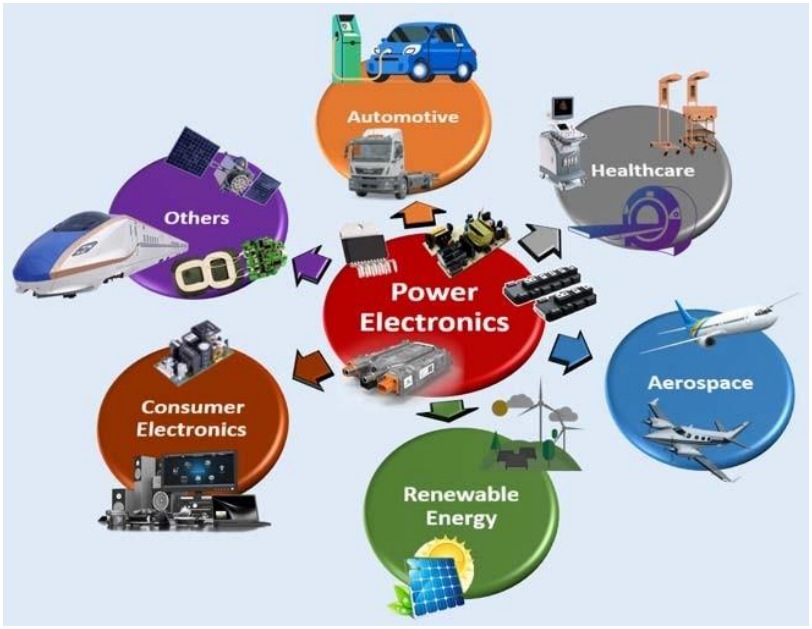
OUTCOME BASED EDUCATION

&

ACCREDITAT



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DEPARTMENT OF

ELECTRICAL AND ELECTRONICS ENGINEERING

M.TECH. – POWER ELECTRONICS

GOKARAJU RANGARAJU

Institute of Engineering and Technology

(Autonomous)

OUTCOME BASED EDUCATION
&
ACCREDITATION

Department of
Electrical and Electronics Engineering

M Tech. Power Electronics

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous Institute under JNTU Hyderabad)
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CONTENTS

Introduction to Outcome Based Education and Accreditation

"Outcomes Based Education" (OBE) of Engineering qualifications gives recognition to graduates for the knowledge, skills and attitudes/behaviors they have acquired upon just completion of a programme and after 4 to 5 years of graduation. This system focuses on the Objectives and Outcomes of the Programme and requires evidence of measurement and attainment of Objectives and Outcomes.

Outcome Based Accreditation (OBA) is an Assessment of the Performance of the Program/Institution as per the Accreditation Criteria defined in terms of Objectives, Outcomes and other key Constituents.

Outcome Based Curriculum (OBC) is prepared keeping in mind that what the student should be able to do at end of the Programme.

Outcome Based Learning &Teaching (OBLT) methods are developed to make the student achieve the Outcomes.

Outcome Based Assessments (OBA) methods are designed to measure what the student has achieved at end of the Programme in terms of Knowledge, Skills, and Attitude/Behavior.

Key Constituents of OBE The Key Constituents of OBE are Vision, Mission, Programme Educational Objectives (PEO), Programme Outcomes (PO), Graduate Attributes (GA), Course Objectives (COB), Course Outcomes (CO), Assessments, Rubrics, Mapping, Evaluation and Grading.

Accreditation

It is an Assessment of the Performance of the Program/Institution as per the Accreditation Criteria. It is an assurance that a Program or Institution meets established quality standards. Accreditation assures quality.

- It is a peer review process that assures the quality of post-secondary education students receive.
- Educational institutions or program volunteer to undergo this review periodically to determine if certain criteria are being met.

- It is important to understand that accreditation is not a ranking system. It is simply assurance that a program or institution meets established quality standards.
- There are two types of accreditation- Institution and Program.
- Institutional accreditation evaluates overall institutional quality. One form of institutional accreditation is accreditation of Colleges and Universities. (National Assessment & Accreditation Council-NAAC under UGC)
- Program accreditation examines specific program of study rather than institution as a whole. (National Board of Accreditation-NBA under AICTE)

Importance and Significance of Accreditation

- To make the institute/department/program aware of the weaknesses of the program offered by it and act on suggestions for improvement.
- To encourage the institute to move continuously towards the improvement of quality of its program, and the pursuit of excellence.
- To facilitate institutions for updating themselves in program curriculum, teaching and learning processes, faculty achievements students' skills/abilities/knowledge.
- To excel among stakeholders (students, faculty, alumni, employers, industries, government, regulators, management, etc.)
- To facilitate receiving of grants from Government regulatory bodies and institutions/agencies.
- To attain international recognition of accredited degrees awarded.
- To facilitate the mobility of graduated students and professionals.

Quality Assurance through Accreditation

Achieving Excellence through Accreditation

"Quality Costs Money, Quality Brings Money" Quote **by Dr. V. V. Rao**

ROLE OF WASHINGTON ACCORD ON ACCREDITATION Washington Accord

The Washington Accord Agreement recognizes that

"Accreditation of engineering ac academic programs is a key foundation for the practice of engineering at the professional level in each of the countries or territories covered by the Accord."

The Washington Accord was sign in 1989.It is an agreement between the bodies responsible for accrediting professional engineering degree programs in each of the signatory countries. It recognizes the substantial equivalency of programs accredited by those bodies and recommends that graduates of accredited programs in any of the signatory countries be recognized by the other countries as having met the academic requirements for entry to the practice of engineering. The Washington Accord covers professional engineering undergraduate degrees. Postgraduate-level programs are not covered by the Accord. The Washington Accord Agreement applies only to accreditations conducted by the signatories within their respective national or territorial boundaries.

Agreements covering qualifications in engineering

There are three agreements covering mutual recognition in respect of qualification in engineering:

The Washington Accord signed in 1989 was the first -it recognises substantial equivalence in the accreditation of qualifications in professional engineering, normally of four years duration.

The Sydney Accord signed in 2001 and recognises substantial equivalence in the accreditation of qualifications in engineering technology, normally of three years duration.

The Dublin Accord signed in 2002 and recognises substantial equivalence in the accreditation of qualifications in technician engineering, normally of two years duration.

The Washington Accord pertains to engineering programs accredited by its signatories within their respective jurisdiction starting in 1989. There are 15 Signatories to the Washington Accord as on today. Signatories to the Washington Accord are organizations responsible for accrediting engineering programs in Australia, Canada, Ireland, New Zealand, the United Kingdom, and the United States (1989); Hong Kong (1995), South Africa (1999), Japan (2005), Singapore (2006),
Korea, Chinese Taipei (2007), Malaysia (2009), Turkey (2011), Russia (2012). Signatories have full rights of participation in the Accord.

Washington Accord Agreement states:

- Accreditation criteria, policies and procedures of the signatories have been verified comparable
- Accreditation decisions made by one signatory are acceptable to the other signatories
- Recognition applies only to accreditations conducted within the signatory's national or territorial boundaries.
- Mutual recognition of accredited engineering programs
- Benchmarking standards for engineering education
- Graduate Attributes (GA) represent the generally agreed reference for accredited programs
- Bench marking accreditation policies and processes

The Signatories will identify and encourage the implementation best practice for the academic preparation of engineers.

