Curriculum Design and Development

Based on the Vision and Mission of the college, respective departments have established their respective vision and mission. Towards achieving vision and mission of the college, each department has proposed their programs' educational objectives (PEOs), program outcomes (POs) and their respective Program Specific Outcomes (PSOs).

The following are the stages of Curriculum Design:

1. Write Vision and Mission of the Department offering the program
2. Identify the context of program
3. Write Program Educational Objectives (PEO) consistent with the Mission and Vision of the Department
4. Write the Program Outcomes (PO) as stated by NBA
5. Prepare PO-PEO matrix to ensure POs facilitate realization of PEOs.
6. Select the number of credits for the program and decide the distribution of Credits
7. Identify the courses to meet the stated Program Outcomes
8. Write the PO-CO matrix
9. Define the assessment process

It is our strong belief that "Engineers engineer, that is, they build systems and products for the betterment of humanity". In order to enter the contemporary profession of engineering, students must be able to perform essential functions of an engineer, which are nothing but Program Outcomes (POs). The following are some program outcomes expected of every enginee:,

- *Graduating engineers should be able to conceive-design-implement-operate complex value-added engineering systems in a modern team-based environment.*
- *"Graduating engineers should appreciate engineering process, be able to contribute to the development of engineering products, and do so while working in engineering organizations.*
- *Implicit is the additional expectation that, as university graduates and young adults, engineering graduates should be developing as whole, mature, and thoughtful individuals with a passion to contribute for societal development"*

We design the curriculum by considering the PEOs, in addition to the above POs given by NBA and defined PSOs of the department, by taking inputs from all stakeholders, namely, industry, R&D establishments, members of professional bodies, alumni, faculty of the college, government and community.

Subsequently, College has constituted Board of Studies (BoS) for all departments. Each BoS consists of senior and experienced faculty of the concerned department, external subject experts from industry, academia, R & D organizations and the university which monitors the academic and other aspects governing the college. These BoS, support college's UG and PG programs in the preparation and revision of curriculum. While preparing curriculum and subsequent revisions, each respective BoS considers vision and mission of the college along with the respective department's vision and mission, then the same is put up before the College Academic Council which consists of college senior faculty members, and external experts from industry, academia, University that monitors the academic and other aspects governing the college, legal expert and other persons of eminence from society. Their inputs are taken for further revision, if any so that the institutional vision and mission are reflected in each program offered by the college.

Our curriculum development and / or its revision shall be consistent with the following principles:

- ❑ Curriculum is outcomes-based and learner-centered: content, learning resources, learning activities, assessment, and evaluation, all derived from, and aligned with program outcomes and course outcomes;
- ❑ Course outcomes represent the culminating demonstrations of learning and achievement;
    - ✔ Course outcomes define the skills, knowledge, and attitudes that a student is expected to demonstrate at the completion of a course or a program of study.
    - ✔ All course outcomes within the program complement and facilitate attainment of the program outcomes
- ❑ Curriculum is purposeful and promotes holistic development of individual;
- ❑ Curriculum is current and relevant with provincial program standards or program descriptions and as per employability needs;
- ❑ Curriculum is designed based on Bloom's taxonomy;
- ❑ Curriculum provides active learning opportunities to maximize student engagement;
    - ✔ Active learning is the process of learning new ideas, skills and attitudes by doing, performing, and taking action, which is either cognitive or physical and/or can include, but is not restricted to, devices such as games, simulations, introspection, and role playing.
- ❑ Curriculum recognizes diversity of students and contributes to the development of a respectful learning environment;

- ❑ Curriculum aligns content, learning resources, and authentic assessment with learning outcomes;
- ❑ Curriculum complies to relevant standards such as AICTE, IEEE, ASME, ASCE etc.;
- ❑ Curriculum is consistent with the mission and vision of the department and as well as the college;
- ❑ Curriculum is appropriate to the level at which the qualification is offered;
- ❑ Curriculum is appropriate to the occupational requirements of the graduates of the program.

The purpose is to encourage students to think not only as an engineer but also as

- Anthropologist
- Biologist
- Chemist
- Literary critic
- Political scientist
- Sociologist
- Statistician etc.

