



INSTITUTE OF AERONATICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

**Process Manual for
CURRICULAR PLANNING AND
IMPLEMENTATION**

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B.Tech - PROGRAM OUTCOMES (PO's)

- PO1 : **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2 : **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3 : **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4 : **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.
- PO5 : **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- PO6 : **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.
- PO7 : **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.
- PO8 : **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9 : **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10: **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.
- PO11: **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.
- PO12: **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

1. CURRICULAR PLANNING

The Curriculum is prepared by the concern Board of Studies (BOS) consisting of experts from the Industry, academia, members of BOS etc. The curriculum is finally approved by the academic council and displayed on institute website. At the beginning of each academic year the academic calendar and guidelines about the dates of commencement of the semester, end of the semester, continuous internal assessment, semester end examinations, Practical examinations, holidays etc will be issued.

Principal receives inputs through Internal Quality Assurance Centre, Department Advisory Board (DAB), council of deans and Academic coordinators etc. Based on these inputs Principal, head of the department (HOD), Dean of Planning, Monitoring and Continuous Education, Dean of Academic, academic committee member coordinators, Dean of Student Affairs, discusses and prepares the institute Event Calendar. These are documented by Dean of Planning, Monitoring and Continuous Education. It is then distributed to all the departments. Each department prepares their department Event Calendar in consultation with head of the department. Principal held a common meeting with all teaching and non-teaching staff before commencement of semester. Students are also made aware of commencement of semester through a common notice in bulletin board and also Telegram messenger.

Head of the department is to conduct a meeting with all staff before commencement of semester. The course allotment is done by head of the department and teaching plan - schedule of instruction of each course is prepared in line with department event calendar by individual course faculty in CMS Portal. The planning and implementation of curriculum is being monitored through Academic Monitoring Committee.

2. ACADEMIC MONITORING COMMITTEE (AMC)

The Academic Monitoring Committee (AMC) is headed by Dean of Planning, Monitoring and Continuous Education and comprises of heads of all departments and department academic coordinators (DAC). AMC is responsible for planning and monitoring of overall academic operations, activities, procedures, functioning and maintaining all relevant documents and files in association with various committee/coordinators of the department. The AMC is responsible for all academic aspects to ensure the effective planning and implementation of curriculum.

Objective(s) of AMC

The objectives of the committee are

- To provide clear guidelines to all teaching staff regarding curriculum planning and implementation
- To develop a mechanism for academic monitoring to ensure effective implementation of academic planner
- To ensure that all departments have done proper planning before the commencement of semester for conduction of lectures and practical's
- To ensure that effective teaching - learning is taking place throughout the semester
- To ensure that effective continuous assessment and evaluation is taking place to support teaching - learning
- To ensure that slow learners and advanced learners are taken care as per their needs
- To ensure that students are mentored for academic as well as personality development
- To ensure the attainment of course outcomes and eventually the program outcomes.
- To monitoring the academic performance, training and placement of the students.
- Planning and monitoring for Faculty development.

2.1. ROLES AND RESPONSIBILITIES:

2.1.1 DEAN OF PLANNING, MONITORING AND CONTINUOUS EDUCATION

Dean of Planning, Monitoring and Continuous Education should be responsible for following activities:

- a. The Dean in consultation with Principal and heads of department will form an Academic Monitoring Committee (AMC) comprising of heads of all departments and department academic coordinators (DAC) generally the Deputy HOD or time table coordinator.
- b. Provide guidelines to department academic coordinators and collect information from department academic coordinators and convey it to the Principal for corrective measures, if required.
- c. Prepare institute Event Calendar in accordance with Academic Calendar and submit the same to Principal for approval and same is to be forwarded to all the departments at least 15 days before commencement of semester.
- d. Ensure that slow learners and advanced learners are taken care as per their needs.
- e. In consultation with Principal and the heads of departments, should circulate the following information for smooth conduction of academics.
 - i. Semester start and end dates.
 - ii. Public holidays.
 - iii. Dates for CIE Tests and Semester End examinations.
 - iv. Schedule of student feedback.
 - v. Schedule of Industrial Visits, Guest Lectures.
 - vi. Dates for annual events (e.g. Annual day, Sports meet, METE, CONCOCT etc.)
 - vi. QIPs (short term courses, guest lectures, FDP, STTP, conferences, seminars) if any
 - ix. AAT work submission dates, practical / project examination dates
 - x. Guidelines for make-up-classes, remedial classes and make-up examinations etc.

