8.4 Attainment of Course outcomes of First year courses

8.4.1 Describe the Assessment Processes used to gather the data upon which the evaluation of Course Outcomes (CO) of First year is done.

THEORY AND PRACTICAL COURSES

There will be four Internal Assessments (CLA I - III), each carrying weightage of 10, 15 & 15 marks, and one online test/Seminar/assignment/Quiz (CLA IV) carrying weightage of 10 marks. The distribution of marks for various components for the Internal Assessment is shown below in the table:

Theory and Practical Courses Assessment Pattern-Regulation 2020R

S. No.	Components for Internal Assessment	Syllabus Coverage for the test/exam	Duration of the test in minutes	Marks (Max.)
01	CLA I	Learning 1.5 Units (I & II) + Lab (3 Experiments)	90	10
02	CLA II	Learning next 1.5 Units (II & III) + Lab (Next 3 Experiments)	90	15
03	CLA III	Learning Units IV & V + Lab (Next 4 Experiments)	90	15
04	Online Test/ Assignment/ Seminar/Quiz/Observation/Record/Viva	All 5 units + Observation/Record/Viva	-	10
Total				**50**

8.4.2 Record the attainment of Course Outcomes (CO) of all First Year Courses

The Assessment Process are Carried out based on the Procedure described in Criteria 3.

The table below shows the attainment of Course Outcomes through Direct and Indirect Assessment for 2022-2023 Batch.

B.Tech – Biomedical Engineering

Course Code	Course Name	COs	Direct Value	Indirect Value	Total
U20LEHJ01	**Technical English**	**CO1**	87	86	87
		CO2	88	85	87
		CO3	86	89	88
		CO4	88	90	89
		CO5	87	92	90
		CO6	83	91	87
U20MABT02	**Advanced Calculus and Complex Analysis**	**CO1**	88	90	88
		CO2	85	93	87
		CO3	85	90	86
		CO4	88	90	88
		CO5	88	90	88
		CO6			
U20PYBJ01	**Electromagnetic Theory, Wave Optics and Quantum Physics**	**CO1**	89	91	90
		CO2	86	94	90
		CO3	86	91	89
		CO4	89	90	90
		CO5	89	92	91
		CO6			
U20CYBJ01	**Engineering chemistry**	**CO1**	95	91	93
		CO2	91	94	93
		CO3	95	91	93

		CO4	95	89	92
		CO5	92	91	92
		CO6	92	82	87
U20CYHT01	**Social and Environmental Engineering**	**CO1**	92	89	91
		CO2	93	92	93
		CO3	93	89	91
		CO4	92	89	91
		CO5	91	88	90
		CO6	92	82	87

8.4.2 Record the attainment of Course Outcomes (CO) of all First Year Courses

The Assessment Process are Carried out based on the Procedure described in Criteria 3.

The table below shows the attainment of Course Outcomes through Direct and Indirect Assessment for 2021-2022 Batch.

Course Code	Course Name	COs	Direct Value	Indirect Value	Total
U20LEHJ01	**Technical English**	**CO1**	77	85	81
		CO2	78	84	81
		CO3	77	85	81
		CO4	78	86	82
		CO5	75	85	80
		CO6	76	75	76
U20MABT02	**Advanced Calculus and Complex Analysis**	**CO1**	86	88	87
		CO2	81	90	86
		CO3	82	88	85
		CO4	85	87	86
		CO5	83	89	86
		CO6			
U20PYBJ01	**Electromagnetic Theory, Wave Optics and Quantum Physics**	**CO1**	88	90	88
		CO2	85	93	87
		CO3	85	90	86
		CO4	88	90	88
		CO5	88	90	88
		CO6			
U20CYBJ01	**Engineering chemistry**	**CO1**	94	90	93
		CO2	90	93	90
		CO3	94	90	93

		CO4	94	88	93
		CO5	91	90	91
		CO6	91	81	89
U20CYHT01	**Social and Environmental Engineering**	**CO1**	94	91	93
		CO2	93	94	94
		CO3	92	91	92
		CO4	93	89	91
		CO5	93	91	92
		CO6	92	84	88

8.4.2 Record the attainment of Course Outcomes (CO) of all First Year Courses

The Assessment Process are Carried out based on the Procedure described in Criteria 3.

The table below shows the attainment of Course Outcomes through Direct and Indirect Assessment for 2020-2021 Batch.