Mechanism used in the design and development of the curriculum with emphasis on "Need Assessment, Feedback, etc"

Our philosophy of curriculum design is aimed at enhancing flexibility in providing holistic education and improving the academic standards to achieve excellence.

In the process of curriculum design and moving towards the objective of preparing students who would be able to contribute significantly for the development of our nation in particular, and the world in general, the BoS and Academic Council (AC) perused the curriculum, guidelines and academic regulations prescribed by the monitoring University, JNTUH, AICTE regulations, its proposed model curriculum and other reputed institutions including a few well known universities abroad.

The College has been organizing and participating in Curriculum Development Workshops for quite some time and reviewing the curriculum. This involves participation of experts from Industry, R&D Establishments and Academic Peers along with its own Faculty members. After a threadbare discussion a draft on the proposed curriculum is prepared by the concerned department of the college, which is subsequently presented to the various Boards of Studies of the affiliating University. Similar exercise was carried out prior to and subsequent to our autonomous status

proposing the curriculum under autonomous status involving experts from industry, R&D establishments, members of professional bodies namely, IEEE, ASME, ASCE, etc., academic peers from reputed institutes, and its own senior faculty members. The proposals were subsequently presented to the Boards of Studies for approval and finally after the acceptance of the proposals by the Boards of Studies, the same were put for consideration at the College Academic Council, which again consists of experts from Industry, R&D and Academic field including three nominees of the monitoring university, JNTUH, and the same were accepted.

Curriculum is designed and proposed such that the main frame of the program structure and the syllabi are within the framework of the norms stipulated by UGC and AICTE. The defining element of the curriculum is "Choice Based Credit System (CBCS)", wherein the teaching learning process is student centric with wide range of courses to choose from.

In this process, inputs from Students, Alumni and Employers are also taken into consideration through curriculum feedback, enclosed in Annexure - I. The Boards of Studies comprising of experts from Industry, R&D and Academia discuss relevance of the current courses offered for each of the programs or disciplines. They also discuss the suggestions given by students Alumni, Industry experts and others and take appropriate decision in framing or designing the curriculum.

Since the employer looks for a set of skills, knowledge, inputs and also attitude in a person that they employ, it is also ensured that the necessary skills set and knowledge inputs are given in a manner wherein the student is exposed to the above aspects mentioned so that the Graduates can be useful to the employer from day one and such Graduates contribute to the growth of the organization he / she works. Enough care is taken to ensure the attitude of the Graduate becomes positive by giving inputs which, of course, are not course related, but touch human life at large which is ensured by incorporating the course titled “Human Values and Professional Ethics”. Students have been provided ample opportunities of working in teams under tough / trying circumstances so that they value the benefits of cooperation and team work. This is ensured by group project and final Semester end project. Employability is also ensured by introducing industrial / field training and induction of professional electives in the program. By involvement and continuous interaction with Industry, R&D Establishments and reputed Academic institutes for curriculum design as well as updating the same catering to the current trends has been helping the institute in absorbing students for Summer training as well as for final placements in their professional career.

Involvement of all stakeholders namely, industry, research bodies, and civil society in the curriculum design and development process.

College frequently interacts with industry, R & D establishments, members of professional bodies, alumni, senior and middle level faculty of the college, occasionally with government and community as well.

Feedback on the curriculum is taken from the above bodies, namely, industry, R & D establishments, members of professional bodies, alumni and the same are incorporated in the courses if the feedback is demands a small change. However, if the feedback demands a major change, the same will be discussed in respective BoS and again in the academic council, if warrants a change, it is incorporated.

The following aspects have been ensured through curriculum design and development

Employability - The college prepares the students imbibing analytical thinking, problem solving skills, creativity, innovation, soft skills, programming skills, etc, which are essential to take up a job will be acquired by the student as part of the curriculum. The students are sufficiently trained in their ability to how to learn new concepts and apply them to various engineering problems. The institute aims to train students not only for their first job but also facilitates them to be a lifelong learner.

