

**CONTENT – R16 REGULATION ATTAINMENT MANUAL**

| S. No. | Content | Page No. |
|--------|--|----------|
| 1 | OUTCOME BASED EDUCATION (OBE) | |
| | 1.1 Introduction | 2 |
| | 1.2 Vision | 3 |
| | 1.3 Mission | 3 |
| | 1.4 Program Outcomes (PO) | 3 |
| | 1.5 Program Educational Objectives (PEO) | 4 |
| | 1.6 Program Specific Outcomes (PSO) | 5 |
| 2 | CO-PO MAPPING | |
| | 2.1 Introduction to Course outcomes | 6 |
| | 2.2 Course Outcomes | 6 |
| | 2.3 COs mapping with PO/PSO | 6 |
| 3 | CO ATTAINMENT | |
| | 3.1 Introduction to Assessment Tools | 9 |
| | 3.2 Assigning of Attainment Levels | 9 |
| | 3.3 Theory attainment | 9 |
| | 3.4 Laboratory attainment | 17 |
| | 3.5 Seminar attainment | 24 |
| | 3.6 Project attainment | 25 |
| 4 | PO/PSO ATTAINMENT | |
| | 4.1 Assessment tools for calculation of PO/PSO | 30 |
| | 4.2 Direct attainment | 30 |
| | 4.3 Indirect attainment | 32 |

OUTCOME BASED EDUCATION (OBE)

1.1. Introduction

Outcome-Based Education (OBE) is a student-centric teaching and learning methodology in which the course delivery, assessment are planned to achieve stated objectives and outcomes. It focuses on measuring student performance i.e. outcomes at different levels. The following are the little mastery behind outcome-based education:

- Clear-cut criteria for what constitutes mastery
- A thoughtful way of instruction that adapts to specific learner needs.
- Complete assistance for learners as and when they face challenges.
- Adequate time given to achieve mastery

The following shows the key constituents of outcome based education.

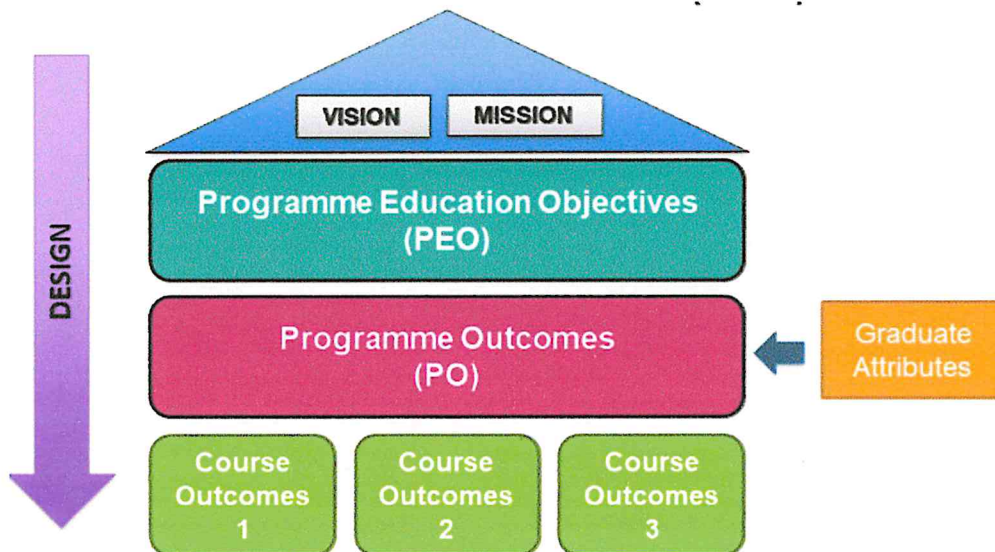


Fig. 1: Key constituents of Outcome based Education

OBE is an internationally practiced educational model that focuses on the measurement of student outcomes and the implementation of corrective measures to overcome deficiencies in course delivery methods / assessment / student attitude, etc.. Curriculum is designed with specific course outcomes (COs) to prepare the graduates to achieve the graduate attributes / Program outcomes (POs) at the point of graduation. The POs are designed to produce graduates who are well-prepared to achieve the Program educational objectives (PEOs) 3 - 5 years after they have graduated. The PEOs had been formulated



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in consultation with all major stakeholders (employers, alumni and students) to meet the demands of a challenging and globalized workplace.

1.2. Vision

To emerge as a center of excellence in the field of Electronics & Communication Engineering to produce competent women engineers with ethical values

1.3. Mission

- To train globally employable engineers through effective teaching – learning process, industry ready skills and value-added courses
- To promote higher education and research initiatives through continuous industry interaction and special skill development programs.
- To promote ethical values, personality and leadership skills through extra and co-curricular activities.

1.4. Program Outcomes (PO)

Graduates will be able to:

1. *Engineering Knowledge:* Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex *electronics and communication* engineering problems.
2. *Problem Analysis:* Identify, formulate, review research literature, and analyze complex *electronics and communication* engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. *Design/Development of Solutions:* Design solutions for complex *electronics and communication* 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.
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 conclusions.



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5. *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.
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 practice.
7. *Environment and Sustain ability*: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. *Ethics*: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. *Individual and Team Work*: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.
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 instructions.
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 multi-disciplinary environments.
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 change.

1.5. Program Educational Objectives (PEOs)

The program is expected to enable the students in realizing the PEOs after three to five years of their graduation.

Graduates will be able to –

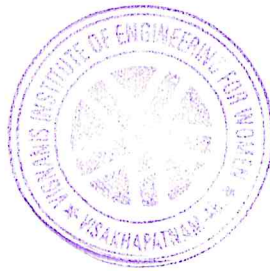
- Utilize their updated knowledge and skills to adapt themselves in hardware and software industry to pursue their career successfully.




- Augment their proficiency towards higher education and progress in research.
- Acquire leadership qualities and exhibit ethical values in their profession and entrepreneurship.

1.6. Program Specific Outcomes (PSOs)

- Exploit the concepts of VLSI and Embedded systems for the implementation of Real Time applications.
- Apply advanced algorithm in Signal Processing, Image processing and communication system to solve complex problems.




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CO-PO MAPPING

2.1. Introduction to Course outcomes

Considering the curriculum prescribed by JNTU Kakinada, course outcomes for each individual course are framed. Module coordinator, Course coordinator and the faculty will have a discussion regarding the concept and will draft the outcomes. With the approval of Program Coordinator and Program Assessment Quality Improvement Committee (PAQIC), the outcomes are finalized. The same is followed if any refinements are required in the outcomes

2.2. Course Outcomes

Course outcomes are the statements that define the knowledge gained by a student after the completion of the course. These are used for establishing the correlation between the course and the program. These outcomes also serve as key tools for the assessment of a student in a program.

The course outcome consists of an action verb, *considered from Revised Bloom's Taxonomy*, context of the concept and condition.

The following are the course outcomes of *Switching Theory and Logic Design, C202*.

C202.1: Explain various number systems, error detecting and correcting codes.

C202.2: Discuss minimization techniques to reduce logical expressions.

C202.3: Illustrate various combinational logic circuits.

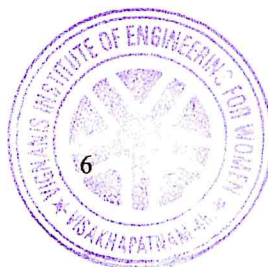
C202.4: Observe the realization of Boolean functions using Programming logic devices.


C202.5: Classify various sequential circuits.

C202.6: Interpret functioning of sequential circuits using state diagram.

