemathematically various source coding methods/modulation/demodulation /error correction codes 4. Compare various modulation/demodulation /error correction codes 5. Determine the behavior of signals in time and frequency domain at various stages of digital communication system 6. Justify modulation/demodulation/Bit rate/ Bandwidth requirements in various applications
2.	ET52	Microprocessors and Microcontrollers	1. Describe the architecture, modes and interrupt structure of 16 bit microprocessors 2. Discuss various mechanisms of computer architectures that include virtual memory address translation, protection with multitasking and task switching. 3. Comprehend the principles of memory systems with cache memory and its design 4. Explain the architecture and utilize the Instruction set

*Sehdev*





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			<p>of 16 bit Microcontrollers</p> <p>5. Illustrate and utilize the integrated peripherals of 16 bit microcontrollers</p>
3.	ET53	Fundamentals of Antenna	<ol style="list-style-type: none"><li>Ability to calculate the fundamental parameters of Antenna</li><li>Ability to describe fundamental theory of antennas</li><li>Ability to evaluate and select antenna on the basis of applications</li><li>Ability to design Antenna Arrays</li></ol>
4.	ET54	Random Signal Analysis	<ol style="list-style-type: none"><li>Apply theory of probability in identifying and solving relevant problems.</li><li>Analyze statistical behavior of single and multiple random variables and manipulate them.</li><li>Apply transformations of random variables; random sequences &amp; Central limit theorem to solve engineering problems and interpret the significance.</li><li>Evaluate random variables, random process, Markov chains and Queuing theory using probabilistic approach.</li></ol>
5.	ETL51	Digital Communication Lab	<ol style="list-style-type: none"><li>Ability to implement various concepts of digital communication.</li><li>Ability to troubleshoot hardware circuits</li><li>Ability to take measurements</li><li>Ability to write and debug software programs</li></ol>
6.	ETL52	Microprocessors & Microcontrollers Laboratory	<ol style="list-style-type: none"><li>Use hardware and software tools for microprocessors and microcontrollers like 8086, 80386 and PIC</li><li>Analyze the problem statement and write and execute an assembly language program for 8086/80386/PIC</li><li>Debug an assembly language program for 8086/80386/PIC</li><li>Document the procedure and analyze the result of an experiment.</li></ol>
7.	ETL53	Antenna Lab	<ol style="list-style-type: none"><li>Install and use modern tools available for antenna design.</li><li>Ability to analyze the antenna fundamental parameters.</li><li>Ability to analyze and design a given antenna.</li><li>Debate the results of modern tools and test them.</li></ol>
8.	ETL54	Statistical and	<ol style="list-style-type: none"><li>To handle the different data types.</li></ol>

  
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		Computational Lab	<ul style="list-style-type: none"> <li>2. To compute the statistical parameters</li> <li>3. To compute cdf and pdf</li> <li>4. To plot and interpret from data visualization</li> <li>5. To Analyse the data</li> </ul>
9.	ETL55	Photovoltaic Laboratory	<ul style="list-style-type: none"> <li>1. Design DC - AC Conversion.</li> <li>2. Test and analyze PV cell characteristics and connections.</li> <li>3. Investigate PV cells based on environmental conditions.</li> <li>4. Measure different parameters of PV Cells.</li> </ul>
10.	ETP56	Product Design-I	<ul style="list-style-type: none"> <li>1. Understand the basic knowledge of functions of an electronic product development processes</li> <li>2. Finding out Electrical and Physical specifications from datasheets</li> <li>3. To learn schematic design.</li> <li>4. To learn Layout design.</li> <li>5. To learn Technical documentation such as Schematic and layout sheets, PCB and schematic foot prints, bills of material, gerber files etc.</li> </ul>
<b>VI sem</b>			
1.	ET61	Digital Time Signal Processing	<ul style="list-style-type: none"> <li>1. Ability to compute various Transform analysis of LTI systems</li> <li>2. Ability to apply DFT Properties and Illustrate FFT algorithms</li> <li>3. Ability to Design and Realize Digital Filters</li> <li>4. Ability to apply engineering problem solving strategies to DSP problems</li> <li>5. Ability to design and test signal processing algorithms for various applications</li> </ul>
2.	ET62	Computer Communication Networks	<ul style="list-style-type: none"> <li>1. Conceptual understanding and functional aspects of computer communication and telecom networks.</li> <li>2. Design and configure small/medium sized computer networks that meet specific needs for communications.</li> <li>3. Simulate computer networks and analyze the simulation results including troubleshoot connectivity problems occurring at layers of TCP/IP model.</li> </ul>
3.	ET63	Embedded Systems & RTOS	<ul style="list-style-type: none"> <li>1. Understand the embedded concepts and architecture models</li> </ul>

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			<ol style="list-style-type: none"> <li>2. Describe ARM architecture</li> <li>3. Comprehend the open source RTOS and its usage</li> <li>4. Design programming models for embedded systems applications</li> </ol>
4.	ETL61	Discrete Time Signal Processing Lab	<ol style="list-style-type: none"> <li>1. Explores the ability to develop programs for various DSP concepts.</li> <li>2. Explores the ability to debug programs for various DSP concepts</li> <li>3. Ability to design and analyze the frequency response of digital IIR and FIR filters.</li> <li>4. Ability to analyse the result and document the experiment.</li> </ol>
5.	ETL63	Embedded Systems & Operating System Laboratory	<ol style="list-style-type: none"> <li>1. Use hardware and software tools for processors like ARM series.</li> <li>2. Analyze the problem statement and write and execute an assembly language program for ARM series processors and Real Time OS</li> <li>3. Debug an assembly language program for ARM series and Real Time OS</li> <li>4. Document the procedure and analyze the result of an experiment.</li> </ol>
6.	ETL62	Computer Communication Networks Laboratory	<ol style="list-style-type: none"> <li>1. Assemble the components of a PC and install one or more network operating systems resulting in a functioning</li> <li>2. Design a small or medium sized computer network including media types, end devices, and interconnecting devices that meets a customer's specific needs.</li> <li>3. Perform basic configurations on routers and Ethernet switches.</li> <li>4. Demonstrate knowledge of programming for network communications</li> <li>5. Learn to simulate computer networks and analyze the simulation results</li> <li>6. Troubleshoot connectivity problems in a host occurring at multiple layers of the OSI model</li> <li>7. Develop knowledge and skills necessary to gain employment as computer network engineer and network administrator.</li> </ol>
7.	ETL64	RF systems and	<ol style="list-style-type: none"> <li>1. Ability to analyse and compute RF system</li> </ol>

  
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		Design Laboratory	<ul style="list-style-type: none"> <li>requirement.</li> <li>2. Ability to use modern tools for designing RF system components.</li> <li>3. Ability to test RF system components.</li> </ul>
8.	ETP65	Product Design-II	<ul style="list-style-type: none"> <li>1. Understand the concepts of reliability.</li> <li>2. Learn control panel layout design for various industrial products</li> <li>3. Thermal design consideration for component level, board level, system level Design</li> <li>4. Conduct a study on testing of a electronic product</li> <li>5. Document the product in the form of IPR and Copyright format.</li> </ul>