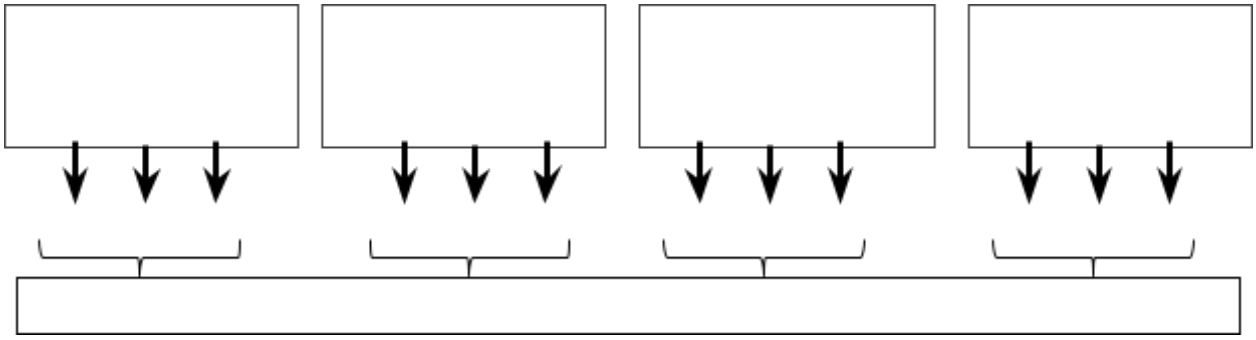
Creativity and Innovation - College encourages hands on learning by introducing mini projects in most of its courses and quite often students are motivated to find innovative solutions while working on these projects. It is our fond hope that some of these projects will lead to start ups in the near future. In fact institute has recruited a handful of faculty who have worked industry for nearly two to three decades and they have been quite helpful in nurturing students in the execution of creative and innovative projects. Mini project and Major project in the curriculum ensure imbibing creativity, innovation and teamwork in the students and further promote research culture.

GCET has been striving hard to bridge the gap between the academia and the industry. In this direction, GCET has taken a good number of initiatives including establishment of a center for Creativity and Innovation. We invited a few experts from reputed academic institutions and industry to join the college as faculty members and has been fairly successful on this front.

Research - The research goals of the institute are implemented by a novel institutional structure. which is as follows:

- Each department is divided into four or five divisions, with each division Chaired by a Senior Professor.
- Divisions are divided as per various specializations in the department.
- Faculty involved in teaching courses pertaining under a division are grouped under that particular division.
- Along with the senior Professor, a few other senior faculty of that division act as lead faculty and act as mentors to other faculty of that division and guide them in their academic pursuits.
  - In each Group, two / three faculty members identified as lead faculty, by the Group Head and information passed on to the HoD.
  - Group Head and the lead faculty would act as Mentors for other faculty members of that group and ensure the teaching-learning process is highly effective in the corresponding courses of that group / specialization.
  - Lead faculty and other faculty of a group may interact very closely with the group Head on all academic / research matters belonging to the courses of the group

    The structure mentioned is as follows:



    The structure promotes

- A healthy mentor – mentee relationship among faculty, more learning opportunities for junior faculty (mentees)
- Research culture, creation of good talent pool in various areas/specializations of the department
- Establishment and conduct of creative and innovative experiments in the lab courses
- Value added teaching, better assessment and evaluation of students' performance
- Establishment of a second rung leadership in various specializations