Course Code	Course Name	COs	Direct Value	Indirect Value	Total
U20LEHJ01	**Technical English**	**CO1**	78	88	80
		CO2	75	89	78
		CO3	85	85	85
		CO4	80	86	81
		CO5	85	84	85
		CO6	86	86	86
U20MABT02	**Advanced Calculus and Complex Analysis**	**CO1**	75	86	81
		CO2	72	85	79
		CO3	81	82	82
		CO4	78	81	80
		CO5	81	82	82
		CO6			
U20PYBJ01	**Electromagnetic Theory, Wave Optics and Quantum Physics**	**CO1**	78	88	80
		CO2	75	89	78
		CO3	85	85	85
		CO4	80	86	81
		CO5	85	84	85
		CO6			
U20CYBJ01	**Engineering chemistry**	**CO1**	88	90	88
		CO2	88	93	89

		CO3	94	90	93
		CO4	94	88	93
		CO5	95	90	94
		CO6	91	81	89
U20CYHT01	**Social and Environmental Engineering**	**CO1**	93	90	92
		CO2	94	93	94
		CO3	94	90	93
		CO4	92	88	91
		CO5	92	90	91
		CO6	93	81	91

8.5 Attainment of Program Outcomes of all first year courses

The Following table shows the PO attainment

PO Attainment for the batch (2022-2023)

PO Attainment for the batch (2022-2023)

COURSE CODE	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
U20LEHJ01	Technical English	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	88.00	88.00	0.00	88.00
U20MABT02	Advanced Calculus & Complex Analysis	86.08	86.08	88.00	0.00	87.00	0.00	0.00	0.00	0.00	0.00	0.00	86.08
U20PYBJ01	Electromagnetic Theory, Wave Optics and Quantum Physics	84.60	84.67	85	85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
U20CYBJ01	Engineering Chemistry	92.67	92.30	90.7	92.5	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
U20CYHT01	Social and Environmental Engineering	91.7	91.30	92.00	90.7	93.00	0.00	0.00	0.00	0.00	88.50	0.00	92.00

8.5.2 Action taken based on the results of evaluation of relevant POs

(The attainment levels by direct (student performance) are to be presented through Program level Course-PO matrix as indicated)

PO Attainment Levels and Actions for improvement – CAY only – Mention for relevant POs

<table>
<tr><th>POs</th><th>Target Level</th><th>Attainment Level</th><th>Observations</th></tr>
<tr><td colspan="4">PO1: The ability to apply knowledge of mathematics, science, and engineering fundamentals.</td></tr>
<tr><td>PO1</td><td>88</td><td>88</td><td>• Target achieved
.</td></tr>
<tr><td colspan="4">Action Taken:
• Conducted Induction program to familiarize them to the new environment and to rectify some critical lacunas.
• Conducted extra classes for physics and mathematics, so that they are able to keep up with what is being taught in the classrooms</td></tr>
<tr><td colspan="4">PO2: The ability to identify, formulate, and solve engineering problems</td></tr>
<tr><td>PO2</td><td>88</td><td>88</td><td>• Target achieved</td></tr>
<tr><td colspan="4">Action Taken:
• The students were found lagging in problem solving part. To overcome this, bridge courses were conducted.
• Additional coaching classes were conducted beyond the regular planned classes.
• Conducted workshop handled by industry experts.
Conducted research / innovation awareness program among students and faculty members.</td></tr>
<tr><td colspan="4">PO 3: The ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</td></tr>
<tr><td>PO 3</td><td>89</td><td>89</td><td>• Target achieved</td></tr>
<tr><td colspan="4">Action Taken:
• Lab session for Python Programming was paid more attention.
• Assignments were given to improve their programming skill sets.</td></tr>
</table>