2.3. COs mapping with PO/PSO

The mapping of courses with POs and PSOs represent the correlation of the courses with the program. Based on the concept, the outcomes are mapped as 3 (Substantial-High), 2 (Moderate-Medium) and 1(Slight-Low). The following shows the method of fixing of mapping.




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Academic Year 2017-18

Course Name: *Switching Theory and Logic Design*

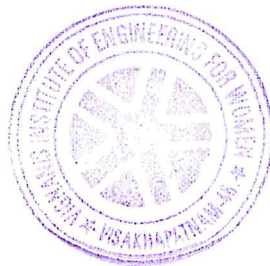
Year/Sem. : II-I

Name of Faculty: *Mrs.S.Malathi,Ms.D.Sri Kanya,Ms. G.Arshini*

CO-PO/PSO Mapping Justification

| CO | PO/ Topic | No. of Classes Alloted for the topic | POs | | | | | | | | | | | | PSOs | | |
|----------------------|--|--------------------------------------|-----------|-----------|----------|-----------|----------|----------|------------|-----------|-------------|----------|----------|-------------|--------------|------|---|
| | | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | |
| COI | Introduction to different number systems | 1 | 1 | 1 | 1 | | 1 | | | | | | 1 | | | 1 | 1 |
| | Conversion from decimal to any number system | 1 | 1 | 1 | | | 1 | | | | | | 1 | | | 1 | 1 |
| | Problems on number systems conversions | 1 | 1 | 1 | 1 | | 1 | | | | | | | | | 1 | |
| | Binary Arithmetic Operations | 1 | 1 | | | | | | | | | | 1 | | | 1 | 1 |
| | Representation and arithmetic operations of signed numbers | 1 | | 1 | 1 | | 1 | | | | | | 1 | 1 | | 1 | 1 |
| | Problems on Diminished radix and radix compliments | 1 | 1 | 1 | 1 | | | | | | | | 1 | 1 | | 1 | 1 |
| | Weighted and non weighted codes | 1 | 1 | | | | | | | | | | | 1 | | 1 | 1 |
| | Binary to gray and gray to binary conversions | 1 | | 1 | 1 | | 1 | | | | | | 1 | 1 | | 1 | |
| | Problem solving on BCD-addition, subtraction | 1 | 1 | 1 | 1 | | 1 | | | | | | | | | 1 | |
| | Problem solving on Excess-3 -addition, subtraction | 1 | 1 | | 1 | | | | | | | | | 1 | | | 1 |
| | Parity generation and error detection(Even & Odd Parity) | 1 | 1 | 1 | | | 1 | | | | | | | | | 1 | 1 |
| | Error correcting code-Hamming Code | 1 | 1 | 1 | 1 | | 1 | | | | | | 1 | 1 | | | 1 |
| | Problem Solving on Error detection & correction codes | 1 | 1 | | 1 | | | | | | | | | | | 1 | |
| | Basic logic operations | 1 | | 1 | 1 | | 1 | | | | | | 1 | | | 1 | 1 |
| | Standard SOP form & POS form | 1 | | | | | | | | | | | 1 | 1 | | 1 | |
| | NAND-NAND NOR-NOR Realizations | 1 | | 1 | | | | | | | | | | | | 1 | 1 |
| Total Classes | 16 | 11 | 11 | 10 | 0 | 9 | 0 | 0 | 1 | 9 | 6 | 0 | 0 | 14 | 11 | | |
| Percentage | | 69 | 69 | 63 | 0 | 56 | 0 | 0 | 6.3 | 56 | 37.5 | 0 | 0 | 87.5 | 68.75 | | |
| Level | | 2 | 2 | 2 | - | 2 | - | - | - | 2 | 2 | - | - | 3 | 2 | | |

Fig. 2.1: CO-PO Mapping justification for a theory course



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A percentage is defined as the ratio of number of classes required for discussing a particular PO to the total number of classes required for discussing the entire unit.

The process is as follows:

From PO1 to PO5 (PO6 to PO12),

If the percentage is $\geq 70\%$, (60%) the mapping level is 3.

If the percentage is $\geq 40\%$, (30%) the mapping level is 2.

If the percentage is $\geq 10\%$, (10%) the mapping level is 1.

If the percentage is $< 10\%$, (10%) no mapping is done.

Considering Unit-1, the list of concepts in Unit 1 is tabulated as shown. Based on the concept, number of classes required for each PO is marked. The percentage defined above is calculated as the mapping level of C202.1.

In Unit 1,

Total number of classes for the completion of the topics = 16

Total number of classes addressing PO1 = 11

Total number of classes addressing PO10 = 6

Percentage of classes for PO1 over total classes = 69%

Percentage of classes for PO10 over total classes = 37.5%

Hence, the mapping level of C202.1 with PO1 is "2" and with PO10 is "2".

The same is repeated for all the units in a course for getting the mapping levels of all the course outcomes defined.

The mapping matrix for *Switching Theory and Logic Design, C202* is

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| C202.1 | 2 | 2 | 2 | - | 2 | - | - | - | 2 | 2 | - | - |
| C202.2 | 2 | 2 | - | - | - | - | - | - | 3 | - | - | 3 |
| C202.3 | 2 | 2 | 2 | - | - | - | - | - | 3 | - | 2 | 2 |
| C202.4 | 2 | 2 | 3 | - | - | - | - | - | 2 | 1 | 2 | 2 |
| C202.5 | 2 | 2 | 2 | 2 | 1 | - | - | 2 | 3 | - | 2 | 3 |
| C202.6 | 3 | 3 | 3 | - | 2 | - | - | - | 3 | 2 | 1 | 3 |

Table 2.1: CO-PO Mapping table for Analog Communications



3. CO ATTAINMENT

3.1. Introduction to Assessment Tools

In the Outcome Based Education (OBE), assessment is done through one or more than one processes, carried out by the institution, that identify, collect, and prepare data to evaluate the achievement of course outcomes (COs).

Assessment Processes

Assessment tools are categorized into two methods to assess the course outcomes as direct methods and indirect methods.

Direct methods display the student's knowledge and skills from their performance in the continuous internal assessment tests, semester examinations, seminars, and class room and laboratory assignments etc. These methods provide a sampling of what students know and/or can do and provide strong evidence of student learning.

Indirect methods such as surveys and opinions of students on the course or program based on their knowledge or skill gained.

3.2. Assigning of Attainment Levels

For the assessment of a course, the outcomes of the course are assigned with certain attainment levels based on the continuous monitoring, their basic knowledge, their skills, etc.

Four values of attainment levels are assigned as:

- *Attainment level 1:* If 60% of the total students had achieved the target marks for a course outcome, then the outcome is assigned with Attainment level 1.
- *Attainment level 2:* If 70% of the total students had achieved the target marks for a course outcome, then the outcome is assigned with Attainment level 2.
- *Attainment level 3:* If 80% of the total students had achieved the target marks for a course outcome, then the outcome is assigned with Attainment level 3.

If at least 60% of the total students didn't achieved the target marks for a course outcome, then the outcome is assigned with Attainment level 0

3.3. Theory attainment

The process of assessment through marks includes:

1. Internal marks (30M)




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2. External marks (70M)
3. Course end survey on the respective course outcomes

3.3.1. Internal Marks

As prescribed by JNTUK, internal marks are considered from two mid examination marks.