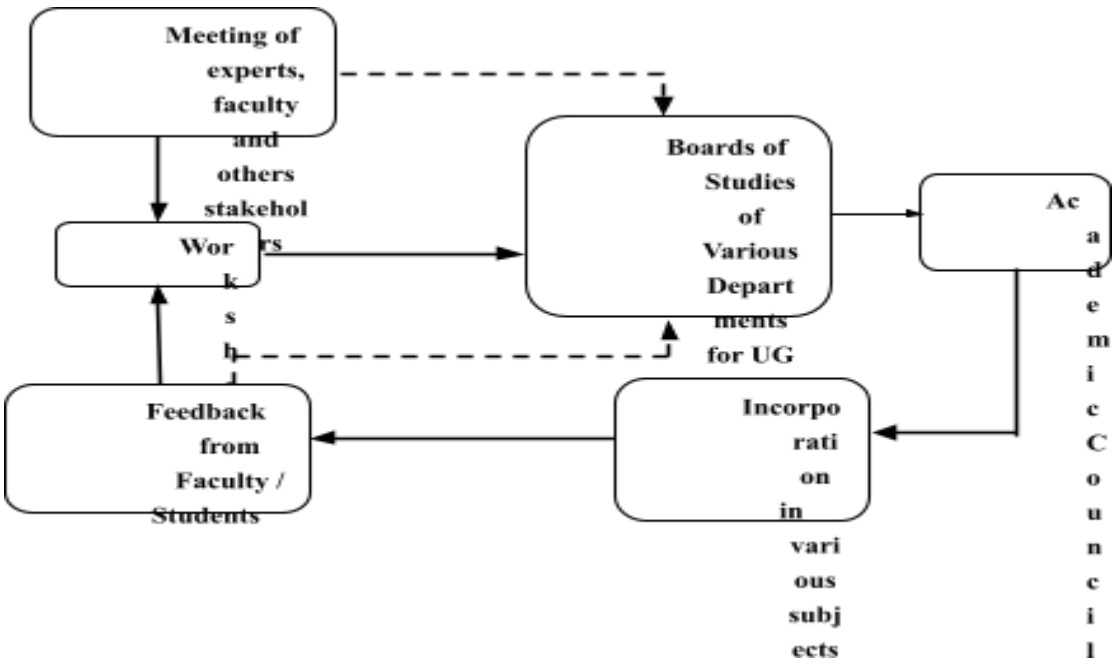
Curriculum developed addresses the needs of the society and has relevance to the regional/national developmental needs

With the above departmental organizational structure, an innovative curriculum, a problem/project based pedagogy and an environment of inquiry all built carefully to meet the requirements of the needs of society, that have the relevance to the regional / national aspirations and developmental needs, the college has been ensuring that it addressed these needs.

The institute is, therefore, structured as research centers and not just simply departments. Hence, the curriculum has flexibility allowing even the undergraduates to do developmental work involving creativity and innovative ideas. With some of the courses having mini projects and presentations, there is an environment of questioning and inquiry, development of interpersonal skills, and healthy discussion on issues of ethics. The institute conducts extension activities to spread the research culture and ethics to the best of its abilities.

Guidelines of the regulatory bodies for developing or restructuring the curricula

The college uses various guidelines including AICTE, ACM/IEEE, ASME, and ASCE guidelines for framing its curricula. The Curriculum Design Model adopted by the college in the organization of its curricula is given hereunder:



Curriculum has been designed based on the following premises:

"Engineering is finding and delivering effective solutions to real life technical problems, within the given material, technological, economic, social, legal and environmental constraints, through the application of available knowledge from mathematics, science, technology, engineering sciences and engineering practice."

Engineering Curriculum, therefore, shall have be designed keeping in view, the above statement, which provides a framework for teaching and learning. Curriculum shall promote a transformation of students in their capabilities as a result of their learning. Curriculum is, therefore, what you want your students to learn through the program and how you propose to facilitate this learning.

Design of curriculum for any program should answer the following questions:

- ❑ What educational purpose should the program seek to attain?
- ❑ What educational experiences can be provided that are likely to attain these purposes?
- ❑ How can these educational experiences be effectively organized?
- ❑ How can we determine whether these purposes are being attained?

Evolution of Engineering Education

Five major shifts in engineering education have occurred during the past 100 years.

- From hands-on and practical emphasis to engineering science and analytical emphasis
- Outcomes-based education and accreditation
- Emphasizing engineering design
- Integrating information, computational, and communications technology in education
- Solving real-time engineering problems thereby providing economically feasible and environmental friendly solutions to such problems

The first two shifts have already occurred, but they continue to have implications for engineering education. The latter three are still in process.

The educational purposes an engineering program seeks to attain are Program Outcomes (POs) given by the accreditation agency, National Board of Accreditation and Program Specific Outcomes (PSOs) chosen by the Department offering the program.

An engineering graduate has to participate in wealth generating activities as a responsible citizen, which in today's world requires that he be able to

- effectively work in a team,
- communicate well with peers and society at large,

- continuously learn, and
- understand the impact of technology on society and environment.

