



*SRES's*  
**SHREE RAMCHANDRA COLLEGE OF ENGINEERING**  
Lonikand, Pune – 412216  
**Department of Civil Engineering**

**Course Outcome Assessment Process:**

The Key aspects in Outcome-Based Education (OBE) are the assessment of Course Outcomes. At the initial stage of OBE implementation, the Course Outcomes (COs) for each course are defined based on the Program Outcomes (POs) and other requirements. At the end of each course, the COs need to be assessed and evaluated to check whether they have been attained or not.

The process of attainment of COs, POs and PSOs starts from writing appropriate COs for each course of the program from first year to fourth year in a four-year engineering degree program. The course outcomes are written by the respective faculty member using action verbs of learning levels suggested by Bloom and Anderson. Then, a correlation is established between COs and POs in the scale of 1 to 3, 1 being the slight (low), 2 being moderate (medium) and 3 being substantial (high). A mapping matrix is prepared in this regard for every course in the program including the elective subjects. The course outcomes written and their mapping with POs are reviewed frequently by a committee of senior faculty members before they are finalized.

Assessment is one or more processes carried out by the department, which identify, collect and prepare data to evaluate the achievement of POs and Program Specific Outcomes (PSOs). Attainment is the action or fact of achieving a standard result towards accomplishment of desired goals. Primarily attainment is the standard of academic attainment as observed by examination results.

**Course Outcomes (COs):** Statements indicating what a student can do after the successful completion of a course. Every Course leads to some Course Outcomes. The CO statements are defined by considering the course content covered in each module of a course. For every course there may be 5 or 6 COs. The keywords used to define COs are based on Bloom's Taxonomy

Attainment of the COs can be measured directly and indirectly. Direct attainment displays the student's knowledge and skills from their performance. It can be determined from the performance of the students in all the relevant assessment instruments like internal assessments, assignments, quiz and final examinations. These methods provide a sampling of what students know and/or can do and provide strong evidence of student learning.

Indirect methods such as Course End Surveys ask the students to reflect on their learning. They access opinions or thoughts about the graduate's knowledge or skills. Indirect measures can provide information about graduate's perception of their learning and how this learning is valued by different stakeholders.





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**Assessment Process for CO Attainment:**

For the evaluation and assessment of CO's and PO's, rubrics are used. The rubrics considered here are given below:

Course Outcome is evaluated based on the performance of students in internal assessments and in End examination of a course. Internal assessment contributes 20% and End examinations assessment contributes 80% to the total attainment of a CO.

After measuring CO attainment for a course, CO-PO mapping table will give Program Outcome attainment levels.

**Program Outcomes (POs):** Program outcomes describe what students are expected to know and would be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program.

- **PO 1 : Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of **complex engineering**
- **PO 2 : Problem Analysis:** Identify, formulate, research literature, and analyze **complex engineering problems** reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering
- **PO 3 : 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
- **PO 4 : 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
- **PO 5 : 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
- **PO 6 : 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





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- **PO 7 : 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
- **PO 8 : Ethics** : Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering
- **PO 9 : Individual and Team Work** : Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary
- **PO 10 : 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
- **PO 11 : 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
- **PO 12 : 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

Apart from the PO's every department has liberty to define its own Program Specific Outcomes (PSO's).

#### **Program Specific Outcomes**

Program Specific Outcomes are statements that describe what the graduates of a specific engineering program should be able to do.

**PSO 1.** Understand economic, environmental, social health and safety factor in civil Engineering

**PSO 2.** Apply Knowledge in analysis design and survey, testing and construction of civil engineering structure along with knowledge of mathematics soft skill to solve complex civil engineering problem.

**PSO 3.** Able to cater to the changing industrial needs





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**Academic Year: 2020-21, SEM-II**

**Course: Surveying (Theory)**

**Course Code : 201009**

**Class: SE, Civil Engineering**

Upon successful completion of this course, the students will be able to:-

- CO1.** Define and Explain basics of plane surveying and differentiate the instruments used for it.
- CO2.** Express proficiency in handling surveying equipment and analyze the surveying data from this equipment.
- CO3.** Describe different methods of surveying and find relative positions of points on the surface of earth.
- CO4.** Execute curve setting for civil engineering projects such as roads, railways etc.
- CO5.** Articulate advancements in surveying such as space based positioning systems
- CO6.** Differentiate map and aerial photographs, also interpret aerial photographs.

**Process involved in CO-PO Mapping**

The role of CO-PO mapping will be assigned to the faculty as per hierarchy. After the course (subject) allotment from the department, the course in-charge of the course has to write appropriate COs for their corresponding course. It should be narrower and measurable statements. By using the action verbs of learning levels, CO's will be designed. CO statements should describe what the students are expected to know and able to do at the end of each course, which are related to the skills, knowledge and behavior that students will acquire through the course.

After writing the CO statements, CO will be mapped with PO of the department. In a department the subject expert teacher will be nominated as course coordinator of the corresponding course. The role of the course coordinator is to review the CO statements and the CO-PO mapping which has been done by course in-charge. The year wise coordinator has to consolidate the CO's of the respective year and maintain the documentation of the CO attainment level of the respective year courses as well as documentation of the individual students extra-curricular and co-curricular activities. These details will hand over to the program coordinator in order to evaluate PO attainment of the individual student as well as individual course at the end of the eighth semester. The Program coordinator has to evaluate the PO attainment of individual





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- d. Tutorial
  - e. Programming Skill Test
3. For practical / oral / tutorial courses following assessment tools are considered
- a. Internal continuous assessment of lab work
  - b. Mock practical / oral
  - c. Mock Seminar
  - d. Project Work

**CO attainment levels were divided in two parts:**

i.	External Assessment (80% weightage) -	Includes University In-Sem and End-Semester Examination and University Oral/Practical Examination and University Term work
ii.	Internal Assessment (20% weightage) -	Continuous Assessment - Tests/ MCQ/Assignments/ Quiz/ Simulation/ Programming Skill Test/ Problem Solving.





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student through direct and indirect method after the student completing their program. All these works have to be done under the guidance of Department Advisory Committee (DAC).