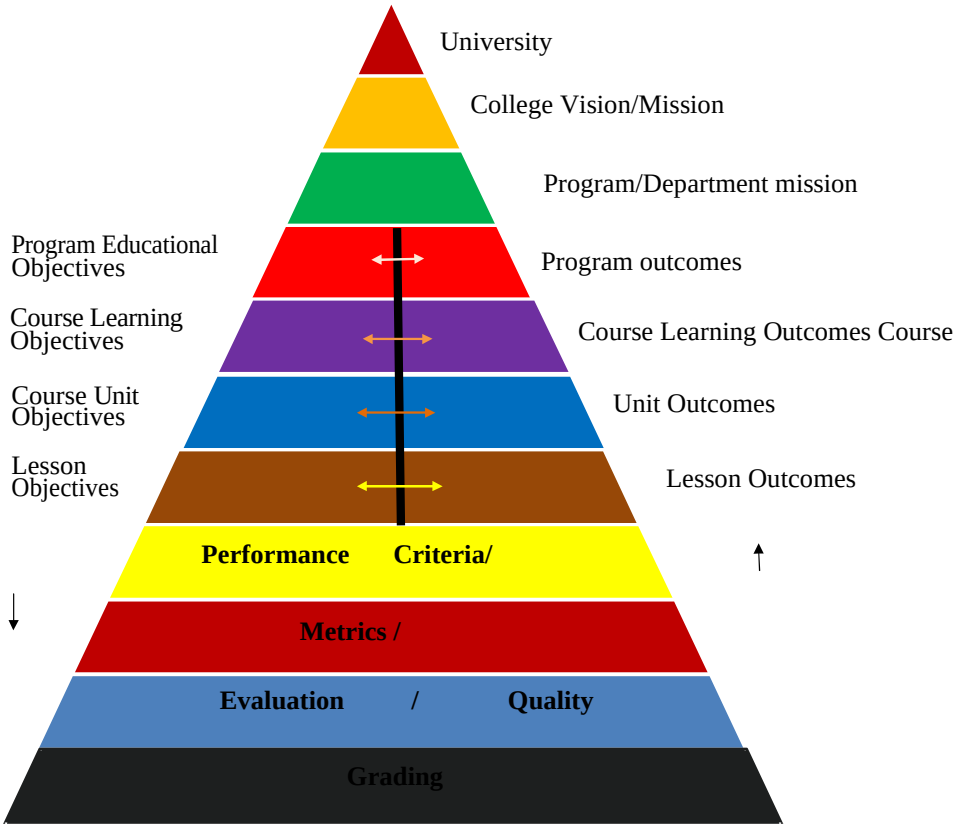
by mutual monitoring regular communication and sharing of information: accreditation criteria, systems, procedures, manuals, publications list of accredited programs; invitations to observe accreditation visits; and invitations to observe meetings of any boards.

"Getting into Washington Accord is like getting into the UN Security Council,"

Organizations holding provisional status have been identified as having qualification accreditation or recognition procedures that are potentially suitable for the purposes of the Accord; those organizations are further developing those procedures with the goal of achieving signatory status in due course; qualifications accredited or recognized by organizations holding provisional status are not recognized by the signatories:

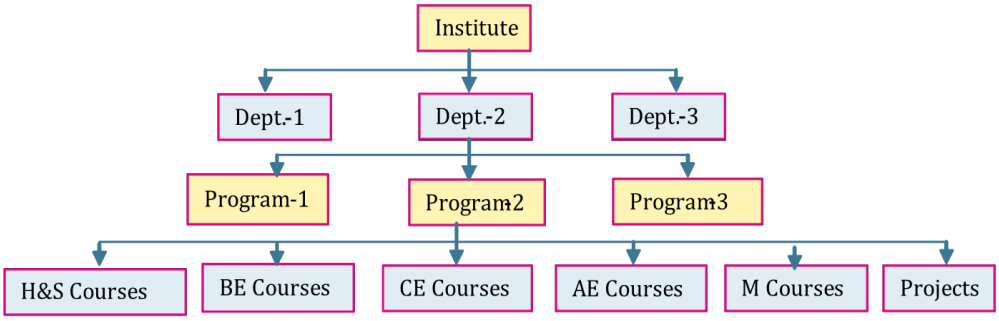
Outcome Based Education (OBE) Pyramid

The OBE Pyramid shown below presents a pictorial clarification of the hierarchical relationships among several different terminologies such as “vision”, “mission”, “goals”, “objectives”, “outcomes”, etc. That appears in Assessment Plan.



Institute and Courses Relationship

An Institute may have several Departments such as Mechanical Engineering, Electrical & Electronics Engineering, Electronics& Communication Engineering, Computer Science Engineering, etc. Each Department may be conducting several Programs such as B.Tech in any Engineering, M.Tech in any Engineering, Diploma and Certificate programs. Each Program may have of several Courses such as shown in the flow diagram below. Each course has a syllabus with its contents.



H&S – Humanities & Sciences, BE – Basic Engg., CE – Core Engg., AE – Allied Engg., M - Management

Definitions

Vision

A vision statement is a mental big picture idea of what you want to accomplish or achieve. The vision statement should be concise and easy to remember.

Because it is easy to remember, it is easy for everyone in the organization to focus on the vision. When people focus on the vision, their daily activities are automatically directed towards achieving the vision.

University Vision

To enable, nurture and produce employable professional graduates from the JNTUH affiliated college system useful to Society.

Institute Vision

To be among the best of the institutions for engineers and technologists with attitudes, skills and knowledge and to become an epicenter of creative solutions.

Program (EEE) Vision

To provide the technical knowledge and soft skills required to succeed in life, career and help society to achieve self-sufficiency.

Mission

A statement of mission is a general statement of how you will achieve your vision

- There is a very close relationship between the vision and mission.
- The mission is an action statement that usually begins with the word “to”. Once again it is a very simple and direct statement that is easy to understand and remember.
- Your mission statement should be simple. However, creating the statement is usually not easy. It may require several drafts. The statement needs to capture the very essence of what your business or organization will achieve and how you will achieve it.

University Mission

To promote a healthy and enabling teaching-learning culture wherein adequate quality of delivery mechanisms are ensured in the JNTUH affiliated college system and to channelize the energies of the youth in constructive activities.

Institute Mission

To achieve and impart quality education with an emphasis on practical skills and social relevance.

Mission and Vision of the Department:

Vision of the Department

To provide the technical knowledge and soft skills required to succeed in life, career and help society to achieve self-sufficiency.

Mission of the Department

1. To impart technical knowledge and skills required to succeed in life.
2. To build upon the culture and values of universal science and contemporary education.
3. To be a center of research and education generating knowledge and technologies which lay groundwork in shaping the future in the fields of electrical and electronics engineering.
4. To develop partnership with industrial, R&D and government agencies and actively participate in conferences, technical and community activities.

PEOs, POs, GAs, Cobs and Cos

Approaches to Accreditation

1. Input-Output Based Education

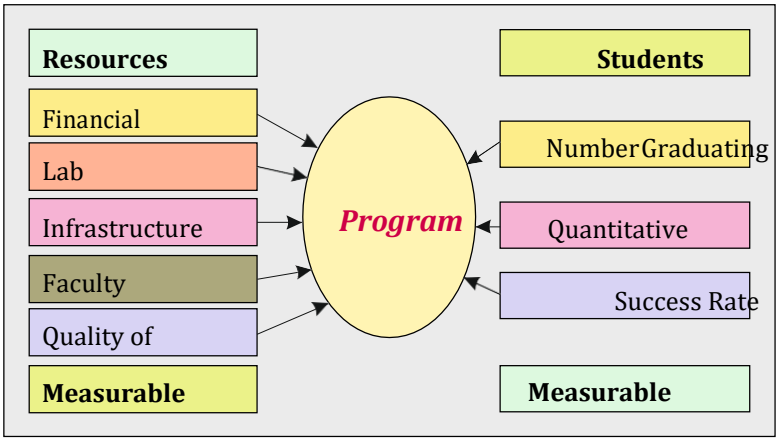
The Input-Output Based Education Model requires strict adherence to a core curriculum. This model often involves direct prescriptions of curriculum and faculty composition. It is teacher centric. It focuses on Inputs.

This model has several advantages

1. It makes the accrediting process uniform and potentially fair,
2. Criteria are unambiguous and often numeric,
3. Relatively easy to maintain
4. The key to success lies in adherence to clear unambiguous rules.