“Engineering is profoundly a creative process. The most elegant description is that engineering is about design under constraints. The engineer designs

- devices,
- components,
- subsystems, and systems

To create a successful design, that leads directly or indirectly to an improvement in our quality of life, an engineer must work within the constraints provided by technical, economic, business, political, social, and ethical issues. Technology is the outcome of engineering;

We then considered the content design using the guidelines of AICTE by Identifying various Courses to be part of the curriculum. Courses need to be identified to meet the stated Program Educational Objectives under different categories:

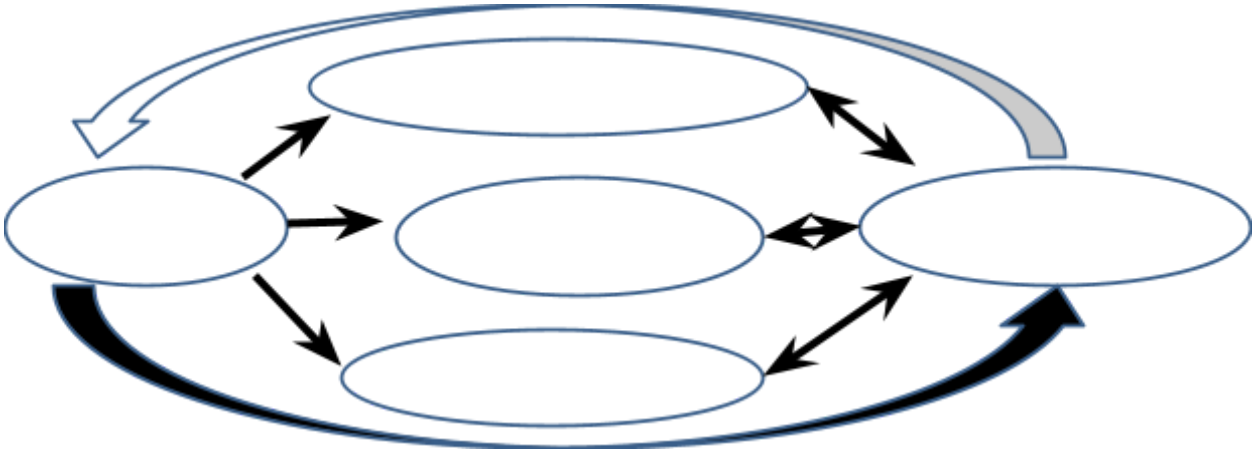
- Humanities and Social Sciences,
- Basic Sciences,
- Engineering Sciences,
- Professional Core,
- Professional Electives,
- Projects,
- Open Electives and
- Mandatory Non-credit courses.

In order to assure that all POs are adequately met through the courses and activities of the program it will be convenient to create a Course-PO matrix. While no course is designed to meet all the POs, all the courses and activities together have to meet all the POs adequately. A Course-PO matrix can facilitate this process.

Course Content Development / Design

Effective Course Content Development / Design is a continuous improvement process that includes five interconnected components. The design process generally starts with analyzing and identifying desired, measureable learning outcomes that support program educational objectives and program outcomes.

The design of learning experiences along with assessment will help to shape the learning environment. As faculty members regularly measure learning outcomes, the instructional design can be revised in the interest of achieving the learning experiences for students. The course design components are presented below in Figure, which illustrates the interconnectivity of these components.



Identification of learning outcomes

- Learning outcomes should indicate the knowledge and skills learners will demonstrate after completing a course and answer the question, "what outcome will the learner achieve after successfully completing the course?"
- "Learning outcomes essentially depend upon learning experiences"
- Designing effective learning experiences

  Learning experiences should be comprised of the following:

Instructional Materials

These can include a variety of printed and online resources that meet with varying learning styles.

Interaction

These can include faculty-learner interaction, learner-instructional materials interaction, learner-learner interaction, interface-learner interaction, and learner support.

Learning Activities

These can include learner-centered activities that are engaging and meaningful.

Feedback and measurement

The development of feedback and measurement strategies help learners achieve stated learning objectives.