**Following are the different methods for Assessment, Evaluation and Measurement of POs/PSOs**

Direct Assessment methods

Indirect Assessment methods

**Direct Assessment methods:**

**Continuous Assessment:** COs are assessed through Sessional & Assignment Examinations and Lab records. The COs are mapped against each question and CO analysis is carried out by faculty for each course and documented. The contribution of COs is assessed in high, moderate and low levels, towards the attainment of POs/PSOs.

**Semester-end Theory Examinations:** The questions in semester-end examinations are tested pertaining to all COs, in varying Blooms Taxonomy Levels.

**Laboratory Records:** Both continuous and semester-end examinations are conducted to test the COs attainment.

**Indirect Assessment Methods:**

**Programme – Exit survey:** This survey taken from the final year students at the completion of their B.Tech programme, stands as the comprehensive feedback for the PO/PSO assessment

**Alumni Survey:** This survey is conducted annually through Google link or mail with the Alumni to obtain the inputs and suggestions on PO attainment in the real time societal environment

**Employer Survey:** This survey is taken from the employer to measure the PO attainments.

**External Examination Assessment Process:**

**Rubrics:**

If 50% of the students crossed 50% of the marks: Attainment Level 1

If 60% of the students crossed 50% of the marks: Attainment Level 2

If 70% of the students crossed 50% of the marks: Attainment Level 3

**Process for Course Outcome Attainment:**

1. Course Outcome Attainment is computed for all the theory, practical courses, including Seminar, Project Work, Elective Courses and Audit Courses.
2. For theory courses following assessment tools are considered
  - a. Unit test
  - b. MCQ Test
  - c. Assignments/ Problem Solving





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**1) Attainment:**

**Academic Year: 2020-21, SEM-II**

**Course: Surveying (Theory)**

**Course Code : 201009**

**Class: SE, Civil Engineering**

**CO Attainment**

COs	CO Attainment Level (Internal)	CO Attainment Level (External)	Direct CO Attainment Level (Internal * 20%) + (External * 80%)	Indirect CO Attainment Level	Total CO Attainment Level (Direct CO Attainment * 90%) + (Indirect CO Attainment * 10%)
CO1	2	2	1	3	1.20
CO2	2	2	1	3	1.20
CO3	2	2	1	3	1.20
CO4	2	3	2.8	3	3.00
CO5	3	3	3	3	2.90
CO6	3	3	3	3	2.90
CO(Avg)	2.333	2.50	1.966	3	2.066





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**FORMULATION OF COURSE ARTICULATION MATRIX:** Course Articulation Matrix correlates the individual COs of a course with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high) 2 for correlation, moderate (medium) correlation, and 1 for slight (low) correlation.

After measuring CO attainment for a course, CO-PO mapping table will give Program Outcome attainment levels. A typical CO-PO mapping table and CO-PSO mapping tables are shown below

CO's	CO-PO Mapping											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	-	-	1	1	-	-	3	-
CO2	3	3	3	1	-	-	-	1	-	-	3	-
CO3	1	-	-	-	-	-	1	1	-	-	-	-
CO4	3	1	1	1	-	-	1	1	-	-	3	-
CO5	3	3	3	2	-	-	1	1	-	-	2	-
CO6	1	-	-	-	-	-	-	1	-	2	3	-
AVG	2.33	1.66	1.66	0.83		-	0.66	1	-	-	2.33	-

COs	CO-PSO Mapping		
	PSOs		
	PSO1	PSO2	PSO3
CO1	-	2	-
CO2	-	2	-
CO3	-	2	1
CO4	-	1	1
CO5	-	2	1
CO6	-	3	2

Course coordinator

Prof. S.M. Bambarly

HOD (Civil)

Prof. S.G. Nikam

Principal

Prof. Dr. A.D. Desai







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**Course Outcome:**

**Academic Year: 2020-21, SEM-II**  
**Course: Quantity Surveying**  
**Contract and tenders (Theory)**  
**Course Code : 401008**  
**Class: BE, Civil Engineering**

Upon successful completion of this course, the students will be able to:-

- CO1.** Estimate of quantities of items for different types of buildings by various methods.
- CO2.** Prepare rate Analysis for all Building works, canals, roads and Cost Estimate.
- CO3** Understand types of specifications, principles for report preparation and tender Notices.
- CO4** Gaining knowledge about type of contracts and drafting of contract documents.
- CO5** Prepare a value estimate and fixing the rent for different properties
- CO6** Prepare the reports for different civil engineering projects

**Process involved in CO-PO Mapping**

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level of the respective year courses as well as documentation of the individual students extra-curricular and co-curricular activities. These details will hand over to the program coordinator in order to evaluate PO attainment of the individual student as well as individual course at the end of the eighth semester. The Program coordinator has to evaluate the PO attainment of individual student through direct and indirect method after the student completing their program. All these works have to be done under the guidance of Department Advisory Committee (DAC).

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Indirect Assessment methods

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**External Examination Assessment Process:**





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**Rubrics:**

If 50% of the students crossed 50% of the marks: Attainment Level 1

If 60% of the students crossed 50% of the marks: Attainment Level 2

If 70% of the students crossed 50% of the marks: Attainment Level 3

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**1) Attainment:**

**Academic Year: 2020-21, SEM-II**

**Course: Quantity Surveying**

**Contract and tenders (Theory)**

**Course Code : 401008**

**Class: BE, Civil Engineering.**





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CO Attainment					
COs	CO Attainment Level (Internal)	CO Attainment Level (External)	Direct CO Attainment Level (Internal * 20%) + (External * 80%)	Indirect CO Attainment Level	Total CO Attainment Level (Direct CO Attainment * 90%) + (Indirect CO Attainment * 10%)
CO1	1	2	1.8	3	1.92
CO2	2	2	2	3	2.1
CO3	2	2	2	3	2.1
CO4	3	3	3	3	3.00
CO5	3	3	3	3	3
CO6	3	3	3	3	3
CO(Avg)					<b>2.52</b>

**FORMULATION OF COURSE ARTICULATION MATRIX:** Course Articulation Matrix correlates the individual COs of a course with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high) 2 for correlation, moderate (medium) correlation, and 1 for slight (low) correlation.

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CO1	3	3	3	1	-	-	1	1	-	-	3	-
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COs	CO-PSO Mapping		
	PSO1	PSO2	PSO3
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CO2	-	2	-
CO3	-	2	1
CO4	-	1	1
CO5	-	2	1
CO6	-	3	2

  
**Course Coordinator**  
 Prof. S.G. Nikam

  
**HOD (Civil)**  
 Prof. S.G. Nikam

  
**Principal**  
 Prof. Dr. A.D. Desai





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engineering problem.