This model also has several serious drawbacks

1. It is difficult to establish and update, it often leads to vigorous debates over what the "core" requirements should be.
2. Lack of innovation and creativity in the curriculum
3. Does not encourage continuous improvement in curriculum
4. Assessment of Knowledge only



2. Outcome Based Education

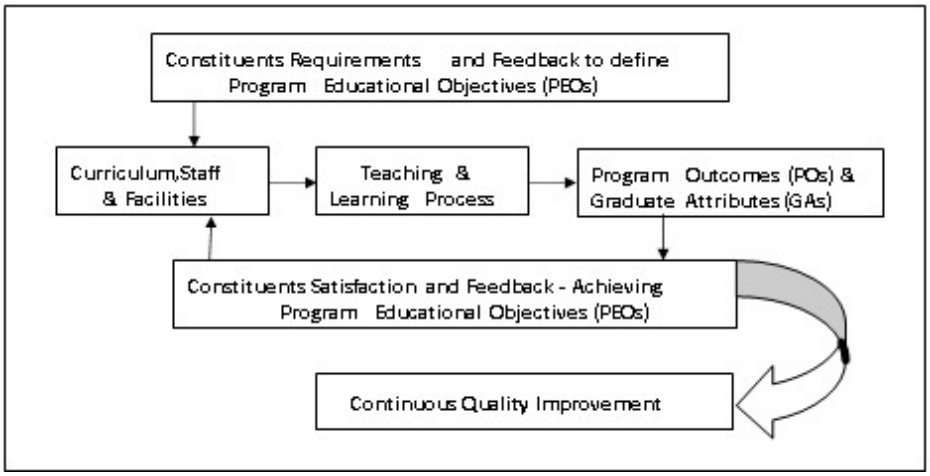
The Outcomes-Based Model prescribes a "small" core curriculum and other basic requirements. It defines the basic parameters for the outcomes of the program. It does focus on the more specific outcomes and objectives declared by the program. The Outcomes-Based Model requires the measurement of outcomes, looking for evidence that these measurements have been used to foster a quality improvement process. It is student centric. It focuses on Outcomes.

This model has several advantages

* Balance between various components of Curriculum
* Assessment of Knowledge, Skills and Attitudes of graduate
* Provides for significant diversity in outcomes and objectives.
* Focuses on the objectives and outcomes of the program.
* Encourages continuous improvement in curriculum.

This model also has several serious drawbacks

* Puts significant responsibility in the hands of the program leaders--and therefore significant risk; some programs may try to achieve outcomes that are unattainable.
* Requires evidence of measurement and attainment of objectives and outcomes.
* Too much data may be collected and analyzed periodically.
* Disagreements and ambiguity about assessment and assessment tools tend to plague the process.
* The process of evaluating outcomes requires a high level of sophistication, as these can sometimes be difficult to measure and assess.
* Complaints on inconsistent evaluations may follow. Strong disagreements may arise about methodology and about the extent to which data need to be collected and analyzed.
* Extra burden on faculty, students and educational institutions.
* Additional preparation, homework, and continuing education time spent by students, parents and faculty in supporting learning.



Programme Educational Objectives (PEOs)

Programme educational objectives are broad statements that describe what graduate are expected to attain within a few (3 to 5) years of graduation. Programme educational objectives are based on the needs of the program's constituencies and goals. PEOs should be consistent with the mission of the Program and the Institution.

PEOs are evolved/prepared in consultation with program's constituencies (Students, Faculty, Parents, Alumni, Industry, Management, Professional Bodies, Data on future, Data on trends in development in the profession, etc.

Program Educational Objectives of Power Electronics program is meant to prepare our students to thrive and to lead in their career

PEO 1: Post Graduates will have a successful technical and professional career, including supportive and leadership roles on multidisciplinary teams.

PEO 2: Post Graduates will be able to acquire, use and develop skills as required for effective professional practices.

PEO 3: Post Graduates will be able to attain holistic education that is an essential prerequisite for being a responsible member of society.

PEO 4: Post Graduates will be engaged in life-long learning, to remain abreast in their profession.

Programme Outcomes (POs)

Programme Outcome / Programme Educational Outcomes / Student Learning Outcomes describe what students are expected to know and be able to do by the time of graduation. Outcomes are narrower statements, and these relate to the skills, knowledge, and behaviors/attitudes that students acquire as they progress through the program. They must reflect all the Graduate Attributes at the end of the course.

Engineering programs must demonstrate that their students attain the following outcomes:

Programme outcomes of PG Power Electronics

a Ability to apply knowledge of mathematics, science, and engineering.

b Ability to design and conduct experiments, as well as to analyze and interpret data.

c Ability to design a system, component, or process to meet desired needs within realistic constraints.

d Ability to function on multi-disciplinary teams.

e Ability to identify, formulates, and solves engineering problems.

f Understanding of professional and ethical responsibility.

g Ability to communicate effectively.

h Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

i Recognition of the need for, and an ability to engage in life-long learning.

j Knowledge of contemporary issues.

k Ability to utilize experimental, statistical and computational methods and tools necessary for engineering practice.

l Post Graduates will demonstrate an ability to design electrical and electronic circuits, power electronics, power systems, electrical machines analyze and interpret data and also an ability to design digital and analog systems and programming them.

SMART OBJECTIVES AND OUTCOMES

Objectives / Outcomes are the building blocks or steps towards achieving a program's goals. Objectives / Outcomes are specific and concise statements that state that will make what change, by how much, where and by when.

When writing Objectives and Outcomes, keep them SMART

SMART work objectives / outcomes are:

- Specific - Is it clear and well defined
- Measurable - Know if it is obtainable and how far away completion is
- Achievable - Agreement with all the stakeholders what it should be
- Realistic - Within the availability of resources, knowledge and time
- Timely - Enough time to achieve it, is there a time limit

Difference between Objectives and Outcomes

Objectives are intended results or consequences of instruction, curricula, programs, or activities. Outcomes are achieved results or consequences of what was learned; i.e., evidence that learning took place. Objectives are focused on specific types of performances that students are expected to demonstrate at the end of instruction. Objectives are often written more in terms of teaching intentions and typically indicate the subject content that the teacher(s) intends to cover. It is teacher- centered. Learning outcomes, on the other hand, are more student/learner-centered and describe what it is that the learner should learn.

Objectives are derived from the mission statement and provide a focus for general

Performance expectations for graduates of the institution or program regardless of the graduates' major areas of study. Objectives direct the development of the student attributes (outcomes) needed to achieve the objectives. They facilitate the direction of educational strategies needed to instill in students the attributes (outcomes) needed to achieve the objectives.

Graduate Attributes (GAs)

Graduate Attributes form a set of individually assessable programme outcomes that are the components indicative of the Graduate's potential to acquire competence to practice at the appropriate level. The GAs is the attributes expected of a graduate of an accredited programme. The Graduate Attributes of the NBA are as following:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
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 public health and safety, and 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.
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 sustainability:** 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 multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with the 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 multidisciplinary 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.

Course / Subject Objectives (CObs)

Course / Subject Objectives are statements that describe what students are expected to attain in terms of specific knowledge, skills, and attitudes after completing the course/subject. Course / Subject Objectives are based on the syllabus content of the course/subject. These are teacher- centered.

Course / Subject Outcomes (COs)

Course / Subject Outcomes describe what students are expected to know and be able to do at the time of completion of the course/subject. These relate to the skills, knowledge, and behaviors/attitudes that the students / learners acquire as they progress through the course/subject. These are specific and be measurable. These are student/learner-centered.

In summary, Course Outcomes (COs) are

* Student-focused, not teacher-focused
* Aligned between course, program, and institutional levels
* Stated in terms of knowledge, skills, attitude or ability that students will acquire.
* Expressed in terms of measurable and/or observable behaviors.
* Needed to reflect the objectives, outcomes and mission of the academic program
* Focused on abilities central to the discipline
* Focused on aspects of learning that will endure student's new modes of thinking
* Limited to manageable number (say, 3-6) being accomplished within a semester

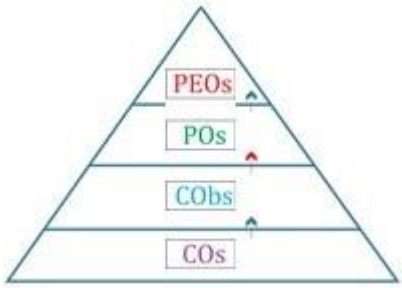
* To begin with an action verb (e.g., write, install, solve, and apply Blooms Taxonomy).