Used focus groups to qualitatively evaluate student perceptions of learning on course based on the following questions:

1. What is the purpose of the course?
2. Why is it part of Undergraduate curriculum? / Why does the program offer this course?
3. What is the course trying to achieve?
4. What are the intended outcomes of the course?
5. Why are these outcomes important?
6. What role does this course play within the Program?
7. How is the course unique or different from other courses of the Program?
8. What essential knowledge or skills should they gain from this experience?
9. Which are the Higher-order thinking skills, that faculty members expect students to develop, learn, and master during the course
10. What knowledge or skills from this course students need to perform well in future classes or Higher Education / Jobs?
11. Why is this course important for students to take?
12. What is/are the prerequisite(s) for this course?
13. When students complete this course, what do they need to know or be able to do?
14. Is there specific knowledge that the students will need to know in the future?
15. Practical or professional skills needed in future?
16. In five years, what would students remember of the course?
17. Uniqueness of the course?
18. Can't this course be "covered" as sub-section of another?
19. Unique contributions of the course to students' learning experience?
20. What is the value of taking this course?
21. How exactly does it enrich the program?
22. How the course helps in student's educational experience and professional career?
23. How will they contribute to the preparation in becoming a Computer Science Engineer?

24. What have you liked most about this course? Why? How has it impacted and contributed towards learning?
25. What specific improvements do you feel could be made to the course?
26. Why should the specified areas be improved?
27. Drawing on your own background and learning experiences, what changes would you suggest to the course if you were to redesign the course?

Questions to Faculty regarding assessment:

1. What methods of instruction do you want to use in your course?
2. What methods of assessment are used in your course currently?
3. Which POs and PSOs are developed in your course?
4. What level of complexity/depth is expected for each of the learning outcomes?
5. Please specify how each of the learning outcomes are taught and assessed in your course.
6. How much has this course contributed to the skills and outcomes?
7. Which of the outcomes you feel has had the greatest/least amount of time spent on it in this course?

Questions to Students regarding their Learning experiences

1. How much has this course contributed to the skills and outcomes?
2. Which of the outcomes do you feel has had the greatest/least amount of time spent on it in this course?
3. Which of the outcomes do you feel you developed to the highest/lowest level of sophistication in this course?
4. Is there any outcome mentioned that was not covered, that you felt should have been covered?
5. How much has this course contributed to your skills and cognitive thinking?
6. Which of the outcomes do you feel has had the greatest/least amount of time spent on it in this course?
7. If you were asked to design this course, what additional value you think you may add to this course that would provide you with higher order thinking skills?

Having identified the groups of courses with their percentage components, we have arrived at the following with the indicated credits.

Humanities and Social Sciences (HSS) courses (04 + 06 credits)

These courses include English, Communication skills, Social Sciences, and Management.

At present, courses belonging to this category are usually the first level courses from Humanities, Social Science and Management disciplines. Such courses are designed for students who would eventually wish to specialize in those disciplines, and are rarely designed to meet the needs of engineering students.

Following are the POs which are met through these HSS courses

1. 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.
2. 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.
3. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
4. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
5. 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.
6. 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.
7. 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.

Courses such as English and Communication skills are to be given in the first year and third year respectively.

- Philosophy is that since many students come from rural areas they obviously need some command of English language since all courses they study require good command of English language.

- They also need to communicate in English, both written and oral; hence, a basic language lab is essential.
- Subsequently, they need to articulate their ideas and communicate with business professionals during their internships, a course on Advanced Communication Skills is essential, which may be offered after they get some exposure to engineering courses so that they would get to know how to write technical and business reports and present the same.

Students need to understand how different types of organizations work, and how financial resources are managed at individual, family, small organization, corporate and national levels.

Hence, Management courses facilitate the above, which are to be given after certain exposure to engineering discipline and internship after the end of second year that facilitates them with fair exposure to organizational working environment.

- Such courses can be "economics and accountancy" and "project management and finance", which are usually offered in third year and final year respectively.

Social Science courses in engineering programs should mainly focus on interactions among humans, and technological impact on humans.

These courses should be more of case based and should relate to local and national scenarios. Issues and cases should be carefully chosen so that students can readily relate to them.