The first mid examination constitutes first three outcomes and the next mid examination constitutes the next three outcomes. The marks of mid examination, 30M are split into:

- a. Descriptive exam with 15M

The questions for descriptive examination are set by the faculty with concerning the course coordinator. It constitutes of three questions framed using Revised Bloom's Taxonomy with each question carrying equal marks. These questions reflect the course outcomes of the course defined by the course coordinator. The answer scripts of the exam are evaluated by the faculty under the observation of the course coordinator with a scheme of evaluation provided.

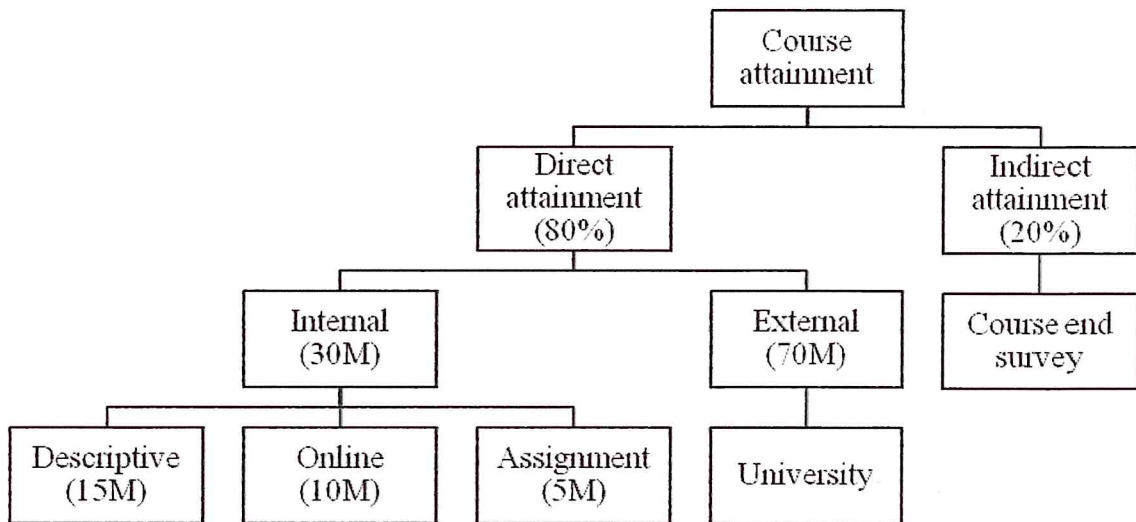


Fig. 3.1: Process of assessment for a theory course

- b. Online exam with 10M

The online exam questions are provided by the University. 20 Multiple Choice Questions are given based on the syllabus which the students have to attempt in a given interval of time. The marks are displayed after the submission of the examination by the student.



c. Student's assignment with 5M

Based on the concepts discussed in the class, few questions like application oriented, problematic, analytical etc. are given as assignment to the students. Assignments are given for all the units and are averaged for the two mid exams.

The following is the course evaluation process.

3.3.2. External Marks

The external grades are obtained after the end exams conducted by JNTU Kakinada. These grades are computed for 100M. From these grades, end exam marks are extracted. The end exam marks are considered to be uniformly distributed among all the outcomes of a respective course. These are evaluated by the external examiner under the observation of Chief evaluator. The results are displayed by the University in the website

3.3.3. Course end survey

A survey on the course outcomes is conducted at the end of the semester, before the University examination. Course coordinator will prepare the questionnaire on the outcomes and will submit the same to Program Assessment Quality Improvement Committee (PAQIC). These feedback forms are distributed among the students and are collected by PAQIC. A sample copy of Course End Survey Form for one course is shown below

3.3.4. Procedure for calculating attainment

The process of calculating course outcome attainment and hence course attainment is described in the following points:

1. Marks obtained by the students in Mid-1 and Mid-2 are collected.
2. Marks for the entire COs are calculated.
3. Fixing the target on the outcomes, number of students who attained the target is counted.
4. Based on the percentage of students attained, from Section 3.2, the attainment level of each outcome is calculated.
5. The average of attainment levels of all the course outcomes gives the internal attainment level of that course.
6. Attainment level of the external examination is also calculated.



7. According to the weightage given by the University, 30% of the internal attainment and 70% of the external attainment is considered to calculate the direct attainment of that course.
8. PAQIC will take the feedback on course outcomes which are consolidated for indirect attainment.
9. Hence, 80% of the attainment level obtained through marks and 20% of the attainment level obtained through end survey, *feedbacks*, is considered to be the total Course Attainment.

Attainment calculation for a course is described below:

A course from second year, C202, *Switching Theory and Logic Design*, is considered as example. Course attainment involves direct attainment (DA) and indirect attainment (IA). Direct attainment comprises of mid examinations (descriptive, assignment and online) and External examination.

Internal Attainment:

The following table represents the evaluation of Mid-I. The table consists of total number of students, their marks for individual questions, assignment marks and online marks. Six course outcomes were defined for the course in which each outcome reflects one unit. Therefore, Mid-I exam covers first three outcomes and Mid-II exam covers the remaining.

According to mid examination syllabus, CO1 covers Question1 (Q1), Assignment1 (A1) & Online. The total marks of CO1 are the summation of marks obtained in Q1, 1/3rd of Online and 1/3rd of A1. Similarly, CO2 & CO3 are also calculated.

Target fixed for the internal examination: 60%


Total number of students: 197

Total absentees: 2

Total number of students attended the exam: 195

From the calculation, the marks for each CO are 10. Hence, the target marks will be 6M.




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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Course Evaluation

Program: *Electronics and Communication Engineering*
 Course Code: C202
 Course Name: *Switching Theory & Logic Design*

Year and Sem: *II-I*
 Course Coordinator: *Mrs. Ch. Anitha Bhavani*
 Course Faculty: *Ms.D.Sri Kanya, Ms. G.Arshimi, Mrs.S.Malathi*