**PSO 3.** Able to cater the changing industrial needs.

**Course Outcome:**

**Academic Year:**

**2020-21, SEM-II**

**Course: Construction**

**Management (Theory)**

**Course Code: 401010**

**Class: BE, Civil Engineering**

Upon successful completion of this course, the students will be able to:-

**CO1.** Intended to give students a working knowledge of money management and how to make economic comparisons of alternatives involving future benefits and cost.

**CO2.** Promote moral and ethical leadership in the global marketplace.

**CO3.** Understand how to control project schedule, cost, quality, and risk.

**CO4.** Develop the ability to create programs and processes for safety, security, sustainability and regulatory compliance.

#### **Process involved in CO-PO Mapping**

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**1) Attainment:**

**Academic Year: 2020-21, SEM-II**  
**Course: Construction Management (Theory)**  
**Course Code:401010**  
**Class: BE, Civil Engineering**







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<b>CO Attainment</b>					
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CO1	1	1	1	3	1.2
CO2	2	3	3	3	3
CO3	2	3	3	3	3
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CO(Avg)	2	2.25	2.3	3	<b>2.37</b>

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CO's	CO-PO Mapping											
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CO3	3	2	2	3	-	-	1	2	3	2	2	3
CO4	3	2	3	1	2	2	2	3	3	2	2	1
AVG	2.667	2.667	2.5	2	2.667	2	1.75	2.5	3	2.5	2.5	2.25

CO-PSO Mapping			
COs	PSOs		
	PSO1	PSO2	PSO3
CO1	2	3	-
CO2	3	3	2
CO3	1	3	2
CO4	3	3	2

*Gundale*

Course Coordinator

Prof. N. V. Gundale

HOD (Civil)

Prof. S.G. Nikam

Principal

Prof. Dr. A.D. Desai





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- **PO 7 : 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
- **PO 8 : Ethics** : Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering
- **PO 9 : Individual and Team Work** : Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary
- **PO 10 : 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
- **PO 11 : 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
- **PO 12 : 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

Apart from the PO's every department has liberty to define its own Program Specific Outcomes (PSO's).

#### **Program Specific Outcomes**

Program Specific Outcomes are statements that describe what the graduates of a specific engineering program should be able to do.

#### **PSO-1**

**Professional Skills:** The ability to absorb and apply fundamental knowledge of core Electronics and Communication Engineering subjects in the analysis, design, and development of various types of integrated electronic systems as well as to interpret and synthesize the experimental data leading to valid conclusions.

#### **PSO-2**

**Successful Career:** Excellent adaptability to changing work environment, good interpersonal skills as a leader in a team in appreciation of professional ethics and societal responsibilities





**SRES's**  
**SHREE RAMCHANDRA COLLEGE OF ENGINEERING**  
Lonikand, Pune – 412216  
**Department of E&TC Engineering**

**Attainment**

**Academic Year: 2020-21, Semester: I**  
**Course: Signals and Systems (Theory)**  
**Course Code: 204191**  
**Class: SE ( E&TC Engineering)**

**Course Outcome:**

Upon successful completion of this course, the students will be able to:-

- CO1:** To understand the mathematical representation of continuous and discrete time signals and systems.
- CO2:** To classify signals and systems into different categories.
- CO3:** To analyze Linear Time Invariant (LTI) systems in time and transform domains.
- CO4:** To build basics for understanding of courses such as signal processing, control system and communication.
- CO5:** To develop basis of probability and random variables.

**Process involved in CO-PO Mapping**

The role of CO-PO mapping will be assigned to the faculty as per hierarchy. After the course (subject) allotment from the department, the course in-charge of the course has to write appropriate COs for their corresponding course. It should be narrower and measurable statements. By using the action verbs of learning levels, CO's will be designed. CO statements should describe what the students are expected to know and able to do at the end of each course, which are related to the skills, knowledge and behaviour that students will acquire through the course.

After writing the CO statements, CO will be mapped with PO of the department. In a department, the subject expert teacher will be nominated as course coordinator of the corresponding course. The role of the course coordinator is to review the CO statements and the CO-PO mapping which has been done by course in-charge. The year wise coordinator has to consolidate the CO's of the respective year and maintain the documentation of the CO attainment level of the respective year courses as well as documentation of the individual students extra-curricular and co-curricular activities. These details will hand over to the program coordinator in order to evaluate PO attainment of the individual student as well as individual course at the end of the eighth semester. The Program coordinator has to evaluate the PO attainment of individual





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**Department of E&TC Engineering**

student through direct and indirect method after the student completing their program. All the above work has to be done under the guidance of Department Advisory Committee (DAC).

**Following are the different methods for Assessment, Evaluation and Measurement of POs/PSOs**

Direct Assessment methods

Indirect Assessment methods

**Direct Assessment methods:**

**Continuous Assessment:** COs are assessed through Sessional & Assignment Examinations and Lab records. The COs are mapped against each question and CO analysis is carried out by faculty for each course and documented. The contribution of COs is assessed in high, moderate and low levels, towards the attainment of POs/PSOs.

**Semester-end Theory Examinations:** The questions in semester-end examinations are tested pertaining to all COs, in varying Blooms Taxonomy Levels.

**Laboratory Records:** Both continuous and semester-end examinations are conducted to test the COs attainment.

**Indirect Assessment Methods:**

**Programme – Exit survey:** This survey taken from the final year students at the completion of their B.E programme, stands as the comprehensive feedback for the PO/PSO assessment

**Alumni Survey:** This survey is conducted annually through Google link or mail with the Alumni to obtain the inputs and suggestions on PO attainment in the real time societal environment

**Employer Survey:** This survey is taken from the employer to measure the PO attainments.

**External Examination Assessment Process:**

**Rubrics:**

If 50% of the students crossed 50% of the marks: Attainment Level 1

If 60% of the students crossed 50% of the marks: Attainment Level 2

If 70% of the students crossed 50% of the marks: Attainment Level 3

**Process for Course Outcome Attainment:**

1. Course Outcome Attainment is computed for all the theory, practical courses, including Seminar, Project Work, Elective Courses and Audit Courses.
2. For theory courses following assessment tools 3 more are considered
  - a. Unit test
  - b. MCQ Test
  - c. Assignments/ Problem Solving
  - d. Tutorial
  - e. Programming Skill Test





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**Department of E&TC Engineering**

3. For practical / oral / tutorial courses following assessment tools are considered

- a. Internal continuous assessment of lab work
- b. Mock practical / oral
- c. Mock Seminar
- d. Project Work

**CO attainment levels were divided in two parts:**

i.	External Assessment (80% weightage) -	Includes University In-Sem and End-Semester Examination and University Oral/Practical Examination and University Term work
ii.	Internal Assessment (20% weightage) -	Continuous Assessment – Tests/ MCQ/Assignments/ Quiz/ Simulation/ Programming Skill Test/ Problem Solving.