Social sciences courses can be offered as "open electives" by civil engineering, electrical engineering, and management departments.

Open Elective Courses (09 credits) may be offered by each department that could be taken by students of other Departments.

However, these courses could also belong to Engineering Sciences, Basic Sciences, and Humanities and Social Sciences offered by

- EEE department which may be on "Sustainable energy", "Renewable energy", "Energy audit", etc in third year and final year
- CE department which may be "Green buildings", Sustainability of water and its impact on society", "Disaster Mitigation and Management" etc.
- Management department which may be on "Entrepreneurship", "Organizational Behavior" etc.

Basic Sciences – Mathematics – 16 credits

- Since most of the engineering courses require a strong mathematical background, particularly calculus, a course on Linear Differential Equations (both ordinary and partial) may be offered

in the first semester. Problems pertaining to electrical circuits, fluid mechanics, vibrations etc may be included in this course.

- A course on probability and statistics may be offered in the second semester so that students would be able to get a fair amount of exposure on how to collect data and doing statistical processing of data, which is is one of the POs. They would also understand the philosophy of prediction and predictive behavior of systems/equipments in various engineering applications.
- A course on various numerical methods may be offered in the third or fourth semester as they find applications in every area of engineering.
- Another course on Mathematics may be offered as per the requirement of discipline/branch of engineering (e.g. Complex variables for EEE and ECE, Number theory for CSE)

Physics and Chemistry (04+04 + 03 credits)

- There can be one course in Engineering Physics and one course in Engineering Chemistry.
- It may please be noted most of the topics presently considered in a course on Physics are already covered in Physics at Intermediate or 12^{th} Standard.
- In addition, there may be another course in Physics as per the requirement of the specific branch of engineering.

Engineering Science courses (20 credits)

1. Engineering Science courses are required for student as he should have enough exposure to various engineering disciplines since the graduating engineer is expected to work in a multi disciplinary environment.
2. This category of courses include, Engineering Workshop, Engineering Drawing, Programming for Problem Solving, Data Structures, Basics of Electrical/Electronics/Mechanical Engineering, Sensors and Instrumentation, etc.
3. Programming for Problem Solving, and Data Structures are required as graduated students are expected to think of a solution to every engineering problem in terms of automation which requires extensive use of software.
4. Basics of Electrical/Electronics/Mechanical Engineering, Sensors and Instrumentation are required as every system employed today falls in the category of electromechanical and sensors are very widely used for the purpose of automation and precision.

Courses should be common during the first two semesters to the extent possible to provide an opportunity to students to interact with students of other discipline for a broader outlook towards engineering profession.

At least, in the first two semesters, should have common courses for

- ME and CE,
- EEE and ECE
- CSE and IT

Professional Core Courses (56 credits)

- Program Educational Objectives (PEOs) are the statements that describe the technical activities graduates will be able to perform in a professional environment within three years of their graduation.
- Professional core courses are those courses without which the graduating engineer can't be called a graduate engineer in the specific branch of engineering
- To the extent possible, prepare the content of the professional core courses and assessment such that student acquires BTL 4, 5, and 6

For ECE, the courses are:

1. Circuit Theory
2. Electronic Circuits
3. Signals and Systems
4. Digital Design
5. IC Applications
6. Analog and Digital Communications
7. Electromagnetics and Transmission lines
8. Antennas and Microwaves
9. Computer Architecture and Microprocessors
10. Microcontrollers and Embedded Systems
11. Digital Signal Processing
12. Probability and stochastic Processes
13. Instrumentation and Control Systems
14. VLSI design using VHDL/Verlog
15. Computer Networks

Professional Electives (20 credits)

A department can offer a large number of electives depending on specializations of its faculty. These courses are usually designed to enhance the placement opportunities of students and also for some students going for higher education programs. We may limit them to about four or five courses. It is also a good idea to offer them with the corresponding lab

For ECE, the courses can be

Communication Area	**Circuit Design**	**Computing Area**	
Wireless Networks	**VLSI Design**	**Advanced Computer Architecture**	
Mobile Cellular Communications	**ASIC Design**	**Artificial Intelligence**	
Radar Systems	**RF Circuit design**	**IoT**	
Optical Communications		**Machine Learning**	

Mini Projects/Major Projects/Internships (16 + 02 credits)

These will provide opportunities to experience different streams in a discipline. These projects can be concerned with explorations, problem identification, problem formulation, conducting surveys, simulation, and design of software or hardware systems, and building prototypes. These facilitate students with attaining all Program Outcomes, in particular PO 4.