2.1.2 DEPARTMENT ACADEMIC COORDINATOR (DAC)

The Department Academic Coordinator should monitor:

- a. Display of Class time table, timely distribution of individual time table and tabulation of faculty work loads.
- b. Students' Attendance monitoring through CMS Portal.
- c. Syllabus coverage monitoring through CMS Portal.
- d. Records of sending letters / SMS to the parents regarding their wards' performance.
- e. Mentors' records.
- f. Record of make-up classes.
- g. Display of monthly attendance, defaulter list, CIE test marks etc.
- k. To conduct interaction with course faculty (if required) and prepare minutes of meeting.
- l. Analyze and follow up various feedback like Turn-I (Early Semester) & Turn II (End of Semester and OBE) through CMS Portal, Course exit survey, student satisfaction survey report etc. related to academics.
- m. Executing Academic Audit for each semester.
- n. Forwarding information about not reported, late reported faculties to lecture hall / practical if any to HOD / Dean / Principal for necessary action.

2.1.3 TIMETABLE COORDINATOR

- a. Ensuring the Roll call list, batches, students' and their parents / local guardians' data with address, mobile number, email ids etc. is in place.
- b. Collection and maintenance of Theory and Practical Attendance Record (through CMS / physical) from course faculty and to prepare defaulter students' list fortnightly.
- c. Monitoring conduction of lectures and Practical regularly and making alternative arrangements in case of faculty is on leave and see that same must be recovered by course faculty taking extra lectures if required. He will also inform the Head of Department about making substitute arrangement for lectures and practical when a faculty is on leave.
- d. Displaying defaulters' list and prepare schedule for make-up classes.
- e. Preparing provisional and final detention list and displaying on notice board in consultation with DAC and HOD.
- f. Monitoring the syllabus completion (Theory and Practical) fortnightly and submitting the report to HOD / Department Academic coordinator.

- g. Collection of records of make-up classes.
- j. Maintaining informal feedback from students (if any).
- k. Conduction of course faculty meeting on regular basis and keep record of it.
- l. Monitoring late reporting student.

2.1.4 COURSE FACULTY

Course Faculty will be responsible for all the academic aspects for

- a. Preparing and maintaining schedule of instruction, course full stack, course file, taking attendance for each lecture / practical.
- b. Maintaining the daily attendance report and send information on the list of students continuously absent for more than 5 days to HOD.
- c. Providing subject notes, unit-wise question bank, Definitions and Terminology, AAT topics, assignments etc. to students.
- d. Periodic conduction of internal examinations, make-up classes, lectures for slow learners etc.
- e. Updating of personal file.
- f. Contribution towards holistic development of the student.
- g. Development of teaching material, planning of lessons, setting up laboratories and experiment, unscheduled teaching activities such student counselling, setting and evaluating test papers, arranging and conducting tests, conduct invigilation duties of CIE / SEE / University examinations, evaluation of answer scripts of of CIE / SEE / University examinations, implementation of project work for students, conduct and evaluate AAT.
- h. Curriculum Development due to the ever expanding demand of knowledge and changing needs of the industry.
- i. Student's activities as an adviser to student technical associations, co-curricular and extra-curricular activities.
- j. Administration which may be departmental and or institutional as member / convener of some committee.
- k. Involve in research and development activities.
- l. Professional activities i.e. involvement in professional and technical societies.
- m. Continuing education activities (FDP / STTP / Seminars / Workshops / Expert Lectures etc.) both as an organizer and (or) as a participant.

2.1.5 MENTOR

Objectives of Mentoring

- To understand the students' needs and potential
- To personally help the students to improve upon in academics, soft skills, personal development etc.
- To guide the students to overcome the problems in academics and personality development.
- To enhance peer interaction.

Roles and Responsibilities of Mentors

- a. To collect the list of allotted students and green book for updating the students' records from Dean of student affairs / HOD.
- b. To collect the "student's Information" from the respective student portal.
- c. To establish the contact with the parents through telephonic discussion, appraise them about the development of their ward.
- d. Conduct meeting with students once in two week.
- e. To act as a Counsellor, Guide and Philosopher of the student.
- f. To encourage the student to have open dialogue.
- g. To record the observations about the student viz. achievements, doubts, fears, grievances.
- h. To evaluate the student's ability, strengths and weaknesses.
- i. To help the students to over-come their weaknesses and strengthen the abilities to excel in his/her defined objectives.
- j. Update students' information on CMS portal.

- k. To report the weak cases to the Dean of student affairs and HOD, as well as those cases wherever special assistance is required, through HoD.
- l. HOD / Department coordinator of First year engineering shall handover the Mentor Record to respective department HOD at the end of every academic Year.
- m. To maintain utmost secrecy about the matters disclosed by the student during counseling.
- n. To maintain the following records:
 - i) Student Information
 - ii) Mentoring Record of students according to academic, Psychological, financial.
 - iii) Attendance of student about mentor meeting.