**Attainment**

**Academic Year: 2020-21, Semester: I**  
**Course: Signals and Systems (Theory)**  
**Course Code: 204191**  
**Class: SE ( E&TC Engineering)**

**Table:1**

CO Attainment					
COs	CO Attainment Level (Internal)	CO Attainment Level (External)	Direct CO Attainment Level (Internal * 20%) + (External * 80%)	Indirect CO Attainment Level	Total CO Attainment Level (Direct CO Attainment * 90%) + (Indirect CO Attainment * 10%)
CO1	1	2	1.8	3	1.92
CO2	3	3	3	3	3.00
CO3	3	2	2.2	3	2.28
CO4	3	3	3	3	3.00
CO5	3	2	2.2	3	2.28
CO(Avg)					2.496





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Lonikand, Pune – 412216  
**Department of E&TC Engineering**

**FORMULATION OF COURSE ARTICULATION MATRIX:** Course Articulation Matrix correlates the individual COs of a course with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high) 2 for correlation, moderate (medium) correlation, and 1 for slight (low) correlation.


After measuring CO attainment for a course, CO-PO mapping table will give Program Outcome attainment levels. A typical CO-PO mapping table and CO-PSO mapping tables are shown below.

**Table2:**

CO's	CO-PO Mapping											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	3	-	-	-	-	-	-	-
CO2	1	2	2	2	2	-	-	-	-	-	-	-
CO3	3	2	3	3	2	-	-	-	-	-	-	-
CO4	3	1	2	1	3	-	-	-	-	-	-	-
CO5	3	3	3	3	2	-	-	-	-	-	-	-
AVG	2.6	2	2.8	2.4	2.4	-	-	-	-	-	-	-

**Table3:**

CO-PSO Mapping		
COs	PSOs	
	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	2	2
CO4	3	3
CO5	2	3

  
Course Coordinator  
Dr.K.Sujatha

  
HOD (E&TC)  
Dr.K.Sujatha

  
Principal  
Prof.Dr.A.D.Desai

HOD  
Dept. of E&TC Engg.,  
S.R.C.O.E., Pune





**Course Outcome:**  
**Academic Year: 2020-21, SEM-II**  
**Course: Structural Design**  
**II(Theory)**  
**Course Code : 301003**  
**Class: TE Civil Engineering**

Upon successful completion of this course, the students will be able to:-

- CO1.** Understand the various design methodologies for the design of RC elements
- CO2.** Know the analysis and design of flanged beams by limit state method and
- CO3** Know the design of beams for shear, bond and torsion
- CO4** Design the various types of slabs and staircase by limit state method.
- CO5** Design columns for axial, uniaxial, biaxially eccentric loadings using Limit State Method as per codal requirements.
- CO6** Design of footing by limit state method.

#### **Process involved in CO-PO Mapping**

The role of CO-PO mapping will be assigned to the faculty as per hierarchy. After the course (subject) allotment from the department, the course in-charge of the course has to write appropriate COs for their corresponding course. It should be narrower and measurable statements. By using the action verbs of learning levels, CO's will be designed. CO statements should describe what the students are expected to know and able to do at the end of each course, which are related to the skills, knowledge and behaviour that students will acquire through the course.

After writing the CO statements, CO will be mapped with PO of the department. In a department the subject expert teacher will be nominated as course coordinator of the corresponding course. The role of the course coordinator is to review the CO statements and the CO-PO mapping which has been done by course in-charge.. The year wise coordinator has to consolidate the CO's of the respective year and maintain the documentation of the CO attainment level of the respective year courses as well as documentation of the individual students extra-







curricular and co-curricular activities. These details will hand over to the program coordinator in order to evaluate PO attainment of the individual student as well as individual course at the end of the eighth semester. The Program coordinator has to evaluate the PO attainment of individual student through direct and indirect method after the student completing their program. All these works have to be done under the guidance of Department Advisory Committee (DAC).

**Following are the different methods for Assessment, Evaluation and Measurement of POs/PSOs**

Direct Assessment methods

Indirect Assessment methods

**Direct Assessment methods:**

**Continuous Assessment:** COs are assessed through Sessional & Assignment Examinations and Lab records. The COs are mapped against each question and CO analysis is carried out by faculty for each course and documented. The contribution of COs is assessed in high, moderate and low levels, towards the attainment of POs/PSOs.

**Semester-end Theory Examinations:** The questions in semester-end examinations are tested pertaining to all COs, in varying Blooms Taxonomy Levels.

**Laboratory Records:** Both continuous and semester-end examinations are conducted to test the COs attainment.

**Indirect Assessment Methods:**

**Programme – Exit survey:** This survey taken from the final year students at the completion of their B.Tech programme, stands as the comprehensive feedback for the PO/PSO assessment

**Alumni Survey:** This survey is conducted annually through Google link or mail with the Alumni to obtain the inputs and suggestions on PO attainment in the real time societal environment

**Employer Survey:** This survey is taken from the employer to measure the PO attainments.

**External Examination Assessment Process:**

**Rubrics:**

If 50% of the students crossed 50% of the marks: Attainment Level 1

If 60% of the students crossed 50% of the marks: Attainment Level 2

If 70% of the students crossed 50% of the marks: Attainment Level 3





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**SHREE RAMCHANDRA COLLEGE OF ENGINEERING**  
Lonikand, Pune – 412216  
**Department of Civil Engineering**

**Process for Course Outcome Attainment:**

1. Course Outcome Attainment is computed for all the theory, practical courses, including Seminar, Project Work, Elective Courses and Audit Courses.
2. For theory courses following assessment tools are considered
  - a. Unit test
  - b. MCQ Test
  - c. Assignments/ Problem Solving
  - d. Tutorial
  - e. Programming Skill Test
3. For practical / oral / tutorial courses following assessment tools are considered
  - a. Internal continuous assessment of lab work
  - b. Mock practical / oral
  - c. Mock Seminar
  - d. Project Work

**CO attainment levels were divided in two parts:**

i.	External Assessment (80% weightage) -	Includes University In-Sem and End-Semester Examination and University Oral/Practical Examination and University Term work
ii.	Internal Assessment (20% weightage) -	Continuous Assessment - Tests/ MCQ/Assignments/ Quiz/ Simulation/ Programming Skill Test/ Problem Solving.