<table>
<tr><td colspan="4">• Health and safety projects are encouraged.</td></tr>
<tr><td colspan="4">PO4: The ability to design and conduct experiments, as well as to analyze and interpret data</td></tr>
<tr><td>PO 4</td><td>89</td><td>89</td><td>• Target achieved</td></tr>
<tr><td colspan="4">Action Taken:
• Conducted project display to improve the problem solving skills.
• Organized Group Discussion, Debate, Industrial Visit to organizations to have a real time experience
• Conducted Student enrichment programs</td></tr>
<tr><td colspan="4">PO 5: The ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td></tr>
<tr><td>PO 5</td><td>90</td><td>90</td><td>• Target achieved</td></tr>
<tr><td colspan="4">Action Taken:
• Arranged guest lecturer and seminar for awareness of modern engineering tools.</td></tr>
<tr><td colspan="4">PO 6: The ability to apply reasoning informed by the knowledge of contemporary issues</td></tr>
<tr><td>PO 6</td><td>0</td><td>0</td><td></td></tr>
<tr><td colspan="4">Action Taken:
• Encouraged students to do Socially related projects.</td></tr>
<tr><td colspan="4">PO 7:The ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context</td></tr>
<tr><td>PO 7</td><td>0</td><td>0</td><td></td></tr>
<tr><td colspan="4">Action Taken:
1. Encouraged students to take up socio-economic based activities.
2. NSS and YRC volunteers are appreciated and motivated to give seminar relevant to environmental studies, health, safety, legal and cultural issues and the consequent responsibilities relates to the professional engineering practice.</td></tr>
<tr><td colspan="4">PO 8: The ability to understand professional and ethical responsibility and apply them in engineering practices</td></tr>
<tr><td>PO 8</td><td>0</td><td>0</td><td></td></tr>
<tr><td colspan="4">Action Taken:
• Projects with social cause were awarded with certificate and momentum during the project exhibition.
• NSS and YRC activities were carried out to imbibe the ethical responsibility each has</td></tr>
</table>

<table>
<tr><td colspan="4">towards the society.
• Conducted guest lectures to improve the professional responsibility.</td></tr>
<tr><td colspan="4">PO 9:The ability to function on multidisciplinary teams</td></tr>
<tr><td>PO 9</td><td>88</td><td>88</td><td>• Target achieved</td></tr>
<tr><td colspan="4">Action Taken:
• Conducted an awareness program about the various domains available for projects.
• Encouraged students to take implant training and group project on multidisciplinary domains.
• Conducted guest lecture series for Resource Management Techniques by mathematics department.</td></tr>
<tr><td colspan="4">PO 10: The ability to communicate effectively with the engineering community and with society at large.</td></tr>
<tr><td>PO 10</td><td>88</td><td>88</td><td>• Target achieved</td></tr>
<tr><td colspan="4">Action Taken:
• Soft skill training conducted by the placement cell.
• Attention paid to communication skill in the communication lab
• Special coaching classes for foreign languages were conducted to improve the placement opportunities.</td></tr>
<tr><td colspan="4">PO 11: The ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.</td></tr>
<tr><td>PO 11</td><td>0</td><td>0</td><td></td></tr>
<tr><td colspan="4">Action Taken:
• Incentives for product based projects given during the project exhibit.
• Conducted one-day workshop on “Entrepreneurship development opportunities” to create awareness for entrepreneurial choices.</td></tr>
<tr><td colspan="4">PO 12:The ability to recognize the need for, and an ability to engage in life-long learning</td></tr>
<tr><td>PO 12</td><td>88</td><td>88</td><td>• Target achieved</td></tr>
<tr><td colspan="4">Action Taken:
• Encourage students to learn more by recognizing the top rank students with prize and a certificate.
• Seminar to be conducted on awareness on competitive exams for higher studies.
• Create case studies for understanding the impact of the subjects in real time.</td></tr>
</table>

8.5 Attainment of Program Outcomes of all first year courses

The Following table shows the PO attainment

PO Attainment for the batch (2021-2022)

PO Attainment for the batch (2021-2022)

COURSE CODE	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
U20LEHJ01	Technical English	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	80.20	80.20	0.00	80.20
U20MABT02	Advanced Calculus & Complex Analysis	86.00	86.00	86.00	0.00	85.67	0.00	0.00	0.00	0.00	0.00	0.00	86.00
U20PYBJ01	Electromagnetic Theory, Wave Optics and Quantum Physics	87.40	87.67	88.00	86.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
U20CYBJ01	Engineering Chemistry	92.00	92.33	91.00	91.50	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
U20CYHT01	Social and Environmental Engineering	92.67	92.67	92.50	92.00	94.00	0.00	0.00	0.00	0.00	90.00	0.00	92.50

8.5.2 Action taken based on the results of evaluation of relevant POs

(The attainment levels by direct (student performance) are to be presented through Program level Course-PO matrix as indicated)

PO Attainment Levels and Actions for improvement – CAY only – Mention for relevant POs