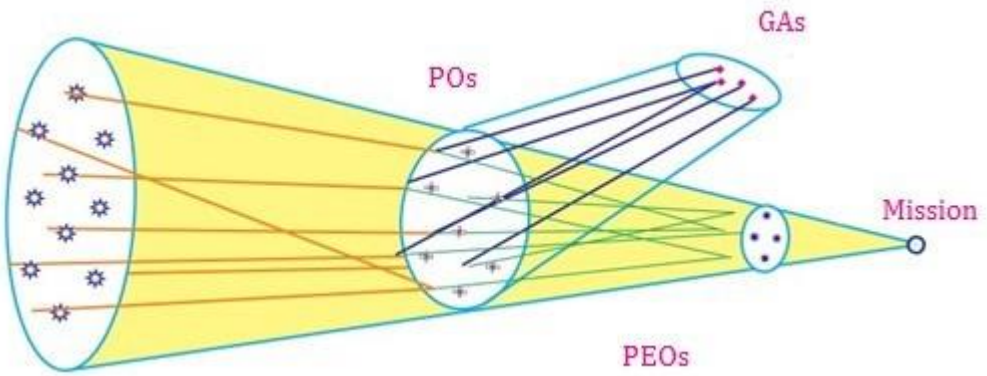
Course Objectives Vs Course Outcomes

The following table summarizes the difference between course objectives and course outcomes.

Course Objectives	Course Outcomes
Describe what a faculty needs to teach and a plan for delivery.	Describe what students should Demonstrate and show upon the completion of a course.
At the end of the course, students will understand and know the concepts of the topics covered.	At the end of the course, students will be able to do, demonstrate, choose, design, the topics covered.

Relationship between PEOs, POs and COs





Program Educational Objectives (PEOs) are assessed a few years (3 to 5 years) after Graduation.

Program Outcomes (POs) are assessed during and upon Graduation

Course Outcomes (COs) are assessed upon Course Completion.

Assessment Methods

Assessment

Assessment is one or more processes that identify, collect, use and prepare data to evaluate the attainment of student outcomes and program educational objectives. Effective assessment uses relevant direct, indirect, quantitative and qualitative measures as appropriate to the objective or outcome being measured. Appropriate sampling methods maybe used as part of an assessment process.

"Assessment is the systematic collection, review, and use of information about educational programs undertaken for the purpose of improving student learning and development." **Assessment Methods and Tools**

Following are some possible Program-level (P) and Course-level (C) Assessment Methods and Tools. These Methods and Tools are used to assess Program Educational Objectives (PEOs), Program Outcomes (POs) and Course Outcomes (COs):

1. Exit surveys, exit interviews (P)
2. Alumni surveys and interviews (P)
3. Employer surveys and interviews (P)
4. Job offers, starting salaries (relative to national benchmarks) (P)
5. Entry Level surveys (P)
6. Performance in co-op and internship assignments and in problem-based learning situations (P, C)
7. Assignments, reports, and tests in the capstone (team/group) design course (P, C)
8. Competitive tests e.g., GRE, GMAT, etc., (P, C)
9. Student surveys, individual and focus group interviews (P, C)
10. Peer evaluations, self-evaluations (P, C)
11. Student portfolios (P, C)
12. Behavioral observation and verbal protocol analysis (analyzing transcripts of student interviews or working sessions to extract patterns of problem-solving, thinking, or communication) (P, C)
13. Written tests or test items clearly linked to learning objectives (C)
14. Written project reports (C)
15. Oral presentations (live or on videotape) (C)
16. Research proposals, student-formulated problems (C)
17. Abstracts, executive summaries, papers (C)

18. Letters, memos (C)
19. Written critiques of documents or oral presentations (C)
20. Classroom assessment techniques (C)

Choose some of the above assessment methods at program-level (P) and course-level (C) most suitable to your Course. Some of the assessments you might have already completed and some you may be planning. For 1st, 2nd & 3rd year B. Tech Courses choose mostly from course-level (C) assessment methods. For 4th year B. Tech Courses choose from both program-level (P) and course-level (C) assessment methods.

Direct Measures

Direct measures provide for the direct examination or observation of student knowledge or skills against measurable learning outcomes.

Indirect Measures

Indirect measures are those that ascertain the opinion or self-report of the extent or value of learning experiences.

Written Surveys and Questionnaires

Asking individuals to share their perceptions about the program (e.g., their own or other skills/attitudes/behavior, or program/course qualities and attributes)

Most common indirect measure

* Usually locally developed but also some national surveys that allow for comparisons

(e.g., National Survey of student Engagement, Educational Benchmarking,)

Exit and other Interviews

Asking individuals to share their perceptions about the program (e g their own skills/attitudes, skills and attitudes of others, or program qualities) in a face-to-face dialog with an interviewer

* Generally indirect measure
* Interview could be crafted to include elements of direct measures

Standardized Exams

Subject-specific examinations, generally group administered mostly multiple choice “objective” tests, usually purchased from a private vendor

* Direct measure of student learning
* Provide ability to make comparisons with other programs
* Need to be confident that it is relevant to the program for which it is used

Locally developed exams

Objective (includes true-false, fill-in-the blank, matching, and multiple-choice question) and/or subjective (open-ended require students to write) tests designed by faculty of the program

* Most common at classroom level
* Direct measure of student learning
* Can be specific to performance indicators for the learning outcomes
* Can be difficult to get faculty agreement on questions related to outcomes

Focus Groups

Group discussions conducted by a trained moderator with participants to identify trends/patterns in perceptions

* Indirect method that can provide valuable information about student perceptions and experiences
* Can be used to provide insights about student responses on other assessments
* Results cannot be generalized to entire cohort

Archival Records

Biographical, academic, or other file data available from the college or other agencies and institutions

* Identify data already available (data audit)
* Generally direct measure
* Build upon data collection efforts that have already occurred
* Constitutes non-intrusive measurement not non-measurement, requiring additional time or effort from students or other groups

Portfolios

Collections of student work which is archived and rated for level of attainment using scoring rubrics. The design of a portfolio is dependent upon how the scoring results are going to be used.

* Direct measure of student learning
* Possible to measure more than one learning outcome at one time (e.g., writing and use of technology)
* Course management systems often support portfolio development

Simulations (Competency-Based Measure)

A person's abilities are measured in a situation that approximates a “real world” world setting

* Direct measure of student learning
* Need well defined outcomes with appropriate tasks
* Can be designed for individuals and groups of Students

Performance Appraisals

Systematic measurement of the demonstration of acquired skills through direct observation

* Provides a direct measure of students' abilities to apply what has been learned

* Internships and co-op experiences provide a good setting for data collection
* Need to be focused data collection process
* Those who are in a position to make judgment
* Well-constructed instrument for data collection

External Examiner

Using an expert in the field from outside the program (usually from a similar program at another institution) to conduct, evaluate, or supplement assessment of your students

* Generally, a direct measure of student learning (if they assess against specific
* competencies)
* Outsiders can "see" attributes to which insiders have grown accustomed
* Evaluators may have skills, knowledge, or resources not otherwise available

Oral Exams

An assessment of student knowledge levels through a face-to-face dialogue face to between the student and examiner usually faculty

* Direct measure of student learning
* Content and style can be geared to specific learning outcomes and
* Characteristics of the program, curriculum, etc.
* May not be allowed by institution who have concerns about pressure on students

Behavioral Observations

Measuring the frequency, duration, relationships, etc. of student actions, usually in a natural setting with non-interactive methods (e.g., formal or informal observations in a classroom).