Mid-I Evaluation


Max Marks: 30M

| S.No. | Reg. No. | Student Name | Descriptive | | | Assignment | | | Online | Marks for CO1 | Marks for CO2 | Marks for CO3 | Total | |
|--|------------|------------------|-------------------|-----|-----|----------------|-----|-----|--------|---------------|---------------|---------------|-------|--|
| | | | Q1 | Q2 | Q3 | A1 | A2 | A3 | Quiz | | | | | |
| | | | CO1 | CO2 | CO3 | CO1 | CO2 | CO3 | | | | | | |
| | | | 5M | 5M | 5M | 5M | 5M | 5M | 10M | 10M | 10M | 10M | 30M | |
| 1 | 15NM1A0477 | MOKA SAI LAKSHMI | 4 | 4 | 3 | 5 | 5 | 5 | 4 | 7.00 | 7.00 | 6.00 | 20 | |
| 2 | 15NM1A04F4 | N.RESHMA REDDY | 0 | 0 | 0 | 5 | 5 | 5 | 4.333 | 3.11 | 3.11 | 3.11 | 9 | |
| 3 | 16NM1A0401 | A KAVITA RAO | 2 | 2 | 0 | 5 | 5 | 5 | 2 | 4.33 | 4.33 | 2.33 | 11 | |
| 4 | 16NM1A0402 | AL MADHURI | 2 | 0 | 1 | 5 | 5 | 5 | 4 | 5.00 | 3.00 | 4.00 | 12 | |
| 5 | 16NM1A0403 | A PRATHYUSHA | 2.5 | 4.5 | 4.5 | 5 | 5 | 5 | 7 | 6.50 | 8.50 | 8.50 | 24 | |
| 6 | 16NM1A0404 | A SRAVYA SRI | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 6.33 | 8.33 | 8.33 | 23 | |
| : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| 192 | 17NM5A0427 | SHAIK FIRDOS | 3 | 2 | 3 | 5 | 5 | 5 | 6 | 6.67 | 5.67 | 6.67 | 19 | |
| 193 | 17NM5A0428 | SIKHA HEMASREE | 3 | 1 | 2 | 5 | 5 | 5 | 6 | 6.67 | 4.67 | 5.67 | 17 | |
| 194 | 17NM5A0429 | S KOUSAR | 1.5 | 4 | 2.5 | 5 | 5 | 5 | 4 | 4.50 | 7.00 | 5.50 | 17 | |
| 195 | 17NM5A0430 | TUMPALA LAVANYA | 5 | 3.5 | 0 | 5 | 5 | 5 | 3 | 7.67 | 6.17 | 2.67 | 17 | |
| 196 | 17NM5A0431 | V TANUJA | 4 | 1 | 1.5 | 5 | 5 | 5 | 4 | 7.00 | 4.00 | 4.50 | 16 | |
| 197 | 17NM5A0432 | V PRATHYUSHA | 5 | 5 | 3 | 5 | 5 | 5 | 9 | 9.67 | 9.67 | 7.67 | 27 | |
| REVISIED BLOOMS TAXONOMY | | | Remembering (R) | | | Analyzing (A) | | | | | Target | | 60% | |
| | | | Understanding (U) | | | Evaluating (E) | | | | | CO1 | CO2 | CO3 | |
| Question wise Max Marks | | | Applying (P) | | | Creating (C) | | | | | 10 | 10 | 10 | |
| | | | 5 | | | 5 | | | 5 | | 10 | 10 | 10 | |
| Level / Target | | | U | A | P | E | E | E | | 6 | 6 | 6 | | |
| CO / Number of students above Target 60% | | | CO1 | CO2 | CO3 | CO1 | CO2 | CO3 | | 134 | 134 | 109 | | |

| | Percentage of students attained the target | Attainment Level |
|-----|--|------------------|
| CO1 | 68.7% | 1 |
| CO2 | 68.7% | 1 |
| CO3 | 55.9% | 0 |

Fig. 3.2: Course evaluation sheet for Mid examination




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Total number of students attained the target for CO1 = 134

Percentage of students attained CO1= $134/195*100= 68.7\%$

From the attainment levels defined above, as the number of students attained >60%, the attainment level of CO1 is 1.

Total number of students attained the target for CO2=134

Percentage of students attained CO1= $134/195*100= 68.7\%$

From the attainment levels defined above, as the number of students attained >60%, the attainment level of CO2 is 1.

Total number of students attained the target for CO3=109

Percentage of students attained CO1= $109/195*100=55.9\%$

From the attainment levels defined above, as the number of students attained <60%, the attainment level of CO3 is 0.

A similar procedure is repeated for CO4, CO5 and CO6.

External Attainment:

Grades are given by the University for each individual student.

These grades haven ranges as:

Grade 'O': 90-100

Grade 'S': 80-89

Grade 'A': 70-79

Grade 'B': 60-69

Grade 'C': 50-59

Grade 'D': 40-49

Grade 'F': Fail

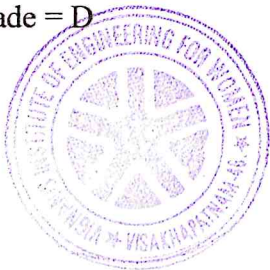
Considering the highest marks of the grades, the end exam marks for each student are calculated.


For example, for 16NM1A0402,

Mid1 marks = 12

Mid2 marks = 8

University grade = D




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Considering the highest marks for the grade 'D',

$$\begin{aligned}\text{The External marks} &= 49 - [80\% \text{ of Best (Mid 1 and Mid 2)} + 20\% \text{ of the remaining Mid}] \\ &= 49 - [0.8 * 12 + 0.2 * 8] = 37\end{aligned}$$

External marks for all the students are calculated and are tabulated as shown.

Target fixed for External examination: 40%

Total number of students: 197

Total absentees: 0

Total number of students attended the exam: 197

External comprises of 70M. Hence, the target marks will be 28M.

Total number of students attained the target for external examination= 175

Percentage of students attained = $175/197 * 100 = 88.87\%$

From the attainment levels defined above, as the number of students attained >80%, the attainment level for External examination is 3.




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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Course Evaluation

Program: *Electronics and Communication Engineering*
 Course Code: *C202*
 Course Name: *Switching Theory & Logic Design*

Year and Sem: *II-I*
 Course Coordinator: *Mrs. Ch. Anitha Bhavani*
 Course Faculty: *Ms.D.Sri Kanya, Ms. G.Arshini*
Mrs.S.Malathi

University Examination

Max Marks: 70M

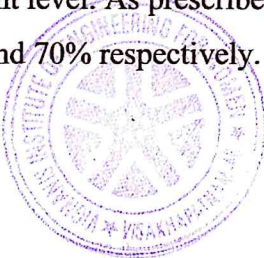
| S.No. | Reg. No. | Student Name | University Exam Grades | University Exam Marks | |
|-------|------------|-------------------------|------------------------|-----------------------|------|
| | | | | Grade conversion | 100M |
| 1 | 15NM1A0477 | MOKA SAI LAKSHMI | A | 79 | 59 |
| 2 | 15NM1A04F4 | N.RESHMA REDDY | F | 39 | 29 |
| 3 | 16NM1A0401 | A KAVITA RAO | F | 39 | 26 |
| 4 | 16NM1A0402 | ADARI LAKSHMI MADHURI | D | 49 | 37 |
| 5 | 16NM1A0403 | ADIREDDY V A PRATHYUSHA | S | 89 | 68 |
| : | : | : | : | : | : |
| : | : | : | : | : | : |
| : | : | : | : | : | : |
| : | : | : | : | : | : |
| : | : | : | : | : | : |
| 192 | 17NM5A0427 | SHAIK FIRDOS | C | 59 | 40 |
| 193 | 17NM5A0428 | SIKHA HEMASREE | A | 79 | 63 |
| 194 | 17NM5A0429 | SYED NAYEEMA KOUSAR | C | 59 | 41 |
| 195 | 17NM5A0430 | TUMPALA LAVANYA | D | 49 | 33 |
| 196 | 17NM5A0431 | VEERLAPATI TANUJA | A | 79 | 61 |
| 197 | 17NM5A0432 | VOLETI AMAL PRATHYUSHA | A | 79 | 53 |

| | |
|--|-------|
| Target | 40% |
| Number of students attended | 197 |
| No. of students attained the target | 175 |
| Percentage of students attained target | 88.8% |
| University Exam Attainment level | 3 |

Fig. 3.3: Course evaluation sheet for the University examination

The final course attainment is calculated as shown.

The average of attainment levels of CO1, CO2, CO3, CO4, CO5 & CO6 give the internal attainment level. As prescribed by the University, the weightage for internal and external is 30% and 70% respectively.