<table>
<tr><th>POs</th><th>Target Level</th><th>Attainment Level</th><th>Observations</th></tr>
<tr><td colspan="4">PO1: The ability to apply knowledge of mathematics, science, and engineering fundamentals.</td></tr>
<tr><td>PO1</td><td>89</td><td>89</td><td>• Target achieved</td></tr>
<tr><td colspan="4">Action Taken:
• Conducted Induction program to familiarize them to the new environment and to rectify some critical lacunas.
• Conducted extra classes for physics and mathematics, so that they are able to keep up with what is being taught in the classrooms</td></tr>
<tr><td colspan="4">PO2: The ability to identify, formulate, and solve engineering problems</td></tr>
<tr><td>PO2</td><td>89</td><td>89</td><td>• Target achieved</td></tr>
<tr><td colspan="4">Action Taken:
• The students were found lagging in problem solving part. To overcome this, bridge courses were conducted.
• Additional coaching classes were conducted beyond the regular planned classes.
• Conducted workshop handled by industry experts.
Conducted research / innovation awareness program among students and faculty members.</td></tr>
<tr><td colspan="4">PO 3: The ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</td></tr>
<tr><td>PO 3</td><td>89</td><td>89</td><td>• Target achieved</td></tr>
<tr><td colspan="4">Action Taken:
• Lab session for Python Programming was paid more attention.
• Assignments were given to improve their programming skill sets.
• Health and safety projects are encouraged.</td></tr>
<tr><td colspan="4">PO4: The ability to design and conduct experiments, as well as to analyze and interpret data</td></tr>
<tr><td>PO 4</td><td>90</td><td>90</td><td>• Target achieved</td></tr>
</table>

Action Taken:

- Conducted project display to improve the problem solving skills.
- Organized Group Discussion, Debate, Industrial Visit to organizations to have a real time experience
- Conducted Student enrichment programs

PO 5: The ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

PO 5	89	89	• Target achieved

Action Taken:

- Arranged guest lecturer and seminar for awareness of modern engineering tools.

PO 6: The ability to apply reasoning informed by the knowledge of contemporary issues

PO 6	0	0	

Action Taken:

- Encouraged students to do Socially related projects.

PO 7:The ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

PO 7	0	0	

Action Taken:

1. Encouraged students to take up socio-economic based activities.
2. NSS and YRC volunteers are appreciated and motivated to give seminar relevant to environmental studies, health, safety, legal and cultural issues and the consequent responsibilities relates to the professional engineering practice.

PO 8: The ability to understand professional and ethical responsibility and apply them in engineering practices

PO 8	0	0	

Action Taken:

- Projects with social cause were awarded with certificate and momentum during the project exhibition.
- NSS and YRC activities were carried out to imbibe the ethical responsibility each has towards the society.
- Conducted guest lectures to improve the professional responsibility.

PO 9:The ability to function on multidisciplinary teams

PO 9	80	80	• Target achieved

Action Taken:

- Conducted an awareness program about the various domains available for projects.
- Encouraged students to take implant training and group project on multidisciplinary domains.
- Conducted guest lecture series for Resource Management Techniques by mathematics department.

PO 10: The ability to communicate effectively with the engineering community and with society at large.

PO 10	85	85	• Target achieved.

Action Taken:

- Soft skill training conducted by the placement cell.
- Attention paid to communication skill in the communication lab
- Special coaching class for foreign languages were conducted to improve the placement opportunities.

PO 11: The ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.

PO 11	0	0	

Action Taken:

- Incentives for product based projects given during the project exhibit.
- Conducted one-day workshop on "Entrepreneurship development opportunities" to create awareness for entrepreneurial choices.

PO 12:The ability to recognize the need for, and an ability to engage in life-long learning

PO 12	86	86	• Target achieved

Action Taken:

- Encourage students to learn more by recognizing the top rank students with prize and a certificate.
- Seminar to be conducted on awareness on competitive exams for higher studies.
- Create case studies for understanding the impact of the subjects in real time.