* Direct measure of student behavior.
* Observations are most often made be an individual and can be augmented by audio or videotape.
* Requires experienced observers

Rubrics and Mapping

Rubric is a tool that helps to make subjective measurements as objective, clear, and consistent as possible by defining the criteria on which performance should be judged.

A tool often shaped like a matrix, with criteria on one side and levels of achievement across the top used to score products or performances. Rubrics describe the characteristics of different levels of performance, often from exemplary to unacceptable. The criteria are ideally explicit, objective, and consistent with expectations for student performance.

Rubrics may be used by an individual or multiple raters to judge student work.
Rubrics are meaningful and useful when shared with students before their work is judged so they better understand the expectations for their performance.

S. No.	Student Name	Performance Criteria	Unsatisfactory	Developing	Satisfactory	Exemplary	Score
			1	2	3	4	
1.		Research & Gather Information	Does not collect any information that relates to the topic.	Collects very little information some relates to the topic	Collects some basic Information most relates to the topic.	Collects a great deal of Information all relates to the topic.	2
		Fulfill team role's	Does not perform any duties of assigned team role.	Performs very little duties.	Performs nearly all duties.	Performs all duties of assigned team role.	2
		Share Equally	Always relies on others to do the work.	Rarely does the assigned work-- often need reminding.	Usually does the assigned work-- rarely needs reminding	Always does the assigned Work without having to be reminded	2
		Listen to other team mates	Is always talking--never allows anyone else to speak.	Usually doing most of the talking-- rarely	Listens, but sometimes talks too much.	Listens and speaks a fair amount.	3
					Average		2.5

S. No.	Student Name	Performance Criteria	Unsatisfactory	Developing	Satisfactory	Exemplary	Score
			1	2	3	4	
2.		Research & Gather Information	Does not collect any information that relates to the topic.	Collects very little information some relates to the topic	Collects some basic Information most relates to the topic.	Collects a great deal of Information on all relates to the topic.	4
		Fulfill team role's	Does not perform any duties of assigned team role.	Performs very little duties.	Performs nearly all duties.	Performs all duties of assigned team role.	2
		Share Equally	Always relies on others to Do the work.	Rarely does the assigned work--often needs reminding.	Usually does the assigned work--rarely needs reminding	Always does the assigned Work without having to be reminded	4
		Listen to other team mates	Is always talking--never allows anyone else to speak.	Usually doing most of the talking--rarely	Listens, but sometimes talks too much.	Listens and speaks a fair amount.	3
					Average		4

S. No.	Student Name	Performance Criteria	Unsatisfactory	Developing	Satisfactory	Exemplary	Score
			1	2	3	4	
3.		Research & Gather Information	Does not collect any information that relates to the topic.	Collects very little information some relates to the topic	Collects some basic Information most relates to the topic.	Collects a great deal of Information all relates to the topic.	5
		Fulfill team role's	Does not perform any duties of assigned team role.	Performs very little duties.	Performs nearly all duties.	Performs all duties of assigned team role.	5
		Share Equally	Always relies	Rarely	Usually	Always	4

			on others to Do the work.	does the assigned work-- often needs reminding.	does the assigned work-- rarely needs reminding	does the assigned Work without having to be reminded	
		Listen to other team mates	Is always talking--never allows anyone else to speak.	Usually doing most of the talking-- rarely	Listens, but sometimes talks too much.	Listens and speaks a fair amount.	5
					Average		4.5

Mapping

Mapping is the process of representing preferably in matrix form, the correlation among the parameters such as PEOs, POs, COs, etc. It may be done for one to many, many to one, and many to many parameters.

Course Outcomes (COs)-Program Outcomes (POs) Relationship Matrix

(Indicate the relationships by mark "X")

P-Outcomes C-Outcomes	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						
7						

Program Educational Objectives (PEOs)-Program Outcomes (POs) Relationship Matrix

(Indicate the relationships by mark "X")

P-Outcomes PEOs	1	2	3	4	5	6
1						
2						
3						
4						

Evaluation

Evaluation is one or more processes for interpreting the data and evidence accumulated through assessment practices. Evaluation determines the extent to which program educational objectives and student outcomes are being attained. Evaluation results in decisions and actions regarding program improvement. Evaluation gives value judgment. It is a statement about quality.

Grading

It is a process of evaluating students, ranking them, and distributing each student's value across a scale. Typically, grading is done at the course level. Grades can be numeric or descriptive or both. Grading is focused on strengths and weaknesses in each individual student's learning for use by each student.

Accreditation Criteria

The assessment and evaluation process of accreditation of an engineering programme is based on broad Criteria and specific Criteria. An engineering programme to be accredited or re- accredited has to satisfy all the criteria during the full term of accreditation. The educational institution should periodically review the strengths and weaknesses of the programme and seek to improve the standards and quality continually, and address deficiencies if any aspect falls short of the standards set by the accreditation criteria. During the full term of accreditation, the institutions are required to submit their annual self-assessment report to NBA.

Criteria-1: Vision, Mission and Programme Educational Objectives

Criteria-2: Programme outcomes

Criteria-3: Programme Curriculum

Criteria-4: Students' Performance

Criteria-5: Faculty Contributions

Criteria-6: Facilities and Technical Support

Criteria-7: Academic Support Units and Teaching-Learning Process

Criteria-8: Governance, Institutional Support and Financial Resources

Criteria-9: Continuous Improvement

Criteria-10: Program Specific Criteria

Program Specific Criteria (PSC)

In addition to the Program General Criteria (1 to 9), each program must satisfy a set of criteria specific to the program, known as Program Specific Criteria (10). The Program Specific Criteria deal with the requirements for engineering practice particular to the related sub-discipline. The stipulation in the Program Specific Criteria chiefly concern curricular issues and qualifications of faculty. In the case where there is more than one set of Program Specific Criteria, a program must satisfy every set of criteria.

Program Specific Criteria for EEE

These program criteria apply to engineering programs that include electrical, electronic, computer, or similar modifiers in their titles.

The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program.

The curriculum must include probability and statistics, including applications appropriate to the program name; mathematics through differential and integral calculus; sciences (defined as biological, chemical, or physical science); and Engineering topics (including computing science) necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components.

The curriculum for programs containing the modifier “electrical” in the title must include advanced mathematics, such as differential equations, linear algebra, complex variables, and discrete mathematics.

The curriculum for programs containing the modifier “computer” in the title must include discrete mathematics.

Master of Technology

(Power Electronics)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY M.Tech
(PE) PROGRAMME STRUCTURE

I YEAR - I SEMESTER

S.No	Group	Course Code	Subject	Hours			Total Hours	Credits	Int. Marks	Ext. Marks	Total Marks
				L	T	P					
1	Core I	GR20D5025	Modeling and Analysis of Electrical Machines	3	0	0	3	3	30	70	100
2	Core II	GR20D5026	Power Electronic Converters	3	0	0	3	3	30	70	100
3	**PE I**	GR20D5027	Power Quality	3	0	0	3	3	30	70	100
		GR20D5028	Modelling and Simulation of Power Electronic Converters								
		GR20D5029	Flexible AC Transmission Systems								
4	**PE II**	GR20D5030	Optimal and Adaptive Control	3	0	0	3	3	30	70	100
		GR20D5031	PWM Techniques for Power Electronic Converters								
		GR20D5032	Electric and Hybrid Vehicles								
5	Core	GR20D5033	Power Quality lab	0	0	4	4	2	30	70	100
6	Core	GR20D5034	Power Electronics Lab	0	0	4	4	2	30	70	100
7	Core	GR20D5011	Research Methodology and IPR	2	0	0	2	2	30	70	100
Total				**14**	**0**	**8**	**22**	**18**	**210**	**490**	**700**
8	Audit		Audit Course 1	2	0	0	2	2	30	70	100