**1) Attainment:**

**Academic Year: 2020-21, SEM-II**

**Course: Structural Design**

**II(Theory)**

**Course Code : 301003**

**Class: TE Civil Engineering**





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Lonikand, Pune – 412216  
**Department of Civil Engineering**

CO Attainment					
COs	CO Attainment Level (Internal)	CO Attainment Level (External)	Direct CO Attainment Level (Internal * 20%) + (External * 80%)	Indirect CO Attainment Level	Total CO Attainment Level (Direct CO Attainment * 90%) + (Indirect CO Attainment * 10%)
CO1	1	2	1.8	3	1.92
CO2	2	3	2.8	3	2.82
CO3	3	2	2.2	3	2.28
CO4	3	3	3	3	3.00
CO5	3	2	2.2	3	2.28
CO6	3	3	2.2	3	2.28
CO(Avg)	2.5	2.5	2.33	3	2.43

**FORMULATION OF COURSE ARTICULATION MATRIX:** Course Articulation Matrix correlates the individual COs of a course with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high) 2 for correlation, moderate (medium) correlation, and 1 for slight (low) correlation.

After measuring CO attainment for a course, CO-PO mapping table will give Program Outcome attainment levels. A typical CO-PO mapping table and CO-PSO mapping tables are shown below





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CO's	CO-PO Mapping											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	-	-	-	1	-	-	-	-
CO2	3	3	3	1	-	-	-	1	1	-	-	-
CO3	3	3	3	1	-	-	-	1	1	-	-	-
CO4	3	3	3	1	-	-	-	1	1	-	-	-
CO5	3	3	3	1	-	-	-	1	1	-	-	-
CO6	3	3	3	1	-	-	-	1	1	-	-	-
AVG	3	2.83	3	1				1	0.83			

CO-PSO Mapping			
COs	PSOs		
	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	-	3	-
CO3	-	3	-
CO4	-	3	-
CO5	-	3	-
CO6	-	3	-

  
Course Cordinator  
Prof. R S Dahatre

  
HOD (Civil)  
Prof. S.G. Nikam

  
Principal  
Prof. Dr. A.D. Desai





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**Department of Electrical Engineering**

- **PO 7 : 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
- **PO 8 : Ethics** : Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering
- **PO 9 : Individual and Team Work** : Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary
- **PO 10 : 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
- **PO 11 : 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
- **PO 12 : 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

Apart from the PO's every department has liberty to define its own Program Specific Outcomes (PSO's).

### **Program Specific Outcomes**

Program Specific Outcomes are statements that describe what the graduates of a specific engineering program should be able to do.

**PSO 1. Electrical Engineering Skills:** Ability to design, analyze and solve problems in the field of Electrical & Electronics Engineering by applying knowledge acquired from Electrical Power Systems, Electrical Machines, Control Systems, Power Electronics and Field theory.

**PSO 2. Interdisciplinary Knowledge:** To train students with good scientific and engineering breadth fundamentals required to solve electrical engineering problems.

**PSO 3. Professional Development:** To excel in current technologies, important to electrical engineering, as well as probable future technological advances & contribute actively to the field by participating in professional societies, attending technical events, doing research, pursuing higher education.





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**Department of Electrical Engineering**

**PSO 4. Leadership Skills:** To develop ethical attitude, communication skills, teamwork skills, entrepreneurial thinking and an ability to relate engineering attitude to societal issues.

**Course Outcome:**

**Academic Year: 2020-21, SEM-I**  
**Course: Control System-II**  
**(Theory)**  
**Course Code : 403145**  
**Class: BE, Electrical Engineering**

Upon successful completion of this course, the students will be able to:-

CO1. Recognize the importance of digital control system.

CO2. Familiarize with pulse transfer function.

CO3. Analyze digital controllers.

CO4. Present system in state space format.

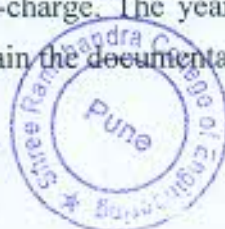
CO5. Solve state equation.

CO6. Design observer for system

**Process involved in CO-PO Mapping**

The role of CO-PO mapping will be assigned to the faculty as per hierarchy. After the course (subject) allotment from the department, the course in-charge of the course has to write appropriate COs for their corresponding course. It should be narrower and measurable statements. By using the action verbs of learning levels, CO's will be designed. CO statements should describe what the students are expected to know and able to do at the end of each course, which are related to the skills, knowledge and behaviour that students will acquire through the course.

After writing the CO statements, CO will be mapped with PO of the department. In a department, the subject expert teacher will be nominated as course coordinator of the corresponding course. The role of the course coordinator is to review the CO statements and the CO-PO mapping which has been done by course in-charge. The year wise coordinator has to consolidate the CO's of the respective year and maintain the documentation of the CO attainment





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**Department of Electrical Engineering**

level of the respective year courses as well as documentation of the individual students extra-curricular and co-curricular activities. These details will hand over to the program coordinator in order to evaluate PO attainment of the individual student as well as individual course at the end of the eighth semester. The Program coordinator has to evaluate the PO attainment of individual student through direct and indirect method after the student completing their program. All the above work has to be done under the guidance of Department Advisory Committee (DAC).

**Following are the different methods for Assessment, Evaluation and Measurement of POs/PSOs**

Direct Assessment methods

Indirect Assessment methods

**Direct Assessment methods:**

**Continuous Assessment:** COs are assessed through Sessional & Assignment Examinations and Lab records. The COs are mapped against each question and CO analysis is carried out by faculty for each course and documented. The contribution of COs is assessed in high, moderate and low levels, towards the attainment of POs/PSOs.