**VII sem**

1.	ET71	Mobile and Wireless Technologies	<ul style="list-style-type: none"> <li>1. Comprehend wireless communication concepts, system capacity and service provided.</li> <li>2. Evaluate various path loss and fading effects</li> <li>3. Analyze losses, multipath effects, architecture and protocols of 3G, 4G and 5G systems</li> <li>4. Compare various aspects of cellular and wireless systems such as pathloss, fading, architecture and protocols</li> </ul>
2.	ET72	Microwave and Optical Fiber Communication	<ul style="list-style-type: none"> <li>1. Apply EM Wave theory and Ray theory to understand nature of Microwave and Optic Signal and their corresponding guiding structures</li> <li>2. Identify and Analyze System Components including Sources and Detectors</li> <li>3. Compare different Optical Networks</li> <li>4. Design tuning networks and optical Link Budget system</li> </ul>
3.	ETL71	Mobile and Wireless Technologies Lab	<ul style="list-style-type: none"> <li>1. Comprehend hardware components of Mobile Communications Systems using AT Command and Python Scripting.</li> <li>2. Simulate and analyze Modulation Techniques using GNU Radio, Mobile Tx/Rx using USRP</li> <li>3. Understand the Protocol Architecture and Operation of LTE, 5G and WiFi using NS3 and Omnet++</li> </ul>
4.	ETL72	Microwave and	<ul style="list-style-type: none"> <li>1. Distinguish, Characterise and measure the basic</li> </ul>

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		Optical Fiber Communication Lab	<ul style="list-style-type: none"> <li>parameters of Microwave Communication using Microwave Measurement Setups and Techniques.</li> <li>2. Use Modern Tools to design and analyze Microwave Components</li> <li>3. Analyze different parameters of optical fiber, optical sources and detectors</li> <li>4. Use Modern Tools to design and analyze Optical Network</li> </ul>
5.	ETEL71A	Machine Learning and AI Lab	<ul style="list-style-type: none"> <li>1. Make use of data sets in implementing the machine learning algorithms</li> <li>2. Build linear model and evaluate performance analysis of model</li> <li>3. Evaluate Supervised and Unsupervised Machine Learning Algorithms</li> <li>4. Implement the machine learning concepts and algorithms in any suitable language of choice.</li> </ul>
6.	ETEL72A	Cryptography and Network Security Lab	<ul style="list-style-type: none"> <li>1. List and describe types of Cryptography and Cryptanalysis</li> <li>2. Demonstrate the symmetric and asymmetric cryptography, cryptographic hash functions, digital signature, digital certificate and certificate authority (CA), CA structure.</li> <li>3. Build and implement cryptosystems using python</li> <li>4. Install and configure and optimize the firewall, IDS, Authentication system</li> </ul>

**VIII sem**

1.	HSS81	Technology Entrepreneurship Lab	<ul style="list-style-type: none"> <li>1. Identify problems worth solving</li> <li>2. Craft value proposition</li> <li>3. Prepare B-Plan</li> <li>4. Draft Patent</li> <li>5. Register virtual company</li> </ul>
2.	OE	Robotic Vision	<ul style="list-style-type: none"> <li>1. Discuss the fundamentals of Robotics</li> <li>2. Apply direct and inverse kinematics algorithms</li> <li>3. Justify the need of vision algorithms</li> </ul>
3.	OE	Cyber Security and Digital Forensics	<ul style="list-style-type: none"> <li>1. Identify and classify various cybercrimes with respect to organizational weaknesses in order to mitigate the security risk and estimate the impact on society and world</li> <li>2. Analyze the results of vulnerability scans of</li> </ul>

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			<p>vulnerability assessment and generate report with penetration testing</p> <p>3. Apply Information Security Standards compliance during software design and development</p> <p>4. Interpret and apply Indian IT laws in various legal issues</p> <p>5. Describe the concept of Digital forensics and use various tools and techniques used for digital forensics investigations</p> <p>6. Integrate advanced security solutions and manage, provide policies, standards, procedures, guidelines, policy framework, assess and mitigate risk.</p>
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Head of the Department  
Dr. Reena Sonkusare







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**Batch (2016-2020)**

Sr. no	Course code	Course name	Course outcomes
<b>I/II Sem</b>			
1.	ES21	Basic Electrical Engineering	<ol style="list-style-type: none"><li>1. To evaluate D.C. circuits using network theorems.</li><li>2. To evaluate 1-Φ AC circuits.</li><li>3. To illustrate constructional features and operation of 1-Φ transformer.</li><li>4. To evaluate 3-Φ AC circuits.</li><li>5. To illustrate the working principle of DC machines.</li><li>6. To conduct experiments on D.C. circuits and AC circuits.</li></ol>
<b>III sem</b>			
1.	BS31	Applied Mathematics-I	<ol style="list-style-type: none"><li>1. Evaluate Laplace and Inverse Laplace transform of functions using various properties.</li><li>2. Solve differential equations with given initial conditions using Laplace and Laplace Inverse.</li><li>3. Expand functions in terms of sine and cosine series on the given interval.</li><li>4. Find Fourier transforms by applying its various properties</li><li>5. Check for a function being analytic using Cauchy-Riemann equations and construct analytic functions.</li><li>6. Construct Bilinear Transformations and find images under Conformal mappings</li></ol>
2.	ET31	Electronic Devices and Circuits	<ol style="list-style-type: none"><li>1. Apply the concept of basic diodes.</li><li>2. Analyze BJT circuits and carry out the small signal analysis of BJT amplifiers.</li><li>3. Describe the working and carry out the small signal analysis of JFET &amp; MOSFET amplifiers.</li><li>4. Analyze and design single and multistage JFET and MOSFET amplifiers.</li><li>5. Differentiate between discrete and integrated biasing techniques.</li><li>6. Understand the concept of feedback amplifiers.</li></ol>
3.	ET32	Circuit Theory	<ol style="list-style-type: none"><li>1. Analyse the given circuits using theorems and transformation techniques</li><li>2. Analyse the given circuit using Graph Theory</li></ol>

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**Department of Electronics and Telecommunication**

			<ol style="list-style-type: none"><li>3. Analyse the given RL, RC and RLC circuits in time domain</li><li>4. Analyse the given RL, RC and RLC circuits in frequency domain</li><li>5. Predict the circuits using Foster and Cauer realization methods</li><li>6. Explain the concept of two port network, relation between the parameters and their interconnection</li></ol>
4.	ET33	Digital Circuits	<ol style="list-style-type: none"><li>1. Explain various logic gates, SOP, POS forms and their minimization with kmap for given combinational circuits.</li><li>2. Construct combinational circuits using given MSI devices.</li><li>3. Discuss different types of programmable logic devices like PAL, PLA, CPLD and FPGA.</li><li>4. Apply the knowledge of flip-flops and MSI to design counters</li><li>5. Design state machines for given state diagrams after state reduction</li><li>6. Discuss fault models and testing methods for digital circuits</li></ol>
5.	ET34	Signals and Systems	<ol style="list-style-type: none"><li>1. Classify and illustrate various operations on signals and systems.</li><li>2. Analyze the properties of a continuous time signal in the frequency domain and observe the spectrum.</li><li>3. Apply Laplace Transform on continuous time signals.</li><li>4. Evaluate Linear Time Invariant system response using Laplace Transform.</li><li>5. Design analog Butterworth and Chebyshev filter.</li><li>6. Interpret system using state space model.</li></ol>
6.	ETL31	Electronic Devices and Circuits Lab	<ol style="list-style-type: none"><li>1. To analyse wave shaping circuits.</li><li>2. To demonstrate the working of a BJT amplifier.</li><li>3. To verify the working, biasing and small signal analysis of JFET amplifiers.</li><li>4. To analyze and design single and multistage JFET amplifiers.</li><li>5. To analyze current mirror circuits through simulation.</li><li>6. To design and simulate feedback amplifiers.</li></ol>
7.	ETL32	Digital Circuits Lab	<ol style="list-style-type: none"><li>1. Follow the given instructions for performing an experiment on the breadboard</li><li>2. Construct logic circuits using gates to realize a given</li></ol>