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| <u>Course Attainment Calculation</u> | | | | | | |
|--------------------------------------|-------|--------|-------------|------------|------------------------------|------|
| Direct Attainment | | | | | Indirect Attainment | |
| | Mid-I | Mid-II | Internal | University | Students Feedback | |
| CO1 | 1 | | 1 | 3 | CO1 | 2.87 |
| CO2 | 1 | | 1 | 3 | CO2 | 2.78 |
| CO3 | 0 | | 0 | 3 | CO3 | 2.84 |
| CO4 | | 0 | 0 | 3 | CO4 | 2.77 |
| CO5 | | 2 | 2 | 3 | CO5 | 2.77 |
| CO6 | | 0 | 0 | 3 | CO6 | 2.84 |
| Average | | | 0.67 | 3 | Final Indirect Attainment | 2.81 |
| Weightage | | | 30% | 70% | | |
| Attainment | | | 0.2 | 2.1 | | |
| Final Direct Attainment | | | 2.3 | | | |
| Weightage | | | 80% | | 20% | |
| Attainment | | | 1.84 | | 0.562 | |
| Course Attainment | | | 2.40 | | | |

Fig. 3.4: Calculation of course attainment

Direct attainment:

Internal attainment=0.67

External attainment=3

Direct attainment (DA) =0.3*Internal attainment +0.7*External attainment = 0.2 + 2.1 = 2.3

Indirect attainment:

Feedbacks are collected from the students on the course outcomes. This is to know how far the students are aware of the outcomes and gained the knowledge regarding these outcomes. All the feedbacks are consolidated in a sheet as shown below and the average of all these feedbacks with respect to the course outcomes is calculated. Through this indirect attainment is calculated.

Course attainment:

Course attainment= 80% of direct attainment + 20% of indirect attainment=80% of 2.3+20% of 2.81=2.40

3.4. Laboratory attainment

The process of assessment through marks includes:

1. Internal marks (25M)
2. External marks (50M)




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3. Course end survey on the respective course outcomes

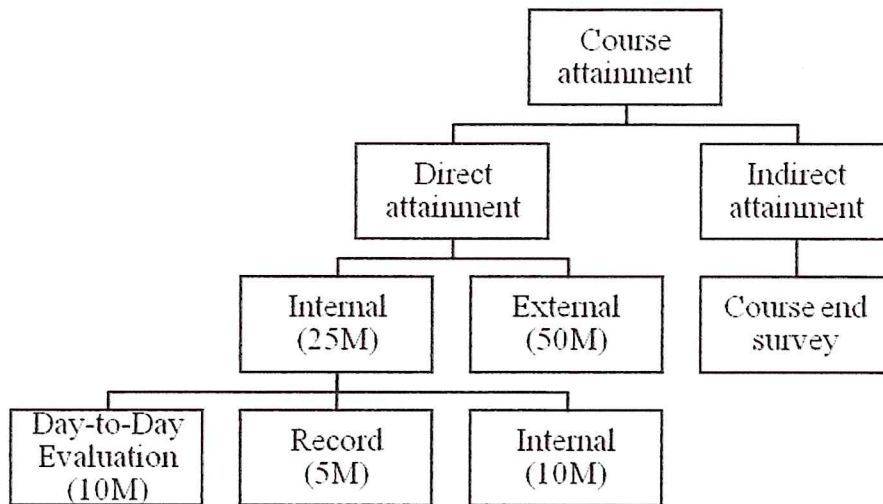


Fig. 3.5: Process of assessment for laboratory course

3.4.1. Internal marks (25M)

The internal marks for labs are divided into three parts, day-day evaluation, record and internal exam.

a. Day to day evaluation with 10M

The students are regularly monitored with respect to the preparation towards the experiments of the lab. Based on the daily viva, completion of the experiment etc. marks is allotted.

b. Record with 5M

The completed experiments/programs in the lab are recorded and are filed in records. On the basis of quality of record preparation and in time submission the marks are allotted.

c. Internal exam with 10M

Internal exam at the end of the course is conducted where the questions are given based on the experiments/programs reflecting the course outcomes.

3.4.2. External marks (50M)

External exam at the end of the course is conducted where the questions are given based on the experiments/programs reflecting the course outcomes. The exam is conducted in the presence of an external examiner appointed by the University. The University allots grades and based on the grades the end marks are extracted.



3.4.3. Course end survey

A survey similar to that of described in Sec.3.3.3 is conducted on the outcomes of laboratory and indirect assessment is evaluated.

The following is the rubrics followed for internal assessment of the laboratory for Day to Day evaluation.

| Metrics/ Attributes | Excellent (2M) | Good (1M) | Weak (0.5M) | Score |
|----------------------|--|--|-------------------------------------|-------|
| Laboratory skills | Active participation. Good team work. | Active participation. Lack in team work. | No active participation. | |
| Pre-Preparation | Good basics. Correlate practically. | Good basics. Unable to correlate practically. | No prior preparation. | |
| Experiment Knowledge | Experimented successful. Clear with results. | Experimented successful. Not clear with results. | Experiment is partially successful. | |
| Interpersonal Skills | Good Time Management | Partial Time Management | Poor Time Management | |
| Subsistence | Regular to lab. Submissions on time. | Regular to lab. Submissions not on time. | Irregular to lab. | |
| Total | | | | |

Table 3.1: Rubrics for laboratory

3.4.4. Procedure for calculating attainment


1. Post the values of day to day evaluation, record and internal marks for each student.
2. Based on the weightage of the CO with respect to number of experiments, marks for each CO is calculated.
3. Fixing the target, total number of students achieved the target is counted.
4. Attainment level for each CO is based on the percentage of students achieved the target.

The marks for CO1 are calculated as follows:

$$\text{Marks for CO1} = (R + I) * \frac{E_1}{E} + \frac{\text{Sum of DD for CO1}}{E}$$

Where R is record marks




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I is Marks obtained in Internal Examination

E is the number of Experiments

E1 is the number of experiments related to CO1

E2 is the number of experiments related to CO2

E3 is the number of experiments related to CO3

DD is the day-to-day evaluation.

The same process is applied for the remaining course outcomes.

Attainment calculation for a lab course is described below:

A course from second year, C207, *Electronic Device and Circuits Lab*, is considered as example. Course attainment involves direct attainment (DA) and indirect attainment (IA). Direct attainment comprises of day to day evaluation, record marks, marks obtained in lab internal examinations and marks obtained in Lab External examination.

Internal Attainment:

Number of experiments as per the University requirement, $E = 10$.

Number of experiments covering CO1, $E_1 = 5$.

Number of experiments covering CO2, $E_2 = 2$.

Number of experiments covering CO3, $E_3 = 3$.

For 16NM1A0401, for CO1,

$$\text{Sum of DD for CO1} = 7 + 6 + 7 + 6 + 7 = 33$$

$R = 2, I = 9$.

$$\begin{aligned} \text{Marks for CO1} &= (R + I) * \frac{E_1}{E} + \frac{\text{Sum of DD for CO1}}{E} \\ &= (2 + 9) * \frac{5}{10} + \frac{33}{10} = 8.8 \end{aligned}$$


For 16NM1A0401, for CO2,

$$\text{Sum of DD for CO2} = 6 + 6 = 12$$

$R = 2, I = 9$.

$$\begin{aligned} \text{Marks for CO2} &= (R + I) * \frac{E_1}{E} + \frac{\text{Sum of DD for CO2}}{E} \\ &= (2 + 9) * \frac{2}{10} + \frac{12}{10} = 3.4 \end{aligned}$$




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External Attainment:

Target fixed for External examination = 40%

Number of students attended = 197

Number of students attained the target = 197

Percentage of students attained = $197/197 * 100 = 100.0\%$

From the attainment levels defined above, as the number of students attained > 80%, the attainment level for external examination is 3.

The final course attainment is calculated as shown.