YEAR - II SEMESTER

Sl. No	Group	Course Code	Subject	Hours			Total Hours	Credits	Int. Marks	Ext. Marks	Total Marks
				L	T	P					
1	Core III	GR20D5035	Electric Drives System	3	0	0	3	3	30	70	100
2	Core IV	GR20D5036	Digital Control of Power Electronic and Drive Systems	3	0	0	3	3	30	70	100
3	**PE III**	GR20D5037	Advanced Power Electronic Converters	3	0	0	3	3	30	70	100
		GR20D5038	Dynamics of Electrical Machines								
		GR20D5039	Advanced Digital Signal Processing								
4	**PE IV**	GR20D5040	AI and Machine Learning applications in Power Electronics	3	0	0	3	3	30	70	100
		GR20D5041	Distributed Generation								
		GR20D5042	Smart Grids								
5	Core	GR20D5043	Electrical Drives Lab	0	0	4	4	2	30	70	100
6	Core	GR20D5044	DSP and Microcontroller Lab	0	0	4	4	2	30	70	100
7	Core	GR20D5143	Mini Project	2	0	0	2	2	30	70	100
Total				**14**	**0**	**8**	**22**	**18**	**210**	**490**	**700**
8	Audit		Audit Course -2	2	0	0	2	2	30	70	100

II YEAR - I SEMESTER

Sl. No	Group	Course Code	Subject	Hours			Total Hours	Credits	Int. Marks	Ext. Marks	Total Marks
				L	T	P					
1	**PE V**	GR20D5045	Wide Bandgap Power Devices	3	0	0	3	3	30	70	100
		GR20D5046	HVDC								
		GR20D5047	Design and development of LED lighting								
2	**Open Elective**	GR20D5146	1. Cost Management Of Engineering Projects	3	0	0	3	3	30	70	100
		GR20D5147	2. Industrial Safety								
		GR20D5148	3. Operations Research								
		GR20D5149	4. Artificial Neural Networks And Fuzzy Systems								
		GR20D5150	5. Cyber Security								
		GR20D5151	6. Internet Of Things Architecture And Design Principles								
3	Dissertation	GR20D5144	Dissertation Phase – I	0	0	20	20	10	30	70	100
Total				**6**	**0**	**20**	**26**	**16**	**90**	**210**	**300**

II YEAR - II SEMESTER

Sl. No	Group	Course Code	Subject	Hours			Credits	Int. Marks	Ext. Marks	Total Marks
				L	T	P				
1	Dissertation	GR20D5145	Dissertation Phase – II	0	0	32	16	30	70	100
			Total			**32**	**16**	**30**	**70**	**100**

Audit Courses 1 & 2

1	GR20D5152	English for Research Paper Writing
2	GR20D5153	Disaster Management
3	GR20D5154	Sanskrit for Technical Knowledge
4	GR20D5155	Value Education
5	GR20D5156	Indian Constitution
6	GR20D5157	Pedagogy Studies
7	GR20D5158	Stress Management by Yoga
8	GR20D5159	Personality Development through Life Enlightenment Skills

MODELING AND ANALYSIS OF ELECTRICAL MACHINES
M.Tech. (PE)
Course Code: GR20D5025

Course Outcomes: At the end of the course, the student will be able to

1.Demonstrate the concept of Electromagnetic energy conversion and its storage
2.Evaluate the transformation techniques
3.Analyze the dynamic behavior rotating machines.
4.Understand equivalent circuit of synchronous machines.
5.Design mathematically model special electrical machines.

POWER ELECTRONIC CONVERTERS
M.Tech. (PE)
Course Code: GR20D5026

Course Outcomes: At the end of the course, the student will be able to

1. Discuss the advances in power electronic devices.
2. Design & analyze the different converter topologies with their applications.
3. Articulate & apply the different modulation techniques.
4. Design & analyze the different matrix converters.
5. Apply the dynamic modeling, control and analysis of different converters.

POWER QUALITY
M.Tech. (PE)
Course Code: GR20D5027

Course Outcomes: At the end of the course, the student will be able to

1.Analyze the different power quality issues and standards
2.Assess the causes of various PQ issues and mitigation techniques
3.Design the Active and Passive compensations for 1-ph and 3-ph systems
4.Analyze the Shunt and Series Compensators like DSTATCOM and DVR
5.Discuss the UPQCs

MODELING AND SIMULATION OF POWER ELECTRONIC CONVERTERS
M.Tech. (PE)
Course Code: GR20D5028

Course Outcomes: At the end of the course, the student will be able to

1. Explain the need of simulation tools for power electronic devices
2. Develop mathematical models for different power electronic converters
3. Simulate various power converters using PSPICE and MATLAB
4. Analyze power electronic circuits for different loads
5. Integrate Power electronic converters real time with the DSP and MATLAB

FLEXIBLE AC TRANSMISSION SYSTEMS
M.Tech. (PE)
Course Code: GR20D5029

Course Outcomes: At the end of the course, the student will be able to

1. Understand the operating principles of various FACTS devices.
2. Design the compensation methods in power system network.
3. Relate the performance and applications of VSI & CSI.
4. Extend the knowledge of active & reactive power and voltage control with FACTS devices.
5. Analyze role of SVC&STATCOM in improving the power system dynamics.

OPTIMAL AND ADAPTIVE CONTROL
M.Tech. (PE)
Course Code: GR20D5030

Course Outcomes: At the end of the course, the student will be able to

1. Apply the mathematical area of calculus of variation for solving optimal control problems.
2. Analyze performance measure and mathematical treatment of optimal control problems.
3. Solve optimal control design problems by taking into consideration the physical constraints on practical control systems.
4. Apply advanced control theory to practical engineering problems.
5. Design controllers using optimal and adaptive control theories

PWM FOR POWER ELECTRONIC CONVERTERS
M.Tech. (PE)
Course Code: GR20D5031

Course Outcomes: At the end of the course, the student will be able to

1. Analyze modulation of single phase VSI and 3 phase VSI
2. Design the control CSI and VSI using PWM
3. Design PWM using different strategies
4. Analyze PWM for multilevel inverters
5. Interpret the Continuing developments in modulation.

ELECTRIC AND HYBRID VEHICLES
M.Tech. (PE)
Course Code: GR20D5032

Course Outcomes: At the end of the course, the student will be able to

1. Assess the impact of conventional vehicles on the society and different types of drive train topologies
2. Design load modeling based on the road profile and braking concepts
3. Categorize different types of motors used in electric and hybrid electric vehicles
4. Identify different types of energy storage systems
5. Examine the concept vehicle to grid (V2G) and grid to vehicle (G2V).

POWER QUALITY LAB
M.Tech. (PE)
Course Code: GR20D5033

Course Outcomes: At the end of the course, the student will be able to

1. Demonstrate the effects Voltage & Current disturbances and Illustrate the effects of harmonics with the filter
2. List the causes of voltage sag and its effect on electrical equipment
3. Relate the effects of non-linear load in a three-phase circuit
4. Interpret the effects of voltage flicker and ground loop and Study the harmonics effect on energy meter
5. Discuss the power quality problems using simulation tools.

POWER ELECTRONICS LAB
M.Tech. (PE)
Course Code: GR20D5034

Course Outcomes: At the end of the course, the student will be able to

1. Choose appropriate switching devices & firing circuits based on their characteristics and application
2. Design and analyze the operation of power switching converters
3. Develop practical control circuits for various real time applications
4. Analyze and evaluate the operation of Inverters & Cycloconverters
5. Judge power electronic converter performance for various applications in virtual platforms

RESEARCH METHODOLOGY AND IPR
M.TECH (PE)
Course Code: GR20D5011

Course Outcomes: At the end of the course, the student will be able to

1. Understand research problem formulation.
2. Analyze research related information and follow research ethics
3. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
4. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering.
5. Understand the nature of Intellectual Property and IPR in International scenario.