8.5 Attainment of Program Outcomes of all first year courses

The Following table shows the PO attainment

PO Attainment for the batch (2020-2021)

COURSE CODE	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
U20LEHJ01	**Technical English**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	82.50	82.50	0.00	82.50
U20MABT02	**Advanced Calculus & Complex Analysis**	80.80	80.80	81.00	0.00	80.30	0.00	0.00	0.00	0.00	0.00	0.00	80.80
U20PYBJ01	**Electromagnetic Theory, Wave Optics and Quantum Physics**	81.80	79.67	85.00	85.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
U20CYBJ01	**Engineering Chemistry**	90.00	93.33	90.33	91.00	89.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
U20CYHT01	**Social and Environmental Engineering**	92.33	92.67	92.50	91.33	94.00	0.00	0.00	0.00	0.00	91.00	0.00	92.50

8.5.2 Action taken based on the results of evaluation of relevant POs

(The attainment levels by direct (student performance) are to be presented through Program level Course-PO matrix as indicated)

PO Attainment Levels and Actions for improvement – CAY only – Mention for relevant POs

<table>
<tr><th>POs</th><th>Target Level</th><th>Attainment Level</th><th>Observations</th></tr>
<tr><td colspan="4">PO1: The ability to apply knowledge of mathematics, science, and engineering fundamentals.</td></tr>
<tr><td>PO1</td><td>85</td><td>85</td><td>• Target achieved</td></tr>
<tr><td colspan="4">Action Taken:
• Conducted Induction program to familiarize them to the new environment and to rectify some critical lacunas.
• Conducted extra classes for physics and mathematics, so that they are able to keep up with what is being taught in the classrooms</td></tr>
<tr><td colspan="4">PO2: The ability to identify, formulate, and solve engineering problems</td></tr>
<tr><td>PO2</td><td>85</td><td>85</td><td>• Target achieved</td></tr>
<tr><td colspan="4">Action Taken:
• The students were found lagging in problem solving part. To overcome this, bridge courses were conducted.
• Additional coaching classes were conducted beyond the regular planned classes.
• Conducted workshop handled by industry experts.
Conducted research / innovation awareness program among students and faculty members.</td></tr>
<tr><td colspan="4">PO 3: The ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</td></tr>
<tr><td>PO 3</td><td>86</td><td>86</td><td>• Target achieved</td></tr>
<tr><td colspan="4">Action Taken:
• Lab session for Python Programming was paid more attention.
• Assignments were given to improve their programming skill sets.
• Health and safety projects are encouraged.</td></tr>
<tr><td colspan="4">PO4: The ability to design and conduct experiments, as well as to analyze and interpret data</td></tr>
<tr><td>PO 4</td><td>89</td><td>89</td><td>• Target achieved</td></tr>
</table>

Action Taken:

- Conducted project display to improve the problem solving skills.
- Organized Group Discussion, Debate, Industrial Visit to organizations to have a real time experience
- Conducted Student enrichment programs

PO 5: The ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

PO 5	86	86	• Target achieved

Action Taken:

- Arranged guest lecturer and seminar for awareness of modern engineering tools.

PO 6: The ability to apply reasoning informed by the knowledge of contemporary issues

PO 6	0	0	

Action Taken:

- Encouraged students to do Socially related projects.

PO 7:The ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

PO 7	0	0	

Action Taken:

1. Encouraged students to take up socio-economic based activities.
2. NSS and YRC volunteers are appreciated and motivated to give seminar relevant to environmental studies, health, safety, legal and cultural issues and the consequent responsibilities relates to the professional engineering practice.

PO 8: The ability to understand professional and ethical responsibility and apply them in engineering practices

PO 8	0	0	

Action Taken:

- Projects with social cause were awarded with certificate and momentum during the project exhibition.
- NSS and YRC activities were carried out to imbibe the ethical responsibility each has towards the society.
- Conducted guest lectures to improve the professional responsibility.

PO 9:The ability to function on multidisciplinary teams

PO 9	83	83	• Target achieved
Action Taken: • Conducted an awareness program about the various domains available for projects. • Encouraged students to take implant training and group project on multidisciplinary domains. • Conducted guest lecture series for Resource Management Techniques by mathematics department.			
PO 10: The ability to communicate effectively with the engineering community and with society at large.			
PO 10	87	87	• Target achieved.
Action Taken: • Soft skill training conducted by the placement cell. • Attention paid to communication skill in the communication lab • Special coaching class for foreign languages were conducted to improve the placement opportunities.			
PO 11: The ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.			
PO 11	0	0	
Action Taken: • Incentives for product based projects given during the project exhibit. • Conducted one-day workshop on "Entrepreneurship development opportunities" to create awareness for entrepreneurial choices.			
PO 12:The ability to recognize the need for, and an ability to engage in life-long learning			
PO 12	84	84	• Target achieved
Action Taken: • Encourage students to learn more by recognizing the top rank students with prize and a certificate. • Seminar to be conducted on awareness on competitive exams for higher studies. • Create case studies for understanding the impact of the subjects in real time.			