Course Attainment Calculation

| | Direct Attainment | | Indirect Attainment | |
|-------------------------|-------------------|------------|---------------------------|------|
| | Internal | University | Students Feedback | |
| CO1 | 3 | 3 | CO1 | 2.57 |
| CO2 | 3 | 3 | CO2 | 2.87 |
| CO3 | 3 | 3 | CO3 | 3.00 |
| Average | 3.00 | 3 | Final Indirect Attainment | 2.40 |
| Weightage | 1/3 | 2/3 | | |
| Attainment | 1 | 2 | | |
| Final Direct Attainment | 3 | | | |
| Weightage | 80% | | 20% | |
| Attainment | 2.4 | | 0.48 | |
| Course Attainment | 2.88 | | | |

Fig. 3.7: Calculation of course attainment for lab

Direct attainment:

Internal attainment = 3

External attainment = 3

Direct attainment (DA) = $1/3 * \text{Internal attainment} + 2/3 * \text{External attainment} = 1/3 * 1 + 2/3 * 3 = 3$

Indirect attainment:

Feedbacks are taken on the course outcomes. The average of the outcomes is calculated.

The consolidated average gives the *indirect attainment*.

Course attainment:

Course attainment = 80% of DA + 20% of IA
 $= 0.8 * 3 + 0.2 * 2.40 = 2.88$

Based on the average of all the feedbacks given by the students on the course outcomes



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3.5. Seminar attainment

Seminar is allotted with 50M. A panel is arranged with the coordinator and senior faculties. Each student has to give her own presentation in front of the panel. Student will be evaluated based on the following points:

- Selection of the topic
- Presentation skills
- Viva
- Quality of seminar document.

This evaluation is covered based on three outcomes.

CO1: Identify advanced technologies in various technical areas.

CO2: Express the ideas as an individual and enhance the written communication skills with ethical values.

CO3: Predict the impact of the engineering solutions in societal and environmental contexts.

The following shows the rubrics followed for the seminar evaluation

| Metrics | Excellent 9-10 | Very Good 7-8 | Good 5-6 | Average 0-4 | Score |
|----------------------------|--|--|---------------------------------|------------------------|-------|
| Topic Selection | Technically exception | Technically effective | Technically understanding | Not properly mentioned | |
| Documentation | Excellent material. Neat format. | Good material. Neat format. | Fair material. Neat format. | Content is not related | |
| Presentation Skills | Presentation is excellent. Good sequence. | Presentation is interesting. Good sequence. | Good sequence | Clumsy to call. | |
| | Exceptionally explained. | Presented in a good way. | May present in a better way | Need to improve. | |
| Questionnaire | Attempted all. | Attempted all except one/two | Attempted all except three/four | Attempted only basics. | |
| Total Marks | | | | | |

Table 3.2: Rubrics for seminar



3.5.1. Direct attainment

The marks for seminar are split into 3 parts:

a. Documentation(15M)

The student identifies advanced technologies and has to prepare a documentation imparting their ideas. This increases their writing skills and the way of expressing their ideas.

b. Presentation(20M)

The student has to justify their topic selected for the presentation. They have to relate their presentation towards societal and environmental contexts.

c. Viva(15M)

Based on the topic and the presentation, students have to justify and defend the questionnaires asked. This improves the knowledge of the students on the basics.

3.5.2. Course end survey

Feedback is taken on seminar based on: Enhancement of communication skills, idea of selecting technical topics, technology related to societal needs, etc.

3.5.3. Procedure for calculating attainment

1. Post the values of presentation, documentation and viva for each student.
2. Based on these marks, for each CO is evaluated.
3. Fixing the target, total number of students who achieved the target is counted.
4. Attainment level for each CO is based on the percentage of students achieved the target.

3.6. Project attainment

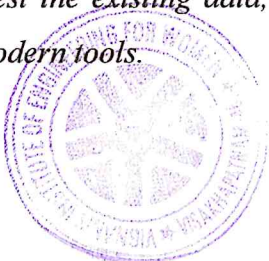
The process of assessment through marks includes:

1. Internal marks (60M)
2. External marks (140M)
3. Course end survey on the respective course outcomes

Outcomes for project are as defined:

CO1: Formulate and apply mathematical, science and engineering principles to solve real time engineering problems.

CO2: Test the existing data, communicate and conduct research on complex problems using modern tools.



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CO3: Validate the obtained results on contemporary issues related to society and environment.

CO4: Determine effectively the engineering principles used in their project individually and as a team as per the norms of engineering practice.

CO5: Structure future work to promote life-long learning in the context of technological adaptation.

3.6.1. Internal marks (60M)

The internal marks are split into two reviews: Project Review Committee (PRC1) and Project Review Committee (PRC2).

Project Review Committee (PRC1) (30M):

This review is based on the technical knowledge, presentation skills and the contribution of students regarding the project. The following table shows the parameters, distribution of marks based on the course outcomes.

| | Parameters | Outcomes | Marks |
|------|--------------------------------|----------|-------|
| PRC1 | Technical Knowledge | CO1 | 10M |
| | Presentation Skills | CO2 | 5M |
| | Quality of work & Contribution | CO3 | 10M |
| | | CO4 | 5M |

Table 3.3: Assessment tools for PRC1

The rubrics followed in the evaluation of the marks for every student is as shown for PRC1. The table represents the allocation of internal marks.

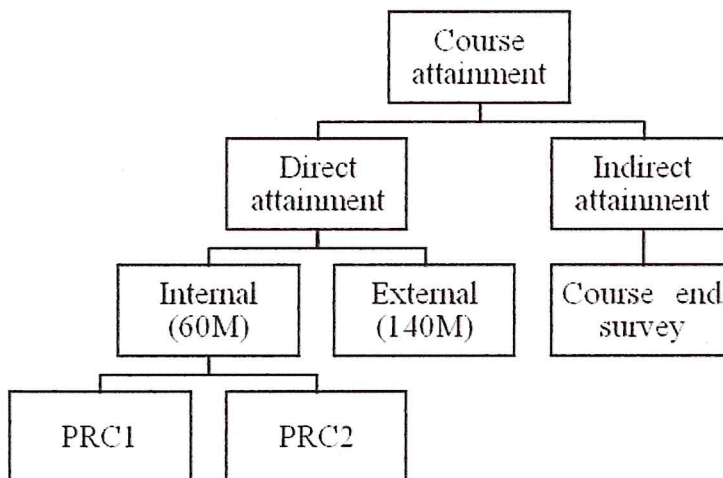



Fig. 3.8: Process of assessment for Project




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The rubrics followed in the evaluation of the marks for every student is as shown for PRC1. The table represents the allocation of internal marks.

| Metrics | Excellent 5 | Very Good 4 | Good 3 | Average 2 | Score |
|----------------------------|--|--|--|---|-------|
| Project Description | Detail procedure. Relevant data for their work. | Good procedure. Relevant data for their work. | Fair procedure. Relevant data for their work. | Not relevant to the work | |
| Technical Knowledge | Content explained exceptionally | Content explained effectively | Content explained in moderate way. | Content is not related | |
| Presentation Skills | Good demonstration and answered all questions | Good demonstration and answered few questions | Good demonstration and answered few questions | Good demonstration and answered basic questions | |
| Contributions | Good participation. Can explain the proposed work. | Fair participation. Can explain the proposed work. | Moderate participation. Can explain the proposed work. | No clear idea and cannot explain their project. | |
| Quality of the work | Execute the work with highest quality | Execute work with high quality. | Need to check to ensure the quality. | Need to revise the work to ensure quality. | |
| Total Marks | | | | | |

Table 3.4: Rubrics for PRC1


Project Review Committee (PRC2) (30M):

This review is based on the technical knowledge, presentation skills, results, coding and future scope of the project. The following table shows the distribution of marks based on the course outcomes.