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**External Examination Assessment Process:**

**Rubrics:**

If 50% of the students crossed 50% of the marks: Attainment Level 1

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**Department of Electrical Engineering**

**Process for Course Outcome Attainment:**

1. Course Outcome Attainment is computed for all the theory, practical courses, including Seminar, Project Work, Elective Courses and Audit Courses.
2. For theory courses following assessment tools 3 more are considered
  - a. Unit test
  - b. MCQ Test
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  - d. Tutorial
  - e. Programming Skill Test
3. For practical / oral / tutorial courses following assessment tools are considered
  - a. Internal continuous assessment of lab work
  - b. Mock practical / oral
  - c. Mock Seminar
  - d. Project Work

**CO attainment levels were divided in two parts:**

i.	External Assessment (80% weightage) -	Includes University In-Sem and End-Semester Examination and University Oral/Practical Examination and University Term work
ii.	Internal Assessment (20% weightage) -	Continuous Assessment - Tests/ MCQ/Assignments/ Quiz/ Simulation/ Programming Skill Test/ Problem Solving.

**1) Attainment:**

**Academic Year: 2020-21, SEM-I**  
**Course: Control System-II**  
**(Theory)**  
**Course Code : 403145**  
**Class: BE, Electrical Engineering**

**Table:1**

<b>CO Attainment</b>					
COs	CO Attainment Level (Internal)	CO Attainment Level (External)	Direct CO Attainment Level (Internal * 20%) + (External * 80%)	Indirect CO Attainment Level	Total CO Attainment Level (Direct CO Attainment * 90%) + (Indirect CO Attainment * 10%)
CO1	1	2	1.8	3	1.92
CO2	1	3	2.6	3	2.64






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**Department of Electrical Engineering**

CO Attainment					
CO3	3	2	2.2	3	2.28
CO4	3	3	3	3	3.00
CO5	3	2	2.2	3	2.28
CO6	3	2	2.2	3	2.28
CO(Avg)					<b>2.4</b>

**FORMULATION OF COURSE ARTICULATION MATRIX:** Course Articulation Matrix correlates the individual COs of a course with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high) 2 for correlation, moderate (medium) correlation, and 1 for slight (low) correlation.

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**Table2:**

CO's	CO-PO Mapping											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	3	3	–	–	–	–	–	–	–
CO2	1	2	2	3	3	–	–	–	–	–	–	–
CO3	3	2	3	3	3	–	–	–	–	–	–	–
CO4	3	3	3	3	3	–	–	–	–	–	–	–
CO5	3	3	3	3	2	–	–	–	–	–	–	–
CO6	3	2	2	3	1							
AVG	2.33	2.33	2.5	3	2.5	–	–	–	–	–	–	–





**SRES's**  
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Lonikand, Pune – 412216  
**Department of Electrical Engineering**

**Table3:**

CO-PSO Mapping				
COs	PSOs			
	PSO1	PSO2	PSO3	PSO4
CO1	3	3	–	–
CO2	3	3	–	–
CO3	3	3	–	–
CO4	3	3	3	–
CO5	3	3	2	–
CO6	3	3	2	–

**Course Coordinator**

**Prof.V.M.V.Rao**

**HOD (Electrical)**

**Prof. V.M.V.Rao**

**Principal**

**Prof.Dr.A.D.Desai**





**SRES's**  
**SHREE RAMCHANDRA COLLEGE OF ENGINEERING**  
Lonikand, Pune – 412216  
**Department of Electrical Engineering**

**PSO 4. Leadership Skills:** To develop ethical attitude, communication skills, teamwork skills, entrepreneurial thinking and an ability to relate engineering attitude to societal issues.

**Course Outcome:**

**Academic Year: 2020-21, SEM-II**

**Course: NMCP**

**(Theory)**

**Course Code : 203148**

**Class: SE, Electrical Engineering**

Upon successful completion of this course, the students will be able to:-

**CO1.** Demonstrate types of errors in computation and their causes of occurrence.

**CO2.** Calculate root of algebraic and transcendental equations using various methods.

**CO3.** Apply numerical methods for various mathematical problems such as interpolation, numerical differentiation, integration and ordinary differential equation.

**CO4.** Solve linear simultaneous equation using direct and indirect method.

**CO5.** Develop algorithms and write computer programs for various numerical methods.

**CO6.** Design Flowchart and writing Python programm.

**Process involved in CO-PO Mapping**

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*SRES's*  
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**Department of Electrical Engineering**

curricular and co-curricular activities. These details will hand over to the program coordinator in order to evaluate PO attainment of the individual student as well as individual course at the end of the eighth semester. The Program coordinator has to evaluate the PO attainment of individual student through direct and indirect method after the student completing their program. All the above work has to be done under the guidance of Department Advisory Committee (DAC).

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Indirect Assessment methods

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If 70% of the students crossed 50% of the marks: Attainment Level 3





**SRES's**  
**SHREE RAMCHANDRA COLLEGE OF ENGINEERING**  
Lonikand, Pune – 412216  
**Department of Electrical Engineering**

**Process for Course Outcome Attainment:**

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  - a. Unit test
  - b. MCQ Test
  - c. Assignments/ Problem Solving
  - d. Tutorial
  - e. Practical exams
3. For practical / oral / tutorial courses following assessment tools are considered
  - a. Internal continuous assessment of lab work
  - b. Mock practical / oral
  - c. Mock Seminar
  - d. Seminar Work

**CO attainment levels were divided in two parts:**

i.	External Assessment (80% weightage) -	Includes University In-Sem and End-Semester Examination and University Oral/Practical Examination and University Term work
ii.	Internal Assessment (20% weightage) -	Continuous Assessment - Tests/ MCQ/Assignments/ Quiz/ Simulation/ Programming Skill Test/ Problem Solving.