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			<p>function.</p> <ul style="list-style-type: none"><li>3. Construct logic circuits using MSI ICs to realize given function</li><li>4. Validate the design of combinational and sequential logic circuits by hardware implementation</li><li>5. Test and troubleshoot given logic circuits using testing instruments</li><li>6. Develop an application using concepts of digital circuits</li></ul>
8.	ELL33	HDL Programming Lab	<ul style="list-style-type: none"><li>1. Write VHDL code to build the given hardware</li><li>2. Verify the behavior of given hardware with VHDL simulation tool</li><li>3. Write synthesizable VHDL code and perform physical verification on FPGA and CPLD device</li><li>4. Write, simulate, synthesize and implement VHDL code with behavioral, dataflow and structural modeling style</li><li>5. Interface the external peripherals with FPGA and design hardware to create an application.</li><li>6. Interpret the RTL, synthesis, Floorplan report and optimally utilize the internal resources of given FPGA</li></ul>
9.	ELL34	Object Oriented Programming Lab	<ul style="list-style-type: none"><li>1. Use object oriented programming concepts for a scenario.</li><li>2. Apply concept of input output and string handling</li><li>3. Demonstrate polymorphism, static and dynamic binding.</li><li>4. Apply Inheritance, Abstract Class and Interface to implement scenario.</li><li>5. Apply the concept of multithreading and exception handling for a scenario.</li></ul>
IV sem			
1.	BS41	Applied Mathematics II	<ul style="list-style-type: none"><li>1. To diagonalise a given matrix and calculate functions of a square matrix</li><li>2. To reduce a given quadratic form to simpler forms</li><li>3. To apply the concept of complex analysis to evaluate integrals</li><li>4. To evaluate line integrals and surface integrals</li><li>5. To calculate expectation, variance and moments of a random variable</li><li>6. To apply the concepts of matrices to real life problems</li></ul>

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2.	ET41	Analog Communication	<ol style="list-style-type: none"><li>1. Demonstrate a clear understanding of different modulation and demodulation techniques using analog communication.</li><li>2. Identify and solve basic communication problems, analyze transmitters and receivers.</li><li>3. Compare and contrast advantages and limitations of different analog communication systems.</li><li>4. Apply sampling theorem to convert analog signals to digital signals while satisfying certain specs</li></ol>
3.	ET42	Electromagnetic Wave Propagation	<ol style="list-style-type: none"><li>1. Ability to comprehend the physical significance of static and dynamic field theory.</li><li>2. Ability to interpret the behaviour of Electromagnetic wave in various media and Interfaces by applying Maxwell's Equation.</li><li>3. Ability to determine the energy flow and Polarization by applying the Maxwell's equation.</li><li>4. Ability to calculate and analyse the parameters for wave propagation in Transmission Line through theoretical calculations and Smith Chart.</li><li>5. Ability to evaluate the degradation in the performance of a device and system or subsystem compatibility based on radiated emission.</li></ol>
4.	ET43	Principles of Control System	<ol style="list-style-type: none"><li>1. Classify different types of Control systems and formulate mathematical modeling of the given system</li><li>2. Illustrate the Transient and steady state behavior of given system for standard test inputs</li><li>3. Analyze the stability of systems in time domain and frequency domain</li><li>4. Justify the concept of Controllability and observability using State variable model</li><li>5. Apply the control theory to design the compensators to enhance stability of system</li><li>6. Evaluate the system performance with the use of Compensators &amp; Controllers</li></ol>
5.	ET44	Integrated Circuits	<ol style="list-style-type: none"><li>1. Describe the fundamentals of Op-Amp.</li><li>2. Analyze and design applications of Op-Amp.</li><li>3. Design different applications using IC 555.</li><li>4. Illustrate the function of Special Purpose ICs such as VCO, PLL, Power amplifier and DAC/ADC conversion technique.</li><li>5. Design DC power supply like LVLC, LVHC, HVLC and HVHC using Regulator ICs.</li></ol>





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6.	ETL41	Fundamentals of Communication Engineering Lab	<ol style="list-style-type: none"> <li>Implement the circuit and observe the working principle of analog modulation techniques</li> <li>Implement the circuit and analyze the working principle of analog demodulators</li> <li>Make use of simulation software to study given communication circuits</li> <li>Implement circuits for analog pulse modulation techniques like PAM, PPM and PWM to observe modulated waveforms</li> <li>Implement the circuit for generation of natural sampling and its effect on reconstruction of the wave.</li> <li>Work in a team to implement the given communication circuit</li> </ol>
7.	ETL43	Principles of Control Systems Lab	<ol style="list-style-type: none"> <li>Examine working principle and application of given control system components.</li> <li>Develop a program using a suitable programming language for time and frequency domain analysis of a given system.</li> <li>Demonstrate the dynamic behavior of the system in time domain and frequency domain.</li> <li>Experiment the effect of the compensator on the performance of the control system.</li> <li>Identify and demonstrate any control system for real life application.</li> </ol>
8.	ETL44	Integrated Circuit Lab	<ol style="list-style-type: none"> <li>To measure different parameters of Op-Amp.</li> <li>Identify, Analyze and design applications of Op-Amp.</li> <li>Implement different applications using special purpose ICs.</li> <li>Design DC power supply for given specification's.</li> <li>Design, simulate and implement different applications using integrated circuits.</li> </ol>
9.	ETL45	Computer Methods for Circuit Simulation Lab	<ol style="list-style-type: none"> <li>Illustrate a network in terms algebraic equations</li> <li>Apply Numerical techniques to solve linear and nonlinear algebraic equations</li> <li>Perform DC and Transient analysis on Electrical networks</li> <li>Analyze the given circuit using Monte Carlo.</li> </ol>
<b>V sem</b>			
1.	ET51	Digital Communication	<ol style="list-style-type: none"> <li>Ability to describe various entities of digital communication system</li> </ol>