| | Parameters | Outcomes | Marks |
|------|--------------------------------|----------|-------|
| PRC2 | Presentation Skills | CO2 | 10M |
| | Quality of work & Contribution | CO3 | 5M |
| | | CO4 | 10M |
| | Future Scope | CO5 | 5M |

Table 3.5: Assessment tools for PRC2




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The rubrics followed in the evaluation of the marks for every student is as shown for PRC2. The table represents the allocation of internal marks.

| Metrics | Excellent 7-10 | Good 5-6 | Average 0-4 | Score |
|-------------------------------------|--|---|--|-------|
| PRC-1 Remarks | Suggestions were considered and improved | Suggestions are considered but partially implemented | Need to improve as per the suggestions given in PRC-1 | |
| Overall Presentation | The proposed work is presented in a systematic way with improved skills. | The proposed work is presented in a systematic way but need to improve the communication skills | The proposed work is presented but need to improve presentation skills | |
| Results & Conclusion | Results are relevant and concluded | Results are relevant but need to improve the conclusion | Results are obtained but need to conclude clearly. | |
| Total | | | | |

Table 3.6: Rubrics for PRC2

3.6.2. External marks (140M)

External project reviews are conducted in the presence of external examiner which is based on complete project review with design, simulation, results etc. These on a whole produce direct attainment. Course end surveys are taken for indirect attainment

3.6.3. Course end survey

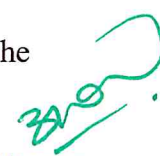
A survey similar to that of described in Sec.3.3.3 is conducted on the outcomes of project and indirect assessment is evaluated.

3.6.4. Procedure for calculating attainment

1. Post the marks for all the parameters related to all COs.
2. Marks of the respective COs for each individual student are added.
3. Fixing the target, total number of students achieved the target is counted.
4. Attainment level for each CO is based on the percentage of students achieved the target.

The following shows a template for project attainment.




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PROJECT INTERNAL MARKS

| S.No. | Reg. No. | Name of the Student | PRC-1 | | | | | PRC-2 | | | | | Total | Marks obtained | | | | | |
|-------|-------------|-------------------------|---------------------|---------------------|---------------------|--------------|-----------------|--------|---------------------|-----|----------------------|---------|-------|---------------------|-------|-------|-------|-------|-------|
| | | | Project Description | Technical Knowledge | Presentation Skills | Contribution | Quality of work | Result | PRC-1 Justification | | Overall Presentation | Results | | Result verification | CO1 | CO2 | CO3 | CO4 | CO5 |
| | | | CO1 | CO1 | CO4 | CO2 | CO3 | CO5 | CO2 | CO3 | CO4 | CO5 | | CO5 | 5M | 5M | 5M | 5M | 5M |
| 1 | 14NMI1A0481 | Pathivada Sai Priyanka | 5 | 2 | 2 | 2 | 3 | 5 | 4 | 4 | 6 | 3 | 2 | 38 | 7.00 | 6.00 | 7.00 | 8.00 | 10.00 |
| 2 | 15NMI1A0477 | Moka Sai Lakshmi | 5 | 5 | 4 | 4 | 5 | 5 | 5 | 5 | 9 | 4 | 4 | 55 | 10.00 | 9.00 | 10.00 | 13.00 | 13.00 |
| 3 | 16NMI1A0401 | A Kavita Rao | 5 | 5 | 3 | 2 | 5 | 5 | 4 | 6 | 8 | 4 | 3 | 50 | 10.00 | 6.00 | 11.00 | 11.00 | 12.00 |
| 4 | 16NMI1A0402 | Adani Lakshmi Madhavi | 5 | 3 | 3 | 3 | 4 | 5 | 4 | 4 | 7 | 4 | 3 | 45 | 8.00 | 7.00 | 8.00 | 10.00 | 12.00 |
| 5 | 16NMI1A0403 | Adireddy V A Prathyusha | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 10 | 5 | 4 | 58 | 10.00 | 10.00 | 10.00 | 14.00 | 14.00 |
| : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| 190 | 17NMI5A0427 | Shak Firdos | 5 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 8 | 4 | 4 | 51 | 9.00 | 8.00 | 9.00 | 12.00 | 13.00 |
| 191 | 17NMI5A0428 | Sikha Hemasree | 5 | 4 | 3 | 3 | 5 | 4 | 5 | 5 | 8 | 4 | 3 | 49 | 9.00 | 8.00 | 10.00 | 11.00 | 11.00 |
| 192 | 17NMI5A0429 | Syed Nayema Kousar | 5 | 3 | 3 | 3 | 5 | 5 | 4 | 5 | 8 | 4 | 4 | 49 | 8.00 | 7.00 | 10.00 | 11.00 | 13.00 |
| 193 | 17NMI5A0430 | Tumpala Lavanya | 5 | 3 | 4 | 3 | 5 | 4 | 5 | 4 | 8 | 4 | 4 | 49 | 8.00 | 8.00 | 9.00 | 12.00 | 12.00 |
| 194 | 17NMI5A0431 | Veerlapati Tanuja | 5 | 5 | 5 | 3 | 4 | 5 | 5 | 5 | 8 | 4 | 4 | 53 | 10.00 | 8.00 | 9.00 | 13.00 | 13.00 |
| 195 | 17NMI5A0432 | Veleti Anil Prathyusha | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 10 | 5 | 4 | 58 | 10.00 | 10.00 | 10.00 | 15.00 | 13.00 |

| | | |
|-------------------------------------|-------------------|----------------|
| BLOOMS TAXONOMY | Remembering (R) | Analyzing (A) |
| | Understanding (U) | Evaluating (E) |
| | Applying (P) | Creating (C) |
| Question wise Max Marks | | |
| Target | | |
| Number of students above Target 60% | | |

| | | | | |
|-----|-----|-----|-----|-----|
| CO1 | CO2 | CO3 | CO4 | CO5 |
| 10 | 10 | 10 | 15 | 15 |
| 6 | 6 | 6 | 9 | 9 |
| 195 | 195 | 195 | 194 | 195 |

| | Percentage of students attained the target | Attainment Level |
|-----|--|------------------|
| CO1 | 1772.7% | 3 |
| CO2 | 1772.7% | 3 |
| CO3 | 1772.7% | 3 |
| CO4 | 1763.6% | 3 |
| CO5 | 1772.7% | 3 |

Fig.3.9: Attainment for project



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PO/PSO ATTAINMENT

4.1. Assessment tools for calculation of PO/PSO

The attainment procedure of Program Outcomes comprises direct and indirect assessments. The direct assessment is a process of calculating direct attainment through the marks obtained by the students in all the courses. Indirect assessment is a process of collecting feedbacks from stake holders on the program outcomes

Attainment tools for calculation of POs/PSOs:

The tools for the calculation of attainments are:

- Course attainments of all the courses for a complete batch
- Correlation matrix for all the courses.
- Results of surveys conducted which add indirect attainment in the calculation