**1) Attainment:**

**Academic Year: 2020-21, SEM-II**  
**Course: NMCP**  
**(Theory)**  
**Course Code : 203148**  
**Class: SE, Electrical Engineering**

**Table:1**

CO Attainment					
COs	CO Attainment Level (Internal)	CO Attainment Level (External)	Direct CO Attainment Level (Internal * 20%) + (External * 80%)	Indirect CO Attainment Level	Total CO Attainment Level (Direct CO Attainment * 90%) + (Indirect CO Attainment * 10%)
CO1	1	2	1.7	3	1.94





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**Department of Electrical Engineering**

CO Attainment					
CO2	1	3	2.6	3	2.64
CO3	3	2	2.2	3	2.28
CO4	3	3	3	3	3.00
CO5	3	2	2.2	3	2.28
CO6	3	2	2.2	3	2.28
CO(Avg)					2.3

**FORMULATION OF COURSE ARTICULATION MATRIX:** Course Articulation Matrix correlates the individual COs of a course with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high) 2 for correlation, moderate (medium) correlation, and 1 for slight (low) correlation.

After measuring CO attainment for a course, CO-PO mapping table will give Program Outcome attainment levels. A typical CO-PO mapping table and CO-PSO mapping tables are shown below.

**Table2:**

CO's	CO-PO Mapping											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	3	3	-	-	-	-	-	-	-
CO2	1	2	2	3	3	-	-	-	-	-	-	-
CO3	3	2	3	3	3	-	-	-	-	-	-	-
CO4	3	3	3	3	3	-	-	-	-	-	-	-
CO5	3	3	3	3	2	-	-	-	-	-	-	-
CO6	3	2	2	3	1							
AVG	2.32	2.23	2.51	3	2.35	-	-	-	-	-	-	-







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**Department of Electrical Engineering**

**Table3:**

CO-PSO Mapping				
COs	PSOs			
	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	-
CO2	3	3	-	-
CO3	3	3	-	-
CO4	3	3	3	-
CO5	3	3	2	-
CO6	3	3	2	-

  
Course Co-ordinator  
**Prof.Rajgire Y.S**

  
HOD (Electrical)  
**Prof. V.M.V.Rao**

  
Principal  
**Prof.Dr.A.D.Desai**





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**PSO 4. Leadership Skills:** To develop ethical attitude, communication skills, teamwork skills, entrepreneurial thinking and an ability to relate engineering attitude to societal issues.

**Course Outcome:**

**Academic Year: 2020-21, SEM-I**

**Course: Power Electronics**

**(Theory)**

**Course Code : 303142**

**Class: TE, Electrical Engineering**

Upon successful completion of this course, the students will be able to:-

**CO1.** Recognize the importance of Simulation of Power electronics Circuits.

**CO2.** Familiarize with Converter, Inverter, Controlled Switching Devices.

**CO3.** Analyze Converter circuits using PSIM Software.

**CO4.** Switching Devices and their characteristics, comparison.

**CO5.** Solve problems based on average voltage, rms voltage, rms currents, harmonic Distortion etc.

**CO6.** Design the harmonic elimination techniques.

**Process involved in CO-PO Mapping**

The role of CO-PO mapping will be assigned to the faculty as per hierarchy. After the course (subject) allotment from the department, the course in-charge of the course has to write appropriate COs for their corresponding course. It should be narrower and measurable statements. By using the action verbs of learning levels, CO's will be designed. CO statements should describe what the students are expected to know and able to do at the end of each course, which are related to the skills, knowledge and behaviour that students will acquire through the course.

After writing the CO statements, CO will be mapped with PO of the department. In a department, the subject expert teacher will be nominated as course coordinator of the corresponding course. The role of the course coordinator is to review the CO statements and the CO-PO mapping which has been done by course in-charge. The year wise coordinator has to consolidate the CO's of the respective year and maintain the documentation of the CO attainment level of the respective year courses as well as documentation of the individual students extra-







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curricular and co-curricular activities. These details will hand over to the program coordinator in order to evaluate PO attainment of the individual student as well as individual course at the end of the eighth semester. The Program coordinator has to evaluate the PO attainment of individual student through direct and indirect method after the student completing their program. All the above work has to be done under the guidance of Department Advisory Committee (DAC).

**Following are the different methods for Assessment, Evaluation and Measurement of POs/PSOs**

Direct Assessment methods

Indirect Assessment methods

**Direct Assessment methods:**

**Continuous Assessment:** COs are assessed through Sessional & Assignment Examinations and Lab records. The COs are mapped against each question and CO analysis is carried out by faculty for each course and documented. The contribution of COs is assessed in high, moderate and low levels, towards the attainment of POs/PSOs.

**Semester-end Theory Examinations:** The questions in semester-end examinations are tested pertaining to all COs, in varying Blooms Taxonomy Levels.

**Laboratory Records:** Both continuous and semester-end examinations are conducted to test the COs attainment.

**Indirect Assessment Methods:**

**Programme – Exit survey:** This survey taken from the third year students at the completion of their T.E programme, stands as the comprehensive feedback for the PO/PSO assessment

**Alumni Survey:** This survey is conducted annually through Google link or mail with the Alumni students to obtain the inputs and suggestions on PO attainment in the real time societal environment

**Employer Survey:** This survey is taken from the employer to measure the PO attainments.

**External Examination Assessment Process:**

**Rubrics:**

If 50% of the students crossed 50% of the marks: Attainment Level 1

If 60% of the students crossed 50% of the marks: Attainment Level 2

If 70% of the students crossed 50% of the marks: Attainment Level 3




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**Department of Electrical Engineering**

**Process for Course Outcome Attainment:**

1. Course Outcome Attainment is computed for all the theory, practical courses, including Seminar, Elective Courses and Audit Courses.
2. For theory courses following assessment tools 3 more are considered
  - a. Unit test
  - b. MCQ Test
  - c. Assignments/ Problem Solving
  - d. Tutorial
  - e. Practical exams
3. For practical / oral / tutorial courses following assessment tools are considered
  - a. Internal continuous assessment of lab work
  - b. Mock practical / oral
  - c. Mock Seminar
  - d. Seminar Work

**CO attainment levels were divided in two parts:**

i.	External Assessment (80% weightage) -	Includes University In-Sem and End-Semester Examination and University Oral/Practical Examination and University Term work
ii.	Internal Assessment (20% weightage) -	Continuous Assessment - Tests/ MCQ/Assignments/ Quiz/ Simulation/ Programming Skill Test/ Problem Solving.