ELECTRIC DRIVE SYSTEM
M.Tech. (PE)
Course Code: GR20D5035

Course Outcomes: At the end of the course, the student will be able to

1. Model and simulate electric drive systems.
2. Design appropriate open loop or closed loop control systems in electric drives.
3. Gain the knowledge of DC motor drives.
4. Understand the operation in IM in motoring and braking modes with respect to stator and rotor side control.
5. Understand the performance PMBLDC motor in motoring and braking modes

DIGITAL CONTROL OF POWER ELECTRONIC AND DRIVE SYSTEMS
M.Tech. (PE)
Course Code: GR20D5036

Course Outcomes: At the end of the course, the student will be able to

1. Evaluate Mathematical Modeling of Digital Power Electronics.
2. Analyze AC/DC and DC/AC converters.
3. Design DC/DC converters.
4. Compare Open-loop and Closed-Loop Control for Digital Power Electronics.
5. List the Application in AC and DC Motor Drives.

ADVANCED POWER ELECTRONIC CONVERTERS
M.TECH (PE)
Course Code: GR20D5037

Course Outcomes: At the end of the course, the student will be able to

1. Valuate the design of APFC.
2. Analyze and design of Switched Mode power conversion topologies,
3. Analyze and design of DC-DC converters.
4. Analyze and design of resonant converters.
5. Design DC-DC convertors for different renewable energy sources

DYNAMICS OF ELECTRICAL MACHINES
M.Tech. (PE)
Course Code: GR20D5038

Course Outcomes: At the end of the course, the student will be able to

1. Analyze the performance characteristics of all electric machines.
2. Apply Knowledge of transformations for the dynamic analysis of machines
3. Determine stability of the machines under small signal conditions
4. Determine stability of the machines under transient conditions.
5. Analyze synchronous machine.

ADVANCED DIGITAL SIGNAL PROCESSING
M.Tech. (PE)
Course Code: GR20D5039

Course Outcomes: At the end of the course, the student will be able to

1. Analyze the time domain and frequency domain representations of discrete time signals and systems.
2. Design techniques for IIR filters and its realization structures.
3. Design techniques for FIR filters and its realization structures.
4. Develop knowledge about the finite word length effects in implementation of digital filters.
5. Estimate power spectrum of stationary random signals.

AI AND MACHINE LEARNING TECHNIQUES APPLICATIONS TO POWER ELECTRONICS
M.TECH (PE)
Course Code: GR20D5040

Course Outcomes: At the end of the course, the student will be able to

1. Describe the importance of designing the System with AI and Machine Learning.
2. Learn Support Vector Machines and its Regression.
3. Distinguish the various Neural Networks Architectures.
4. Categorize Fuzzy rule base and neuro-fuzzy systems.
5. Analyze various power electronic systems using neural & fuzzy systems.

DISTRIBUTED GENERATION
M.Tech. (PE)
Course Code: GR20D5041

Course Outcomes: At the end of the course, the student will be able to

1. Understand the planning and operational issues related to Distributed Generation.
2. Acquire Knowledge about Distributed Generation
3. Learn Micro-Grids modelling and Analysis
4. Simulate case studies with Micro grids
5. Illustrate Protection methods for Micro grids

SMART GRIDS
M.Tech. (PE)
Course Code: GR20D5042

Course Outcomes: At the end of the course, the student will be able to

1. Appreciate the difference between smart grid & conventional grid
2. Apply knowledge of different Smart Sensors in real time applications
3. Formulate solutions in the areas of smart substations, and wide area measurements
4. Illustrate Distributed Automation integrated with Smart techniques
5. List and compare different Wireless Sensor Networks in Smart Grid

ELECTRICAL DRIVES LAB
M.Tech. (PE)
Course Code: GR20D5043

Course Outcomes: At the end of the course, the student will be able to

1. Explain the performance of TRIAC as AC voltage controller
2. Design Simulation model for DC or AC drives.
3. Develop speed control methods to three phase IM and Explain the concept of scalar control in three phase IM
4. Explain the concept of electrical braking in different applications
5. Mathematically model PMSM and PMBLDC motor and Control of PMBLDC, SRM and PMSM in MATLAB/ SIMULINK

DIGITAL SIGNAL PROCESSING AND MICROCONTROLLER LAB
M.Tech. (PE)
Course Code: GR20D5044

Course Outcomes: At the end of the course, the student will be able to

1. Run the programs using Code Composer Studio.
2. Execute the programs using different PWM generation.
3. Execute the speed control operation on BLDC/ PMSM motor.
4. Execute the data exchange between the two sources using Code Composer Studio.
5. Describe the importance of programming using CC Studio for motor applications

MINI PROJECT
M.Tech. (PE)
Course Code: GR20D5143

Course Outcomes: At the end of the course, the student will be able to

1. Choose the problem domain in the specialized area under computer science and engineering.
2. Acquire and categorize the solution paradigms with help of case studies
3. Design and code using selected hardware, software and tools.
4. Execute, Implement and demonstrate the problem statement by using the selected hardware, software and tools.
5. Document the thesis and publish the final work in a peer reviewed journal.

ENGLISH FOR RESEARCH PAPER WRITING (AUDIT COURSE)
M.Tech. (PE)
Course Code: GR20D5152

Course Outcomes: At the end of the course, the student will be able to

1. Will have given a view of what writing is all about
2. Will be able to understand Research and its process
3. Will be able to comprehend the steps and methods involved in research process
4. Will have learned various skills necessary that are necessary for doing research
5. Will have learned how to write quality research papers along with other research areas

WIDE BANDGAP POWER DEVICES
M.Tech. (PE)
Course Code: GR20D5045

Course Outcomes: At the end of the course, the student will be able to

1. Comparison of SI based devices with wideband gap power devices
2. Demonstration of GAN characteristics
3. Illustrate the SIC Characteristics
4. Design of GAN based power electronics circuits
5. Design of SIC based power electronics circuits

HIGH VOLTAGE DC TRANSMISSION

M.Tech. (PE)

Course Code: GR20D5046

Course Outcomes: At the end of the course, the student will be able to

1. Compare the differences between HVDC and HVAC transmission.
2. Know about VSC transmission advantages.
3. Cover the different control strategies.
4. Identification of valve firing control schemes.
5. Address the role of AC system faults on HVDC system.

DESIGN AND DEVELOPMENT OF LED LIGHTING

M.Tech. (PE)
Course Code: GR20D5047

Course Outcomes: At the end of the course, the student will be able to

1. Demonstrate Need of LEDs over other lamps
2. Design of heat sinks for LED Lighting
3. Identify the Design parameters of LEDs
4. Design of Drivers for AC and DC lighting
5. Can suggest suitable microcontrollers for LED applications

COST MANAGEMENT OF ENGINEERING PROJECTS (OPEN ELECTIVE)

M.Tech. (PE)
Course Code: GR20D5146

Course Outcomes: At the end of the course, the student will be able to

1. Discuss various construction costs to manage a construction project.
2. Summarize different construction activities and its application related to cost based on the field requirements.
3. Identify Cost Behavior of various types of cost and Quality Management
4. Identifying various construction Budgets involved Cost Management process.
5. Discussing various types of Techniques and Problem-solving techniques involved in Construction

INDUSTRIAL SAFETY (OPEN ELECTIVE)

M.Tech. (PE)
Course Code: GR20D52147

Course Outcomes: At the end of the course, the student will be able to

1. Understanding of Safety principles.
2. Analyze different types of exposure and biological effects, exposure guidelines and basic workplace monitoring Ability to do Hazard analysis.
3. Demonstrate an understanding of workplace injury prevention, risk management, and incident investigations.
4. Understand the acute and chronic health effects of exposures to chemical, physical and biological agents in the workplace.
5. Demonstrate knowledge of the types of hazards, planning, organization and training needed to work safely with hazardous materials.

OPERATIONS RESEARCH (OPEN ELECTIVE)

M.Tech. (PE)

Course Code: GR20D5148

Course Outcomes: At the end of the course, the student will be able to

1. The student will formulate and solve problems as networks and graphs for optimal allocation of limited resources such as machine, material and money.
2. The student will able to carry out sensitivity analysis.
3. The student will solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
4. The student will able to distinguish various inventory models and develop proper inventory policies.
5. The student will also propose the best strategy using decision making methods under uncertainty and game theory.