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			<ol style="list-style-type: none"><li>2. Solve problems to interpret various concepts</li><li>3. Analyze mathematically various source coding methods/modulation/demodulation /error correction codes</li><li>4. Compare various modulation/demodulation /error correction codes</li><li>5. Determine the behavior of signals in time and frequency domain at various stages of digital communication system</li><li>6. Justify modulation/demodulation/Bit rate/ Bandwidth requirements in various applications</li></ol>
2.	ET52	Microprocessors and Microcontrollers	<ol style="list-style-type: none"><li>1. Describe the architecture, modes and interrupt structure of 16 bit microprocessors</li><li>2. Discuss various mechanisms of computer architectures that include virtual memory address translation, protection with multitasking and task switching.</li><li>3. Comprehend the principles of memory systems with cache memory and its design</li><li>4. Explain the architecture and utilize the Instruction set of 16 bit Microcontrollers</li><li>5. Illustrate and utilize the integrated peripherals of 16 bit microcontrollers</li></ol>
3.	ET53	Fundamentals of Antenna	<ol style="list-style-type: none"><li>1. Ability to calculate the fundamental parameters of Antenna</li><li>2. Ability to describe fundamental theory of antennas</li><li>3. Ability to evaluate and select antenna on the basis of applications</li><li>4. Ability to design Antenna Arrays</li></ol>
4.	ET54	Random Signal Analysis	<ol style="list-style-type: none"><li>1. Apply theory of probability in identifying and solving relevant problems.</li><li>2. Analyze statistical behavior of single and multiple random variables and manipulate them.</li><li>3. Apply transformations of random variables; random sequences &amp; Central limit theorem to solve engineering problems and interpret the significance.</li><li>4. Evaluate random variables, random process, Markov chains and Queuing theory using probabilistic approach.</li></ol>
5.	ETL51	Digital Communication Lab	<ol style="list-style-type: none"><li>1. Ability to implement various concepts of digital communication.</li><li>2. Ability to troubleshoot hardware circuits</li></ol>

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			<ul style="list-style-type: none"> <li>3. Ability to take measurements</li> <li>4. Ability to write and debug software programs</li> </ul>
6.	ETL52	Microprocessors & Microcontrollers Laboratory	<ul style="list-style-type: none"> <li>1. Use hardware and software tools for microprocessors and microcontrollers like 8086, 80386 and PIC</li> <li>2. Analyze the problem statement and write and execute an assembly language program for 8086/80386/PIC</li> <li>3. Debug an assembly language program for 8086/80386/PIC</li> <li>4. Document the procedure and analyze the result of an experiment.</li> </ul>
7.	ETL53	Antenna Lab	<ul style="list-style-type: none"> <li>1. Install and use modern tools available for antenna design.</li> <li>2. Ability to analyze the antenna fundamental parameters.</li> <li>3. Ability to analyze and design a given antenna.</li> <li>4. Debate the results of modern tools and test them.</li> </ul>
8.	ETL54	Statistical and Computational Lab	<ul style="list-style-type: none"> <li>1. To handle the different data types.</li> <li>2. To compute the statistical parameters</li> <li>3. To compute cdf and pdf</li> <li>4. To plot and interpret from data visualization</li> <li>5. To Analyse the data</li> </ul>
9.	ETL55	Photovoltaic Laboratory	<ul style="list-style-type: none"> <li>1. Design DC - AC Conversion.</li> <li>2. Test and analyze PV cell characteristics and connections.</li> <li>3. Investigate PV cells based on environmental conditions.</li> <li>4. Measure different parameters of PV Cells.</li> </ul>
10.	ETP56	Product Design-I	<ul style="list-style-type: none"> <li>1. Understand the basic knowledge of functions of an electronic product development processes</li> <li>2. Finding out Electrical and Physical specifications from datasheets</li> <li>3. To learn schematic design.</li> <li>4. To learn Layout design.</li> <li>5. To learn Technical documentation such as Schematic and layout sheets, PCB and schematic foot prints, bills of material, gerber files etc.</li> </ul>
VI sem			
1.	ET61	Digital Time Signal Processing	<ul style="list-style-type: none"> <li>1. Ability to compute various Transform analysis of LTI systems</li> </ul>

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			<ol style="list-style-type: none"> <li>2. Ability to apply DFT Properties and Illustrate FFT algorithms</li> <li>3. Ability to Design and Realize Digital Filters</li> <li>4. Ability to apply engineering problem solving strategies to DSP problems</li> <li>5. Ability to design and test signal processing algorithms for various applications</li> </ol>
2.	ET62	Computer Communication Networks	<ol style="list-style-type: none"> <li>1. Conceptual understanding and functional aspects of computer communication and telecom networks.</li> <li>2. Design and configure small/medium sized computer networks that meet specific needs for communications.</li> <li>3. Simulate computer networks and analyze the simulation results including troubleshoot connectivity problems occurring at layers of TCP/IP model.</li> </ol>
3.	ET63	Embedded Systems & RTOS	<ol style="list-style-type: none"> <li>1. Understand the embedded concepts and architecture models</li> <li>2. Describe ARM architecture</li> <li>3. Comprehend the open source RTOS and its usage</li> <li>4. Design programming models for embedded systems applications</li> </ol>
4.	ETL61	Discrete Time Signal Processing Lab	<ol style="list-style-type: none"> <li>1. Explores the ability to develop programs for various DSP concepts.</li> <li>2. Explores the ability to debug programs for various DSP concepts</li> <li>3. Ability to design and analyze the frequency response of digital IIR and FIR filters.</li> <li>4. Ability to analyse the result and document the experiment.</li> </ol>
5.	ETL63	Embedded Systems & Operating System Laboratory	<ol style="list-style-type: none"> <li>1. Use hardware and software tools for processors like ARM series.</li> <li>2. Analyze the problem statement and write and execute an assembly language program for ARM series processors and Real Time OS</li> <li>3. Debug an assembly language program for ARM series and Real Time OS</li> <li>4. Document the procedure and analyze the result of an experiment.</li> </ol>
6.	ETL62	Computer Communication	<ol style="list-style-type: none"> <li>1. Assemble the components of a PC and install one or more network operating systems resulting in a</li> </ol>

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		Networks Laboratory	<ul style="list-style-type: none"> <li>functioning</li> <li>2. Design a small or medium sized computer network including media types, end devices, and interconnecting devices that meets a customer's specific needs.</li> <li>3. Perform basic configurations on routers and Ethernet switches.</li> <li>4. Demonstrate knowledge of programming for network communications</li> <li>5. Learn to simulate computer networks and analyze the simulation results</li> <li>6. Troubleshoot connectivity problems in a host occurring at multiple layers of the OSI model</li> <li>7. Develop knowledge and skills necessary to gain employment as computer network engineer and network administrator.</li> </ul>
7.	ETL64	RF systems and Design Laboratory	<ul style="list-style-type: none"> <li>1. Ability to analyse and compute RF system requirement.</li> <li>2. Ability to use modern tools for designing RF system components.</li> <li>3. Ability to test RF system components.</li> </ul>
8.	EIP65	Product Design-II	<ul style="list-style-type: none"> <li>1. Understand the concepts of reliability.</li> <li>2. Learn control panel layout design for various industrial products</li> <li>3. Thermal design consideration for component level, board level, system level Design</li> <li>4. Conduct a study on testing of a electronic product</li> <li>5. Document the product in the form of IPR and Copyright format.</li> </ul>
<b>VII sem</b>			
1.	ET71	Mobile and Wireless Technologies	<ul style="list-style-type: none"> <li>1. Comprehend wireless communication concepts, system capacity and service provided.</li> <li>2. Evaluate various path loss and fading effects</li> <li>3. Analyze losses, multipath effects, architecture and protocols of 3G, 4G and 5G systems</li> <li>4. Compare various aspects of cellular and wireless systems such as pathloss, fading, architecture and protocols</li> </ul>
2.	ET72	Microwave and	<ul style="list-style-type: none"> <li>1. Apply EM Wave theory and Ray theory to</li> </ul>