**1) Attainment:**

**Academic Year: 2020-21, SEM-I**  
**Course: Power Electronics**  
**(Theory)**  
**Course Code : 303142**  
**Class: TE, Electrical Engineering**

**Table:1**

<b>CO Attainment</b>					
COs	CO Attainment Level (Internal)	CO Attainment Level (External)	Direct CO Attainment Level (Internal * 20%) + (External * 80%)	Indirect CO Attainment Level	Total CO Attainment Level (Direct CO Attainment * 90%) + (Indirect CO Attainment * 10%)
<b>CO1</b>	1	2	1.7	3	1.94

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 Lonikand, Pune - 412216  
 Department of Electrical Engineering

CO Attainment					
CO2	1	3	2.6	3	2.64
CO3	3	2	2.2	3	2.28
CO4	3	3	3	3	3.00
CO5	3	2	2.2	3	2.28
CO6	3	2	2.2	3	2.28
CO(Avg)					2.3

**FORMULATION OF COURSE ARTICULATION MATRIX:** Course Articulation Matrix correlates the individual COs of a course with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high) 2 for correlation, moderate (medium) correlation, and 1 for slight (low) correlation.

After measuring CO attainment for a course, CO-PO mapping table will give Program Outcome attainment levels. A typical CO-PO mapping table and CO-PSO mapping tables are shown below.

**Table2:**

CO's	CO-PO Mapping											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	3	3	-	-	-	-	-	-	-
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CO4	3	3	3	3	3	-	-	-	-	-	-	-
CO5	3	3	3	3	2	-	-	-	-	-	-	-
CO6	3	2	2	3	1							
AVG	2.32	2.23	2.51	3	2.35	-	-	-	-	-	-	-






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Department of Electrical Engineering

**Table3:**

CO-PSO Mapping				
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	PSO1	PSO2	PSO3	PSO4
CO1	3	3	–	–
CO2	3	3	–	–
CO3	3	3	–	–
CO4	3	3	3	–
CO5	3	3	2	–
CO6	3	3	2	–

  
Course Co-ordinator  
Prof.Rajgire Y.S

  
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Principal  
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**Department of Mechanical Engineering**

**Course Outcome:**

**Academic Year: 2020-21, SEM-II**

**Course: Manufacturing Processes (Theory)**

**Course Code : 202050**

**Class: SE, Mechanical Engineering**

Upon successful completion of this course, the students will be able to:-

**CO1. SELECT** appropriate moulding, core making and melting practice and estimate pouring time, solidification rate and **DESIGN** riser size and location for sand casting process

**CO2. UNDERSTAND** mechanism of metal forming techniques and **CALCULATE** load required for flat rolling

**CO3. DEMONSTRATE** press working operations and **APPLY** the basic principles to **DESIGN** dies and tools for forming and shearing operations

**CO4. CLASSIFY and EXPLAIN** different welding processes and **EVALUATE** welding characteristics

**CO5. DIFFERENTIATE** thermoplastics and thermosetting and **EXPLAIN** polymer processing techniques

**CO6. UNDERSTAND** the principle of manufacturing of fibre-reinforce composites and metal matrix composites.

**Process involved in CO-PO Mapping**

The role of CO-PO mapping will be assigned to the faculty as per hierarchy. After the course (subject) allotment from the department, the course in-charge of the course has to write appropriate COs for their corresponding course. It should be narrower and measurable statements. By using the action verbs of learning levels, CO's will be designed. CO statements should describe what the students are expected to know and able to do at the end of each course, which are related to the skills, knowledge and behaviour that students will acquire through the course.

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**Department of Mechanical Engineering**

order to evaluate PO attainment of the individual student as well as individual course at the end of the eighth semester. The Program coordinator has to evaluate the PO attainment of individual student through direct and indirect method after the student completing their program. All the above work has to be done under the guidance of Department Advisory Committee (DAC).

**Following are the different methods for Assessment, Evaluation and Measurement of POs/PSOs**

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Indirect Assessment methods

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**Semester-end Theory Examinations:** The questions in semester-end examinations are tested pertaining to all COs, in varying Blooms Taxonomy Levels.

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- c. Assignments/ Problem Solving
  - d. Tutorial
  - e. Programming Skill Test
3. For practical / oral / tutorial courses following assessment tools are considered
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  - b. Mock practical / oral
  - c. Mock Seminar
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**CO attainment levels were divided in two parts:**

i.	External Assessment (80% weightage) -	Includes University In-Sem and End-Semester Examination and University Oral/Practical Examination and University Term work
ii.	Internal Assessment (20% weightage) -	Continuous Assessment - Tests/ MCQ/Assignments/ Quiz/ Simulation/ Programming Skill Test/ Problem Solving.

**1) Attainment:**

**Academic Year: 2020-21, SEM-II**

**Course: Manufacturing Processes (Theory)**

**Course Code : 202050**

**Class: SE, Mechanical Engineering**

**Table:1**

CO Attainment					
COs	CO Attainment Level (Internal)	CO Attainment Level (External)	Direct CO Attainment Level (Internal * 20%) + (External * 80%)	Indirect CO Attainment Level	Total CO Attainment Level (Direct CO Attainment * 90%) + (Indirect CO Attainment * 10%)
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CO2	3	3	3	3	3
CO3	3	2	2.2	3	2.28
CO4	1	3	2.6	3	2.64
CO5	3	2	2.2	3	2.28





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**Department of Mechanical Engineering**

CO Attainment					
CO6	1	3	2.6	3	2.64
CO(Avg)					2.64

**FORMULATION OF COURSE ARTICULATION MATRIX:**

Course Articulation Matrix correlates the individual COs of a course with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high) 2 for correlation, moderate (medium) correlation, and 1 for slight (low) correlation.

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CO4	2	2	2	2	3	-	-	-	-	-	-	-
CO5	2	2	2	3	3	-	-	-	-	-	-	-
CO6	2	2	3	3	3							
AVG	1.8	2	2.1	2.00	2.50	-	-	-	-	-	-	-







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**Department of Mechanical Engineering**

**Table3:**

CO-PSO Mapping				
COs	PSOs			
	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	-
CO2	3	3	-	-
CO3	3	3	-	-
CO4	3	3	3	-
CO5	3	3	2	-
CO6	3	3	2	-

**Course Coordinator**

**Prof. N. S. Khajure**



**HOD (Mechanical)**

**Prof. M. K. Jadhav**

**Principal**

**Prof. Dr. A. D. Desai**