ARTIFICIAL NEURAL NETWORKS AND FUZZY SYSTEMS (OPEN ELECTIVE)

M.Tech. (PE)

Course Code: GR20D5149

Course Outcomes: At the end of the course, the student will be able to

1. To Expose the students to the concepts of feed forward neural networks
2. To provide adequate knowledge about feedback networks.
3. To teach about the concept of fuzziness involved in various systems.
4. To provide adequate knowledge about fuzzy set theory.
5. To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.

CYBER SECURITY (OPEN ELECTIVE)

M.Tech. (PE)

Course Code: GR20D5150

Course Outcomes: At the end of the course, the student will be able to

1. Understand importance and challenges of Cyber security
2. Investigate cybercrime and collect evidences
3. Identify security risks and take preventive steps
4. Able to use knowledge of forensic tools and software
5. Knowledge about Indian IT act and International law

INTERNET OF THINGS ARCHITECTURE AND DESIGN PRINCIPLES (OPEN ELECTIVE)

M.Tech. (PE)

Course Code: GR20D5151

Course Outcomes: At the end of the course, the student will be able to

1. Understand the concepts of Internet of Things
2. Analyze basic protocols in wireless sensor network
3. Design IoT applications in different domain and be able to analyze their performance
4. Understand the Hardware concepts of Internet of Things
5. Implement basic IoT applications through python.

DISASTER MANAGEMENT (AUDIT COURSE)

M.Tech. (PE)

Course Code: GR20D5153

Course Outcomes: At the end of the course, the student will be able to

1. Capacity to integrate knowledge and to analyze, evaluate and manage the different public health aspects of disaster events at a local and global levels, even when limited information is available.
2. Capacity to describe, analyze and evaluate the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
3. Capacity to work theoretically and practically in the processes of disaster management (disaster risk reduction, response, and recovery) and relate their interconnections, particularly in the field of the Public Health aspects of the disasters.
4. Capacity to manage the Public Health aspects of the disasters.
5. Capacity to obtain, analyze, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them

SANSKRIT FOR TECHNICAL KNOWLEDGE (AUDIT COURSE)

M.Tech. (PE)

Course Code: GR20D5154

Course Outcomes: At the end of the course, the student will be able to

1. Understanding basic Sanskrit alphabets and Understand tenses in Sanskrit Language.
2. Enable students to understand roots of Sanskrit language.
3. Students learn engineering fundamentals in Sanskrit.
4. Students can attempt writing sentences in Sanskrit.
5. Ancient Sanskrit literature about science & technology can be understood

VALUE EDUCATION (AUDIT COURSE)

M.Tech. (PE)

Course Code: GR20D5155

Course Outcomes: At the end of the course, the student will be able to

1. Knowledge of self-development
2. Learn the importance of Human Values
3. Developing the Professionalism Ethics, Risks, Responsibilities and Life Skills.
4. Student will be able to realize the significance of ethical human conduct and self-development

5. Students will be able to inculcate positive thinking, dignity of labor and religious tolerance.

INDIAN CONSTITUTION (AUDIT COURSE)

M.Tech. (PE)
Course Code: GR20D5156

Course Outcomes: At the end of the course, the student will be able to

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of1956.
5. Discuss the significance of Election Commission of India.

PEDAGOGY STUDIES (AUDIT COURSE)

M.Tech. (PE)
Course Code: GR20D5157

Course Outcomes: At the end of the course, the student will be able to

1. What pedagogical practices are being used by teachers in formal classrooms in developing countries?
2. What pedagogical practices are being used by teachers in informal classrooms in developing countries?
3. Synergy from the work force.
4. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
5. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

STRESS MANAGEMENT AND YOGA (AUDIT COURSE)

M.Tech. (PE)
Course Code: GR20D5158

Course Outcomes: At the end of the course, the student will be able to

1. Develop healthy mind in a healthy body thus improving social health also improve efficiently.
2. Develop body awareness. Learn how to use their bodies in a healthy way. Perform well in sports and academics.
3. Will balance, flexibility, and stamina, strengthen muscles and connective tissues enabling good posture.
4. Manage stress through breathing, awareness, meditation and healthy movement.
5. Build concentration, confidence and positive self-image

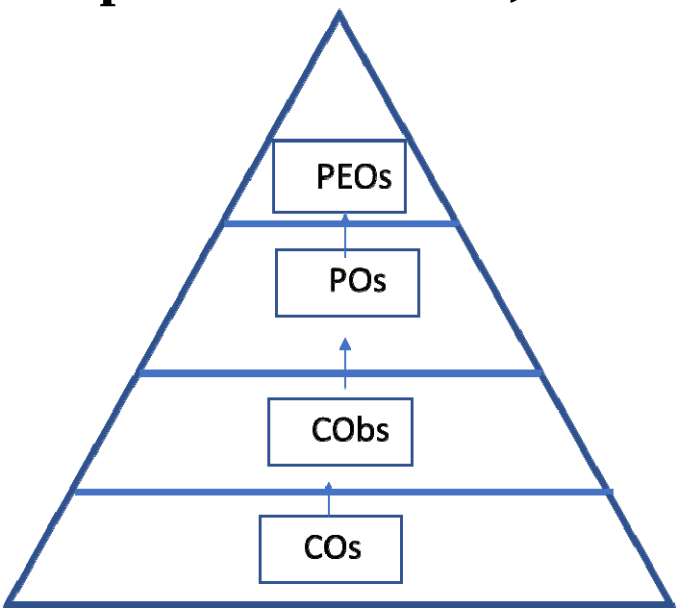
PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS (AUDIT COURSE)

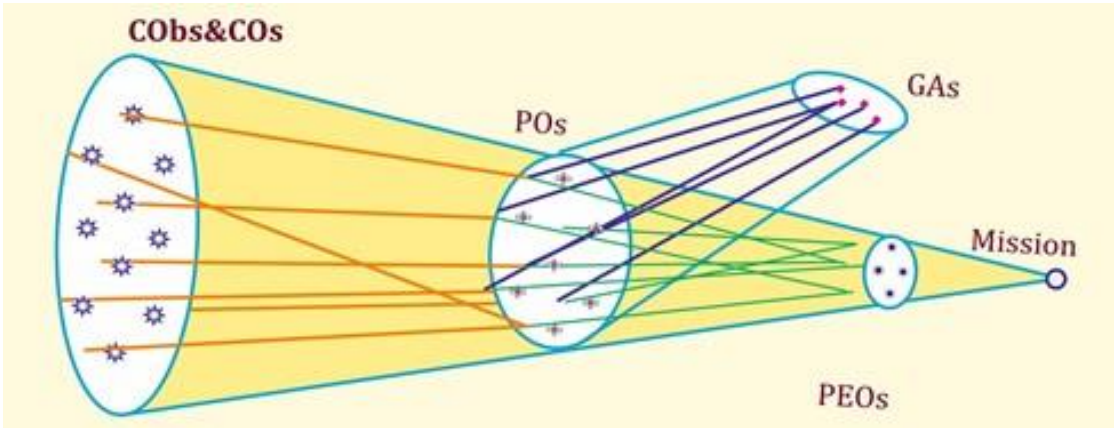
M.Tech. (PE)
Course Code: GR20D5159

Course Outcomes: At the end of the course, the student will be able to

1. Study of Shrimad- Bhagwad-Gita will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neethishatakam will help in developing versatile personality of students
4. To develop self-developing attitude towards work without self-aggrandizement and to develop suffering free meditative mind
5. To develop tranquil attitude in all favorable and unfavorable situations and to develop high spiritual intelligence

Relationship between PEOs, POs and Cos





Program Educational objects (PEO'S) are assessed a few years (3 to 5 years) after Graduation.

Program Outcomes (POs) are assessed during and upon Graduation.

Course Outcomes (COs) are assessed upon Course Completion.

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(Autonomous)