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		Optical Fiber Communication	<ul style="list-style-type: none"> <li>understand nature of Microwave and Optic Signal and their corresponding guiding structures</li> <li>2. Identify and Analyze System Components including Sources and Detectors</li> <li>3. Compare different Optical Networks</li> <li>4. Design tuning networks and optical Link Budget system</li> </ul>
3.	ETL71	Mobile and Wireless Technologies Lab	<ul style="list-style-type: none"> <li>1. Comprehend hardware components of Mobile Communications Systems using AT Command and Python Scripting.</li> <li>2. Simulate and analyze Modulation Techniques using GNU Radio, Mobile Tx/Rx using USRP</li> <li>3. Understand the Protocol Architecture and Operation of LTE, 5G and WiFi using NS3 and Omnet++</li> </ul>
4.	ETL72	Microwave and Optical Fiber Communication Lab	<ul style="list-style-type: none"> <li>1. Distinguish, Characterise and measure the basic parameters of Microwave Communication using Microwave Measurement Setups and Techniques.</li> <li>2. Use Modern Tools to design and analyze Microwave Components</li> <li>3. Analyze different parameters of optical fiber, optical sources and detectors</li> <li>4. Use Modern Tools to design and analyze Optical Network</li> </ul>
5.	ETEL71C	IP Network Design Lab	<ul style="list-style-type: none"> <li>1. Set up a network and configure switches and routers with troubleshooting</li> <li>2. Design LAN with implementation of subnets</li> <li>3. Design LAN-WAN interface for internetworking.</li> <li>4. Implement VOIP, IPv6 and ETC</li> </ul>
6.	ETEL72A	Cryptography and Network Security Lab	<ul style="list-style-type: none"> <li>1. List and describe types of Cryptography and Cryptanalysis</li> <li>2. Demonstrate the symmetric and asymmetric cryptography, cryptographic hash functions, digital signature, digital certificate and certificate authority (CA), CA structure.</li> <li>3. Build and implement cryptosystems using python</li> <li>4. Install and configure and optimize the firewall, IDS, Authentication system</li> </ul>
VIII sem			
1.	HSS81	Technology Entrepreneurship	<ul style="list-style-type: none"> <li>1. Identify problems worth solving</li> <li>2. Craft value proposition</li> </ul>





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		Lab	<ol style="list-style-type: none"><li>3. Prepare B-Plan</li><li>4. Draft Patent</li><li>5. Register virtual company</li></ol>
2.	OE	Robotic Vision	<ol style="list-style-type: none"><li>1. Discuss the fundamentals of Robotics</li><li>2. Apply direct and inverse kinematics algorithms</li><li>3. Justify the need of vision algorithms</li></ol>
3.	OE	Cyber Security and Digital Forensics	<ol style="list-style-type: none"><li>1. Identify and classify various cybercrimes with respect to organizational weaknesses in order to mitigate the security risk and estimate the impact on society and world</li><li>2. Analyze the results of vulnerability scans of vulnerability assessment and generate report with penetration testing</li><li>3. Apply Information Security Standards compliance during software design and development</li><li>4. Interpret and apply Indian IT laws in various legal issues</li><li>5. Describe the concept of Digital forensics and use various tools and techniques used for digital forensics investigations</li><li>6. Integrate advanced security solutions and manage, provide policies, standards, procedures, guidelines, policy framework, assess and mitigate risk.</li></ol>
4.	ETE81A	Telecom Network Operations & Management	<ol style="list-style-type: none"><li>1. Explain the need for interoperable network management &amp; analyze the trends and development of the Telecommunications Network Management.</li><li>2. Identifying the functions of the Network Manager and analyzing the Infrastructure of Network Management</li><li>3. Implement server/agent architectures to monitor and control networks, devices, resources and applications</li><li>4. Analyze and apply the basics of telecommunication, networking and information technologies and architect and implement networked information systems.</li></ol>
5.	ETE81B	Wireless Network Planning and Design	<ol style="list-style-type: none"><li>1. Understand RF planning basics and DAS.</li><li>2. Design indoor DAS planning solutions and Tunnel Radio Planning.</li><li>3. Analyze performance of the various indoor planning aspects.</li><li>4. Evaluate the various aspects of wireless network planning.</li></ol>

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Department of Electronics and Telecommunication

6.	ETE 82A	Space Communication Technologies	<ol style="list-style-type: none"><li>1. To understand the basics of satellites and orbits.</li><li>2. To understand the satellite segment and earth segment.</li><li>3. To analyze the various methods of satellite access.</li><li>4. To understand the applications of satellites.</li></ol>
7.	ETE82B	Cloud Computing and Analytics	<ol style="list-style-type: none"><li>1. Define and explain cloud computing services and models.</li><li>2. Compare and select cloud service providers/software.</li><li>3. Implement open source cloud and administration.</li><li>4. Describe the risks associated in a cloud computing environment.</li></ol>
8.	ETEL81A	Telecom Network Operations & Management lab	<ol style="list-style-type: none"><li>1. Troubleshoot and monitor network using various commands, tools and utilities</li><li>2. Install and configure host/network/server/services management using open source tools.</li><li>3. Configuration of switch for network management functions</li><li>4. Build and implement Security Information Enterprise Management (SIEM) project using Opens Source Software (OSS)</li></ol>
9.	ETEL81B	Wireless Network Planning and Design Lab	<ol style="list-style-type: none"><li>1. Simulate various wireless network planning parameters</li><li>2. Debug programs.</li><li>3. Analyze results of simulation</li><li>4. Document Cellular and Wifi signal strength behaviour in detail</li></ol>
10.	ETEL82A	Space Communication Laboratory	<ol style="list-style-type: none"><li>1. Establish satellite link for communication for various data types</li><li>2. Analyze Different Orbital Parameters &amp; link budget of satellite signal for proper communication for given data.</li><li>3. Analyze the use of GPS systems for the benefit of society.</li><li>4. Study &amp; document different application of satellite communication</li></ol>
11.	ETEL82B	Cloud Computing and Analytics Lab	<ol style="list-style-type: none"><li>1. Implement and describe fundamentals of cloud computing and Summarize various cloud delivery models.</li><li>2. Create and run virtual machines on open source OS.</li><li>3. Implement Infrastructure, Storage as a Service.</li><li>4. Install and explain security features for cloud.</li></ol>





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Head of the Department  
Dr. Reena Sonkusare



A handwritten signature in blue ink, appearing to read "Reena Sonkusare", is written over a horizontal line with a small arrow pointing to the right at the end.