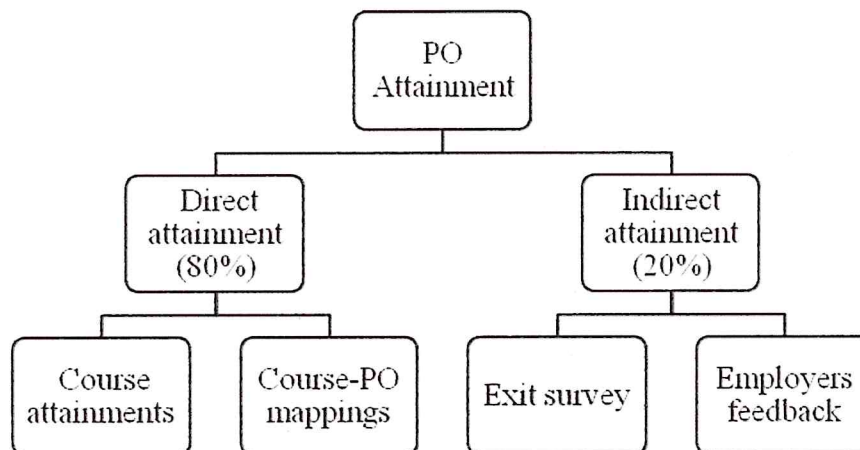


Fig. 4.1: Assessment tools for Program Outcome attainment calculation

4.2. Direct attainment

The direct attainment of program outcomes is calculated as follows:

1. Calculate the Course_PO attainment for all the courses with the help of Course-PO mapping as shown in Sec. 2.3, table using the formula

$$\text{Course_PO attainment} = \frac{(\text{Course_PO mapping}) * (\text{Course attainment})}{3}$$

2. The average of all the Course_PO attainments gives the direct PO attainment.



The detailed procedure is explained with an example of course, *Switching Theory and Logic Design, C202*. The average of mappings of all the outcomes gives the Course-PO mapping of *Switching Theory and Logic Design*.

Course attainment for C202 = 2.40

From the CO-PO mapping table,

Course mapping with PO1

= average of (CO1, CO2, CO3, CO4, CO5, CO6) for PO1

$$= \frac{3 + 3 + 3 + 3 + 3 + 2}{6} = 2.83$$

Course attainment with PO1

$$= \frac{(\text{Course_PO mapping}) * (\text{Course attainment})}{3}$$

$$= \frac{2.83 * 2.65}{3} = 2.50$$

| CO-PO/PSO Mapping and Attainment | | | | | | | | | | | | | | |
|---|------|------|------|------|------|-----|-----|------|------|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 2 | 2 | 2 | - | 2 | - | - | - | 2 | 2 | - | - | | 2 |
| CO2 | 2 | 2 | - | - | - | - | - | - | 3 | - | - | 3 | - | 2 |
| CO3 | 2 | 2 | 2 | - | - | - | - | - | 3 | - | 2 | 2 | - | - |
| CO4 | 2 | 2 | 3 | - | - | - | - | - | 2 | 1 | 2 | 2 | 3 | - |
| CO5 | 2 | 2 | 2 | 2 | 1 | - | - | 2 | 3 | - | 2 | 3 | 3 | - |
| CO6 | 3 | 3 | 3 | - | 2 | - | - | - | 3 | 2 | 1 | 3 | - | - |
| Course - PO Mapping | 2.17 | 2.17 | 2.40 | 2.00 | 1.67 | - | - | 2.00 | 2.67 | 1.67 | 1.75 | 2.60 | 3.00 | 2.00 |
| Course - PO Attainment | 1.73 | 1.73 | 1.92 | 1.60 | 1.33 | - | - | 1.60 | 2.14 | 1.33 | 1.40 | 2.08 | 2.40 | 1.60 |


Fig. 4.2: Course-PO attainment calculation

Similar procedure is followed all the POs. This gives the Course-PO attainment for a course.

Following similar procedure, the Course-PO attainments for all the courses are calculated. The attainments thus calculated are tabulated as shown in Fig. 4.3. The averages of all courses with respect to Program Outcomes are calculated.

Overall attainment procedure is shown in Fig. 4.3.




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4.3. Indirect attainment

Surveys are conducted on Program Outcomes. Feedbacks are taken from the students at the end of the program and employers (to a small extent). Opinions of these stakeholders are collected in a grading scale of 3 (Substantial or High) to 1 (Slight or Low). Average of all the feedbacks given by the stake holders is considered to be indirect attainment values.

Program exit survey:

Questionnaires are framed by the Program Coordinator on the program outcomes (PO) and program specific outcomes (PSO) and are duly submitted to the PAQIC. At the end of the program, students are asked to give feedback on POs and PSOs.

The consolidated average of the feedbacks for the respective program outcomes is calculated.

Employer's feedback:

Questionnaires are framed on program outcomes and feedback on the quality of students is taken.

The consolidated average of the program exit survey and employer's feedback results in the indirect attainment.

PO attainment calculation:

$$\text{PO Attainment} = 80\% \text{ Direct Attainment} + 20\% \text{ Indirect Attainment}$$

A similar procedure is followed for the calculation of PSO attainment.



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|  VIGNAN'S INSTITUTE OF ENGINEERING FOR WOMEN Kapujaggarajupeta , VSEZ (P.O), Visakhapatnam -530 049 .A.P DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING | | | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|------|------|------|
| COURSE - PO ATTAINMENT for 2016-20 Batch | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| C101 | - | - | - | - | - | 1.99 | 1.99 | 1.99 | 1.99 | 2.56 | 2.13 | 2.56 |
| C102 | 2.40 | 2.40 | 2.40 | 2.40 | - | 2.40 | 2.00 | 2.00 | - | - | 2.00 | 2.40 |
| : | : | : | : | : | : | : | : | : | : | : | : | : |
| : | : | : | : | : | : | : | : | : | : | : | : | : |
| C201 | 1.89 | 1.89 | 1.62 | 1.62 | 2.02 | 1.21 | - | - | - | - | - | 1.35 |
| C202 | 1.69 | 1.69 | 1.72 | 2.15 | 2.09 | - | - | - | - | - | - | 2.03 |
| : | : | : | : | : | : | : | : | : | : | : | : | : |
| : | : | : | : | : | : | : | : | : | : | : | : | : |
| C301 | 2.40 | 2.26 | 2.38 | 2.26 | - | 2.12 | - | 1.70 | 1.70 | - | 2.26 | 1.70 |
| C302 | 2.18 | 2.05 | 2.15 | 2.05 | 2.05 | - | - | - | 1.54 | - | - | 1.73 |
| : | : | : | : | : | : | : | : | : | : | : | : | : |
| : | : | : | : | : | : | : | : | : | : | : | : | : |
| C401 | 2.41 | 2.26 | 2.16 | 2.48 | - | 1.35 | - | - | - | - | - | 2.10 |
| C402 | 2.43 | 2.43 | 2.26 | 2.02 | 2.43 | - | - | - | 1.62 | - | - | 1.94 |
| : | : | : | : | : | : | : | : | : | : | : | : | : |
| : | : | : | : | : | : | : | : | : | : | : | : | : |
| Direct attainment (DA) | 2.44 | 2.37 | 2.35 | 2.32 | 2.34 | 2.12 | 2.15 | 2.21 | 2.13 | 2.20 | 2.22 | 2.18 |
| Indirect attainment (IA) | 2.65 | 2.85 | 2.90 | 2.95 | 2.90 | 2.80 | 2.75 | 2.45 | 2.85 | 2.65 | 2.35 | 2.65 |
| 80% of DA | 1.96 | 1.90 | 1.88 | 1.86 | 1.87 | 1.69 | 1.72 | 1.77 | 1.71 | 1.76 | 1.78 | 1.74 |
| 20% of IA | 0.53 | 0.57 | 0.58 | 0.59 | 0.58 | 0.56 | 0.55 | 0.49 | 0.57 | 0.53 | 0.47 | 0.53 |
| PO Attainment | 2.49 | 2.47 | 2.46 | 2.45 | 2.45 | 2.25 | 2.27 | 2.26 | 2.28 | 2.29 | 2.25 | 2.27 |

Fig. 4.3: Calculation of Program Outcome attainment




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