Complex Engineering Problems

- Involve wide-ranging or conflicting technical, engineering and other issues
- Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models
- Requires in-depth knowledge that allows a fundamentals-based first principles analytical approach
- Involve infrequently encountered issues
- Are outside problems encompassed by standards and codes of practice for professional engineering practice

While reviewing curriculum, the following questions may be raised

- Are critical thinking, communication, and discipline-specific learning outcomes appropriate to the course?
- Does the current program structure of core and elective courses address each of the learning objectives and provide the opportunity for student learning?
- Does the current elective courses and laboratory / experimental learning facilitate students to meet industry expectations?

- Do the current means of assessment accurately measure student learning on the defined outcomes?
- Are expectations of student performance met?

Factors to be considered when designing a course

1. Specific Context of the Teaching/Learning Situation
   - Is the course for first year, second year, or third year or final year students?
   - How many credits?
   - What physical elements of the learning environment will affect the class?
   - Are the students majors in your department or are they fulfilling a distribution credit?
2. General Context of the Learning Situation
   - What are the learning expectations in this course in the overall context of the curriculum towards the profession / society?
   - What would distinguish students who would take this course from students from students who do not? That is, how should taking your course transform students with respect to their abilities?
   - What do you want your students to remember from your course in 5-10 years?
   - What skills should students gain in this course?
   - How does this course relate to other courses in the discipline? Then how would you define the course goals accordingly (e.g., for an introductory, fundamental, or advanced course in the discipline)?
3. Nature of the Course
   - Is the course primarily theoretical, practical, or a combination of both?
   - Is the course primarily convergent or divergent?
4. Characteristics of the Learners
   - What prior knowledge, experiences, and initial feelings do students usually have about this subject? Consider previous course(s) they may or may not have taken.
   - What are their learning goals, expectations, and preferred learning styles?
   - What is the motivation for the student to take this course vis-à-vis the program curriculum?
5. Assessment an important aspect of student learning
   - Improving the quality of learning in a course involves not just determining to what extent students have mastered the course content *at the end of the course; improving the quality of*

learning also involves determining to what extent students are mastering content *throughout the course.*

- *Thus in addition to* providing instructors with valuable information about students' learning, assessment should assist the students in diagnosing *their own learning. That is,* assessment should help students "become more effective, self-assessing, self-directed learners".

6. The quality of learning in a course can be measured by the quality of assessment instruments used. Metrics to measure the quality of assessment can be defined in terms of distribution, difficulty level and nature of questions among the six levels of Bloom's Taxonomy.
7. Make sure to think carefully when pairing assessments with learning objectives.
    - How are you going to assess the students?
        - ✔ What assessment tools would be employed to gain students learning?
            - € Please note that assessment tasks are designed so that they support evidence of student learning and achievement of course learning outcomes.

The curriculum is designed to facilitate students obtain liberal education, which has the potential to broaden their perspective and transform the world. The curriculum offers various designated courses namely, Hard Core, Soft Core, Basic Sciences Core, Engineering Sciences Core, Social Sciences and Humanities Core, Professional Electives along with Open Electives such that it ensures balance between these courses. These courses are introduced with an objective of enabling the students to go for further specialization in their chosen field of interest, if they so desire.

Some of the mandatory non-credit courses suggested by AICTE have been taken as credit based mandatory courses by the college to ensure seriousness of participation amongst the students in these courses. The curriculum is structured with five theory and three laboratory courses from second year first semester onwards up to fourth year first semester to facilitate more practical oriented teaching and learning with an emphasis on local and global needs. The support of the college management, which has been forthcoming for the provision of all the required facilities, including establishing additional labs and infrastructure is unstinted and commendable. The introduction of Open Elective courses promots the philosophy of liberal education. Academic flexibility is maintained through a wide range of courses offered across departments.