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Batch (2015-2019)

Sr. no	Course code	Course name	Course outcomes
<b>I / II Sem</b>			
1.	ES21	Basic Electrical Engineering	<ol style="list-style-type: none"><li>1. To evaluate D.C. circuits using network theorems.</li><li>2. To evaluate 1-Φ AC circuits.</li><li>3. To illustrate constructional features and operation of 1-Φ transformer.</li><li>4. To evaluate 3-Φ AC circuits.</li><li>5. To illustrate the working principle of DC machines.</li><li>6. To conduct experiments on D.C. circuits and AC circuits.</li></ol>
<b>III sem</b>			
1.	BS31	Applied Mathematics-I	<ol style="list-style-type: none"><li>1. Evaluate Laplace and Inverse Laplace transform of functions using various properties.</li><li>2. Solve differential equations with given initial conditions using Laplace and Laplace Inverse.</li><li>3. Expand functions in terms of sine and cosine series on the given interval.</li><li>4. Find Fourier transforms by applying its various properties</li><li>5. Check for a function being analytic using Cauchy-Riemann equations and construct analytic functions.</li><li>6. Construct Bilinear Transformations and find images under Conformal mappings</li></ol>
2.	ET31	Analog Electronics I	<ol style="list-style-type: none"><li>1. To understand the physical operation of semiconductor devices.</li><li>2. To understand DC and AC models of semiconductor devices.</li><li>3. To apply concepts of DC and AC modeling of semiconductor devices for the design and analysis.</li><li>4. To verify the theoretical concepts through laboratory and simulation experiments.</li></ol>
3.	ET32	Circuit Theory	<ol style="list-style-type: none"><li>1. Analyse the given circuits using theorems and transformation techniques</li><li>2. Analyse the given circuit using Graph Theory</li><li>3. Analyse the given RL, RC and RLC circuits in time domain</li></ol>

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**Department of Electronics and Telecommunication**

			<ol style="list-style-type: none"><li>4. Analyse the given RL, RC and RLC circuits in frequency domain</li><li>5. Predict the circuits using Foster and Cauer realization methods</li><li>6. Explain the concept of two port network, relation between the parameters and their interconnection</li></ol>
4.	ET33	Digital Circuits	<ol style="list-style-type: none"><li>1. Explain various logic gates, SOP, POS forms and their minimization with kmap for given combinational circuits.</li><li>2. Construct combinational circuits using given MSI devices.</li><li>3. Discuss different types of programmable logic devices like PAL, PLA, CPLD and FPGA.</li><li>4. Apply the knowledge of flip-flops and MSI to design counters</li><li>5. Design state machines for given state diagrams after state reduction</li><li>6. Discuss fault models and testing methods for digital circuits</li></ol>
5.	ET34	Signals and Systems	<ol style="list-style-type: none"><li>1. Classify and illustrate various operations on signals and systems.</li><li>2. Analyze the properties of a continuous time signal in the frequency domain and observe the spectrum.</li><li>3. Apply Laplace Transform on continuous time signals.</li><li>4. Evaluate Linear Time Invariant system response using Laplace Transform.</li><li>5. Design analog Butterworth and Chebyshev filter.</li><li>6. Interpret system using state space model.</li></ol>
6.	ETL31	Analog Electronics Lab	<ol style="list-style-type: none"><li>1. To analyse wave shaping circuits.</li><li>2. To demonstrate the working of a BJT amplifier.</li><li>3. To verify the working, biasing and small signal analysis of JFET amplifiers.</li><li>4. To analyze and design single and multistage JFET amplifiers.</li><li>5. To analyze current mirror circuits through simulation.</li><li>6. To design and simulate feedback amplifiers.</li></ol>
7.	ETL32	Digital Circuits Lab	<ol style="list-style-type: none"><li>1. Follow the given instructions for performing an experiment on the breadboard</li><li>2. Construct logic circuits using gates to realize a given function.</li><li>3. Construct logic circuits using MSI ICs to realize</li></ol>

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			<ul style="list-style-type: none"> <li>given function</li> <li>4. Validate the design of combinational and sequential logic circuits by hardware implementation</li> <li>5. Test and troubleshoot given logic circuits using testing instruments</li> <li>6. Develop an application using concepts of digital circuits</li> </ul>
8.	ELL33	HDL Programming Lab	<ul style="list-style-type: none"> <li>1. Write VHDL code to build the given hardware</li> <li>2. Verify the behavior of given hardware with VHDL simulation tool</li> <li>3. Write synthesizable VHDL code and perform physical verification on FPGA and CPLD device</li> <li>4. Write, simulate, synthesize and implement VHDL code with behavioral, dataflow and structural modeling style</li> <li>5. Interface the external peripherals with FPGA and design hardware to create an application.</li> <li>6. Interpret the RTL, synthesis, Floorplan report and optimally utilize the internal resources of given FPGA</li> </ul>
9.	ELL34	Object Oriented Programming Lab	<ul style="list-style-type: none"> <li>1. Use object oriented programming concepts for a scenario.</li> <li>2. Apply concept of input output and string handling</li> <li>3. Demonstrate polymorphism, static and dynamic binding.</li> <li>4. Apply Inheritance, Abstract Class and Interface to implement scenario.</li> <li>5. Apply the concept of multithreading and exception handling for a scenario.</li> </ul>

**IV sem**

1.	BS41	Applied Mathematics II	<ul style="list-style-type: none"> <li>1. To diagonalise a given matrix and calculate functions of a square matrix</li> <li>2. To reduce a given quadratic form to simpler forms</li> <li>3. To apply the concept of complex analysis to evaluate integrals</li> <li>4. To evaluate line integrals and surface integrals</li> <li>5. To calculate expectation, variance and moments of a random variable</li> <li>6. To apply the concepts of matrices to real life problems</li> </ul>
2.	ET41	Fundamentals of	<ul style="list-style-type: none"> <li>1. Infer principle of working of various sub systems of</li> </ul>





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		Communication Engineering	<ul style="list-style-type: none"><li>analog communication</li><li>2. Analyze the performance parameters of analog and pulse modulations</li><li>3. Apply concepts of Signals and systems to Analog Communication</li><li>4. Analyze the principle of working of receivers.</li><li>5. Characterize noise and interpret effect of noise on modulations</li><li>6. Compare the different analog communication systems.</li></ul>
3.	ET42	Wave theory and Propagation	<ul style="list-style-type: none"><li>1. Ability to find the nature of electric or magnetic fields produced due to different charge distributions.</li><li>2. Ability to understand working of different equipment based on electromagnetic use in day to day life.</li><li>3. Knowledge of behavior of EM waves and traveling of waves in free space as well as media.</li><li>4. Able to find conditions for loss of signal.</li><li>5. Able to apply numerical methods for designing antennas.</li><li>6. An ability to select proper parameters for propagation of the waves by considering the factors affecting.</li><li>7. Any ability to identify and solve problems related to the propagation of waves.</li><li>8. To understand the basics of wave propagation required for the study of antennas.</li></ul>
4.	ET43	Principles of Control System	<ul style="list-style-type: none"><li>1. Classify different types of Control systems and formulate mathematical modeling of the given system</li><li>2. Illustrate the Transient and steady state behavior of given system for standard test inputs</li><li>3. Analyze the stability of systems in time domain and frequency domain</li><li>4. Justify the concept of Controllability and observability using State variable model</li><li>5. Apply the control theory to design the compensators to enhance stability of system</li><li>6. Evaluate the system performance with the use of Compensators &amp; Controllers</li></ul>
5.	ET44	Analog Electronics II	<ul style="list-style-type: none"><li>1. Analyze and design multistage electronic Circuits.</li><li>2. Differentiate between discrete and integrated biasing techniques.</li><li>3. Differentiate between small signal and large signal Amplifiers.</li></ul>





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6.	ETL41	Fundamentals of Communication Engineering Lab	<ol style="list-style-type: none"> <li>Implement the circuit and observe the working principle of analog modulation techniques</li> <li>Implement the circuit and analyze the working principle of analog demodulators</li> <li>Make use of simulation software to study given communication circuits</li> <li>Implement circuits for analog pulse modulation techniques like PAM, PPM and PWM to observe modulated waveforms</li> <li>Implement the circuit for generation of natural sampling and its effect on reconstruction of the wave.</li> <li>Work in a team to implement the given communication circuit</li> </ol>
7.	ETL43	Principles of Control Systems Lab	<ol style="list-style-type: none"> <li>Examine working principle and application of given control system components.</li> <li>Develop a program using a suitable programming language for time and frequency domain analysis of a given system.</li> <li>Demonstrate the dynamic behavior of the system in time domain and frequency domain.</li> <li>Experiment the effect of the compensator on the performance of the control system.</li> <li>Identify and demonstrate any control system for real life application.</li> </ol>
8.	ETL45	Computer Methods for Circuit Simulation Lab	<ol style="list-style-type: none"> <li>Illustrate a network in terms algebraic equations</li> <li>Apply Numerical techniques to solve linear and nonlinear algebraic equations</li> <li>Perform DC and Transient analysis on Electrical networks</li> <li>Analyze the given circuit using Monte Carlo.</li> </ol>
<b>V sem</b>			
1.	ETC501	Microcontroller & Applications	<ol style="list-style-type: none"> <li>Ability to describe the architecture and the software aspects of microcontroller 8051 and ARM7.</li> <li>Interface various peripheral devices to the microcontroller 8051.</li> <li>Write assembly language programs for microcontroller 8051 and ARM7.</li> <li>Design microcontroller 8051 based system for various applications.</li> </ol>
2.	ETC502	Analog Communication	<ol style="list-style-type: none"> <li>Demonstrate a clear understanding of different modulation and demodulation techniques using</li> </ol>

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Department of Electronics and Telecommunication

			<ul style="list-style-type: none"><li>analog communication.</li><li>2. Identify and solve basic communication problems, analyze transmitters and receivers.</li><li>3. Compare and contrast advantages and limitations of different analog communication systems.</li><li>4. Apply sampling theorem to convert analog signals to digital signals while satisfying certain specs.</li></ul>
3.	ETC503	Random Signal Analysis	<ul style="list-style-type: none"><li>1. Prove mathematically and interpret statistical properties that will be used in later semesters in the design and analysis of communication systems.</li><li>2. Analyze statistical behavior of single and multiple random variables and be able to manipulate them.</li><li>3. Students can solve engineering problems using axiomatic probability theory, random variables, and random processes</li></ul>
4.	ETC504	RF Modeling and Antennas	<ul style="list-style-type: none"><li>1. Analyze and Design RF Filters.</li><li>2. Analyze the radiation mechanism and fundamental parameters of Antennas.</li><li>3. Able to Demonstrate knowledge of antennas in communication systems.</li><li>4. Able to discriminate between antennas on the basis of their electrical performance.</li><li>5. Able to design different microstrip Antennas and Antenna Arrays.</li></ul>
5.	ETC505	Integrated Circuits	<ul style="list-style-type: none"><li>1. Able to understand the areas of applications of the Operational Amplifier.</li><li>2. Able to analyze special purpose integrated circuits (IC 555, Regulators etc).</li><li>3. Able to select IC and design practical circuits that perform the desired operations (Using Counters and Shift Registers).</li></ul>
7.	ETL501	Microcontroller and Application Laboratory	<ul style="list-style-type: none"><li>1. Use hardware and software tools for microcontroller 8051 and ARM.</li><li>2. Analyze the problem statement and write and execute an assembly language program for 8051/ARM7.</li><li>3. Debug an assembly language program for 8051/ARM7.</li><li>4. Document the procedure and analyze the result of an experiment.</li></ul>
8.	ETL502	Communication Engineering	<ul style="list-style-type: none"><li>1. Demonstrate a clear understanding of different modulation and demodulation techniques used in</li></ul>

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**Department of Electronics and Telecommunication**

		Laboratory-I	<ul style="list-style-type: none"><li>1. analog communication.</li><li>2. Able to use basic circuit building blocks to create more advanced circuits.</li><li>3. Able to determine fundamental communication system parameters.</li></ul>
9.	ETL503	Communication Engineering Laboratory-II	<ul style="list-style-type: none"><li>1. Ability to program and analyze the experiments in different softwares. (Softwares used: MATLAB, Pspice, IE3D )</li><li>2. Ability to perform experiments based on applications of Integrated Circuits.</li><li>3. Ability to program and analyze the various concepts.</li><li>4. Ability to perform experiments based on applications of Integrated Circuits.</li><li>5. To be able to improve their debugging skill.</li><li>6. To be able to document the experiment.</li></ul>

**VI sem**

1.	ETC601	Digital Communication	<ul style="list-style-type: none"><li>1. Ability to model various entities of digital communication system mathematically.</li><li>2. Identify and analyse methods of various digital communication sub-blocks and compare their performance.</li><li>3. Ability to Perform the time and frequency domain analysis of the signals in a digital communication system.</li><li>4. Explain receiver techniques for detection of a signal in AWGN channels.</li><li>5. Provide sound evaluation of digital communication applications in terms of their performance.</li></ul>
2.	ETC602	Digital Time Signal Processing	<ul style="list-style-type: none"><li>1. Able to compute various Transform Analysis of Linear Time Invariant System.</li><li>2. Ability to apply engineering problem solving strategies to DSP problems.</li><li>3. Ability to Design and simulate digital filters.</li><li>4. Ability to Design and test signal processing algorithms for various applications.</li><li>5. Ability to Recover information from signals.</li></ul>
3.	ETC603	Computer Communication Networks	<ul style="list-style-type: none"><li>1. Conceptual understanding and functional aspects of computer communication and telecom networks.</li><li>2. Design and configure small/medium sized computer networks that meet specific needs for communications.</li></ul>

  
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**Department of Electronics and Telecommunication**

			<ol style="list-style-type: none"><li>3. Simulate computer networks and analyze the simulation results including troubleshoot connectivity problems occurring at layers of TCP/IP model.</li></ol>
4.	ETC604	Television Engineering	<ol style="list-style-type: none"><li>1. To understand the working principles of basic TV.</li><li>2. To Describe and differentiate latest digital TV, HDTV, WDTV.</li><li>3. To differentiate working principles of latest display like LCD, LED, Plasma</li></ol>
5.	ETC605	Operating System	<ol style="list-style-type: none"><li>1. Comprehend and describe the role of an operating system, its functions and issues.</li><li>2. Compare between different algorithms used for management and scheduling of processes, Memory and input-output operation.</li><li>3. Appreciate, compare and contrast the various features of typical operating systems through case study approach.</li></ol>
6.	ETC606	VLSI Design	<ol style="list-style-type: none"><li>1. To evaluate MOSFET fabrication techniques and scaling.</li><li>2. To evaluate DC and transient analysis of CMOS logic.</li><li>3. To illustrate MOS circuit design styles.</li><li>4. To evaluate Semiconductor memories.</li><li>5. To illustrate Data path design.</li><li>6. To illustrate VLSI clocking and system design</li></ol>
7.	ETL601	Discrete Time Signal Processing Lab	<ol style="list-style-type: none"><li>1. Explores the ability to develop programs for various DSP concepts.</li><li>2. Explores the ability to debug programs for various DSP concepts</li><li>3. Ability to design and analyze the frequency response of digital IIR and FIR filters.</li><li>4. Ability to analyse the result and document the experiment.</li></ol>
8.	ETL602	Communication Engineering Laboratory III	<ol style="list-style-type: none"><li>1. Ability to implement various concepts of networking and digital communication.</li><li>2. Ability to design/configure/reconfigure sub blocks and components of networking and digital communication.</li><li>3. Ability to write and debug software programs</li></ol>
9.	ETL603	Communication	<ol style="list-style-type: none"><li>1. Ability to Realize and design MOSFET based logic</li></ol>

  
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Department of Electronics and Telecommunication

		Engineering Laboratory IV	<ul style="list-style-type: none"> <li>circuits with different design styles using circuit simulators and layout editor.</li> <li>Ability to understand the working principles of analog TV, latest display and troubleshooting.</li> <li>To be able to document the experiment.</li> </ul>
<b>VII sem</b>			
1.	ETC701	Image and Video Processing	<ul style="list-style-type: none"> <li>1. To cover the fundamentals and mathematical models in digital image and video processing.</li> <li>2. To develop time and frequency domain techniques for image enhancement.</li> <li>3. To expose the students to current technologies and issues in image and video processing.</li> <li>4. To develop image and video processing applications in practice.</li> </ul>
2.	ETC702	Mobile Communication	<ul style="list-style-type: none"> <li>1. Understand GSM, CDMA concepts and architecture frame structure, system capacity, service provided.</li> <li>2. Study of evolution of mobile communication generations 2G, 2.5 G, 3G with their characteristics and limitations.</li> <li>3. Understand Emerging Technology required for fourth generation mobile systems such as SDR, MIMO etc.</li> <li>4. Understand different indoor and outdoor propagation models related to losses and different type of fading.</li> </ul>
3.	ETC703	Optical Communication and Networks	<ul style="list-style-type: none"> <li>1. Apply fundamental principles of optics and light waves to design optical fiber communication systems.</li> <li>2. Identify structures, functions, materials and working principles of optical fibers, light sources, couplers, detectors and multiplexers.</li> <li>3. Design optical fiber communication links using appropriate optical fiber, lights sources, couplers, detectors and multiplexers.</li> <li>4. Explore the concept of designing and operating principles of modern optical communications systems and networks.</li> <li>5. Apply the knowledge developed in class to contemporary optical fiber communication research and industrial areas.</li> </ul>
4.	ETC704	Microwave and	<ul style="list-style-type: none"> <li>1. To Analyze the microwave passive circuit</li> </ul>





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Department of Electronics and Telecommunication

		Radar Engineering	<p>components and design the tuning and matching networks.</p> <ul style="list-style-type: none"><li>2. Identify the state of art in microwave tubes and semiconductors and their uses in real life.</li><li>3. Apply the microwave devices and RADAR for industrial and scientific purposes.</li></ul>
5.	ETL701	Image and Video Processing Lab	<ul style="list-style-type: none"><li>1. Understand how to mathematical model image and video processing.</li><li>2. Learn different techniques for image enhancement.</li><li>3. Implement various techniques for image and video processing.</li></ul>
6.	ETL702	Advanced Communication Engineering Lab I	<ul style="list-style-type: none"><li>1. Understand hardware components of Mobile Communications Systems using Open Source SMS Gateway.</li><li>2. Use of Modulation Techniques using GNU Radio, Mobile Tx/Rx using USRP</li></ul>
7.	ETL703	Advanced Communication Engineering Lab II	<ul style="list-style-type: none"><li>1. Apply fundamental principles of optics and light waves to design optical fiber communication systems.</li><li>2. Understand the working principles of optical fibers, light sources, couplers, detectors and multiplexers.</li><li>3. Design optical fiber communication links using appropriate optical fiber, lights sources, couplers, detectors and mux.</li><li>4. To Analyze the microwave passive circuit components and design the tuning and matching networks.</li><li>5. Identify the state of art in microwave tubes and semiconductors and their uses in real life.</li><li>6. Apply the microwave devices and RADAR for industrial and scientific purposes</li></ul>
VIII sem			
1.	ETC801	Wireless Networks	<ul style="list-style-type: none"><li>1. Design the phases of planning and design of mobile wireless networks.</li><li>2. List and compare personal area network (PAN) technologies such as Zig bee, Bluetooth.</li><li>3. Understand details of sensor network architecture ,traffic related protocols, transmission technology etc.</li><li>4. Understand middleware protocol and network management issues of sensor networks.</li></ul>

*Sachin*

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2.	ETC802	Satellite Communication and Networks	<ol style="list-style-type: none"><li>1. Explain the basics of satellite communication</li><li>2. Explain and analyzes link budget of satellite signal for proper communication</li><li>3. Use the system for the benefit of society</li><li>4. Use the different application of satellite communication</li></ol>
3.	ETC803	Internet and Voice Communication	<ol style="list-style-type: none"><li>1. To implement LAN using both static and dynamic addressing techniques including subnetting and explain the components of a router including DHCP, NAT/PAT, routing function, switching function.</li><li>2. Install, Configure troubleshoot and upgrade client and server operating systems and working of DNS as global internet including caching and primary servers.</li><li>3. Explain how TCP byte stream sliding window is related to a traditional packet based sliding window algorithm, the concept of encapsulation and its relationship to layering in the network model.</li><li>4. Implement VoIP and explain about the real time interactive audio video systems.</li></ol>
4.	ETE802	Telecom Network Management	<ol style="list-style-type: none"><li>1. Explain the need for interoperable network management &amp; analyze the trends and development of the Telecommunications Network Management.</li><li>2. Demonstrate broad knowledge of fundamental principles and technical standards underlying</li><li>3. Describe the concepts and architecture behind standards based network management associated with SNMP and CMIP.</li><li>4. Apply basic of telecommunication, networking and information technologies and architect and implement networked informative systems.</li><li>5. Continuously improve their technology knowledge and communication skills.</li></ol>
5.	ETL801	Wireless Networks Laboratory	<ol style="list-style-type: none"><li>1. Students will be able to install NS-3 and OMNET++.</li><li>2. Students can generate and simulate wireless network scenario in NS3 &amp; OMNET++.</li><li>3. Students can verify results by plot in GNU plot and capture packets in Wire-shark.</li></ol>
6.	ETL802	Satellite communication and Networks Laboratory	<ol style="list-style-type: none"><li>1. By Using basic concepts of satellite communication students will be able to write programs for orbital parameters calculations.</li><li>2. Students will be able to analyze the link budget of</li></ol>

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			<ul style="list-style-type: none"><li>3. satellite signals for proper communication for a given problem.</li><li>3. Students will be able to study satellites for the benefit of society by using case study.</li></ul>
7.	ETL803	Internet and Voice Communication Laboratory	<ul style="list-style-type: none"><li>1. Implement, configure and analyze different TCP/IP protocols using the simulation software tools like Packet Tracer and Wireshark.</li><li>2. Install software packages required to configure some protocols and multimedia handling using open source tools.</li><li>3. Install software packages required for multimedia handling using open source tools.</li><li>4. To be able to document the experiments.</li></ul>
8.	ETEL802	Telecom Network Management	<ul style="list-style-type: none"><li>1. Apply the basics of telecommunication, networking and information technologies and architect and implement networked information systems.</li><li>2. Use network management tools and maintain the network by performing routine maintenance tasks.</li><li>3. Install, configure, diagnose, repair, implement, and evaluate a computer-based system, process, component, or program to meet desired needs and to use current techniques, skills, and tools necessary for network management practice.</li></ul>

Head of the Department  
Dr. Reena Sonkusare