2.1.6 LABORATORY INCHARGE

- a. Dissemination of Vision, Mission statements into laboratory.
- b. Maintain dead-stock register.
- c. Preparation of laboratory manual and ELRV video for each experiment.
- d. Display of information related to Lab time-table, Total laboratory cost, List of major equipment, Lab area, Standard operating procedures (SOPs).
- e. Display of Models, Charts, Slides etc.
- f. To monitor condition of an equipment, to conduct preventive and predictive maintenance, calibration, annual maintenance contract of laboratory equipment.
- g. Suggest new equipment to meet the need of teaching, erection / installation and commissioning of new equipment, Procurement of consumables etc. before the implementation of revised syllabus (if any).
- h. Determine size of the batch, Number of sets, Demonstration kits etc. to be arranged.
- i. Preparation of day-to-day Continuous assessment lab sheet for each batch.
- j. Conduct mock practical / or oral examination for batch.
- k. Maintain laboratory utilization register, equipment utilization for specific work.
- l. Maintain calibration, testing and consultancy (if any) records conducted in laboratory.
- m. Periodic feedback from students about working of instruments and special need.
- n. Make a laboratory budget.
- o. Monitor laboratory safety and cleanliness.

3.0 PROCESS OF EFFECTIVE CURRICULAR IMPLEMENTATION:

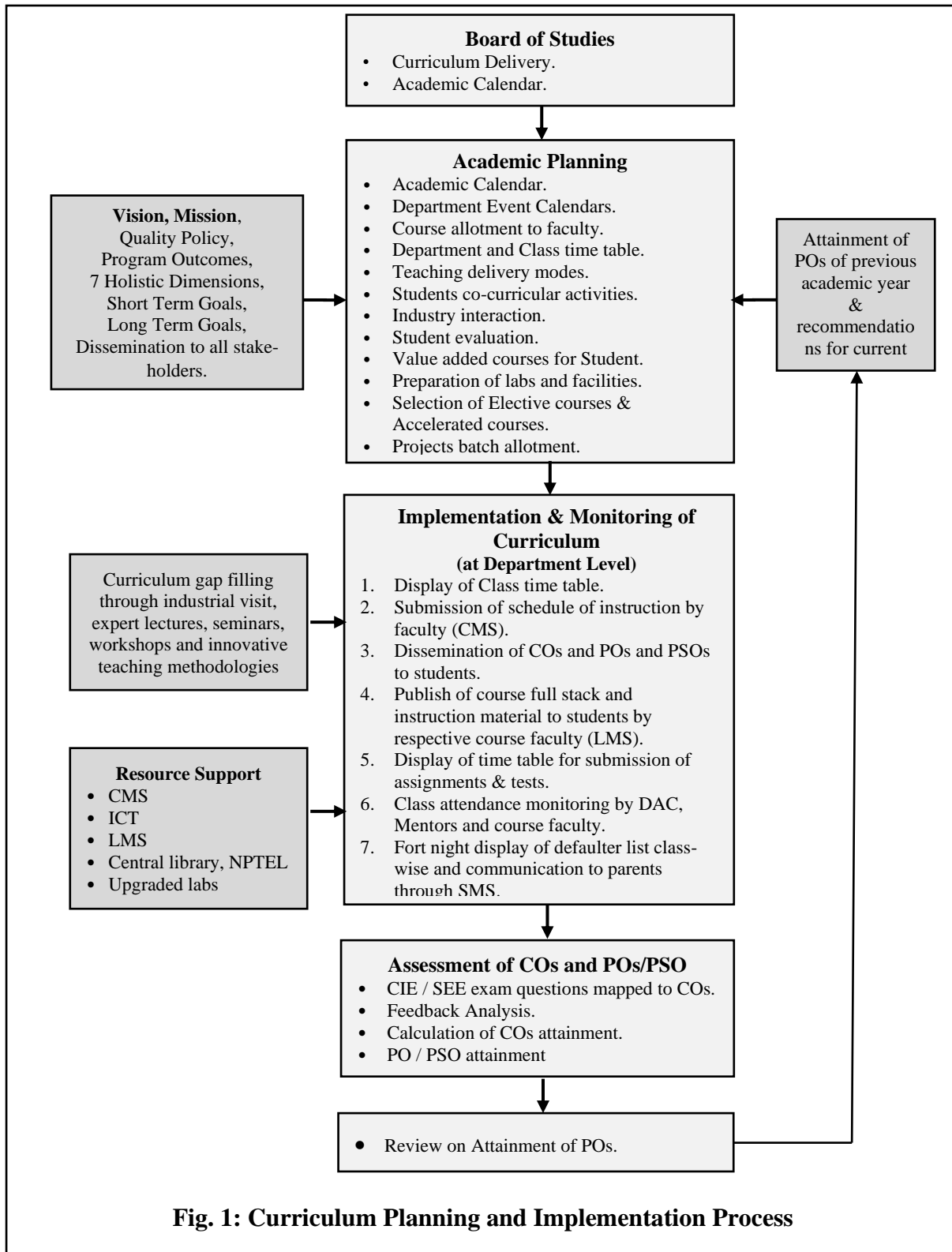
The implementation of curricular is carried through a systematic procedure as explains in detail:

PREPARATION OF SCHEDULE OF INSTRUCTION (TEACHING PLAN)

The syllabus prepared by BOS, specifies the number of lectures, list of recommended books and assessment scheme of internal and external marks. HOD distributes the teaching load by considering the course choice form filled by the faculty members. In order to have smooth conduct of curriculum, HOD allocates the load according to faculty competency. The activity is carried out immediately after the end of the previous semester so that faculty members get sufficient time for the preparation of the course assigned to them for the next semester.

Every faculty member prepares a schedule of instruction of entire semester in-line with the department's academic calendar. To prepare and maintain documentation, the institute provides the facility of CMS portal. Detailed module-wise and date-wise plan is prepared by individual faculty.

Schedule of AAT evaluations, CIA and SEE examinations are displayed time to time. Training on OBE, induction, guidance is imparted to newly joined faculty for building and maintaining academic culture in the institute by center for educational technologies (CLET). An induction programme is conducted for First Year Engineering students before start of semester. Imparting guidelines for upgrading innovative and creative teaching learning process, methodology, tools and techniques at periodic intervals by implementing advanced concept of pedagogy, ICT, e/Early learning videos and course full stack through learning management system, student centric AAT methods, participative learning etc. for enhancing teaching and learning experience. Figure 1 shows the process of effective curriculum planning, monitoring and implementation.



CURRICULUM DELIVERY

The effective implementation of curriculum is ensured by supplementing classroom teaching with expert lectures, presentations / seminars, open ended experiments, in-house and industry supported projects, tutorials, group assignments, case studies, industry visits, industrial training, internships, IARE LMS e-learning/Early Learning Videos (ELRV), NPTEL lectures, tech talk topics, concept video presentations, technical quiz, assignments, internal-tests etc. as shown below.

Training needs of faculty are identified by the head of the department. Faculty is encouraged to attend short term training programs (STTPs), faculty development programs (FDPs), Seminars, Workshops, Industry Training etc. to bridge the need.

Contents beyond curriculum are identified and taught both in the classroom and in the laboratory to expose student learning to recent trends in the industry. Figure 2 shows the course delivery process.



Figure 2: Course delivery

MONITORING PROCESS

Academic coordinator, HOD and Dean of Planning, Monitoring and Continuous Studies, monitors the progress of syllabus coverage every fortnight through CMS portal. The number of lectures planned and the number of lectures actually conducted facilitates identification of gaps, if any, and necessary corrective actions are taken for filling the gap.

Following activities related to academic monitoring are carried out through CMS:

- Preparation of Timetable: Class wise, Laboratory-wise, Class room-wise and Individual.
- Preparation of Schedule of Instruction (Teaching Plan).
- Attendance Monitoring: (Course-wise, Class-wise, Percentage-wise).
- Syllabus coverage Monitoring.

- Continuous Assessment.
- Internal Examination schedule, result analysis.
- Upload of tech talk, concept video, open ended experiments, assignments, question bank, definitions and terminology, e-learning/Early Learning Readiness Video lectures, lecture notes, power point presentations, class handouts.
- Student's feedback – early semester, end of the semester and OBE.
- Communication to parents through SMS.

PROCESS TO IDENTIFY SLOW LEARNERS

The students are tracked during their academic journey in the institute and special efforts are made to bring slow learners (students with certain limitations) to come at par with the average / above average category. Students with good background and skills are guided to higher levels of achievements and encouraged towards challenging goals (skill-up and skill-bridge).

The entry level student data is shared with the dean of student affairs and Mentors (15 students to mentor), to evaluate the student learning level as advanced learner or slow learner. The mentors, in weekly meetings with all faculties of respective classes, carry out discussion based on analysis records available about students' levels, abilities, characteristics, skills, attitudes, examination results (internal and external) and their current day to day interactions / experiences. Based on this evaluation, feedback is given to students and special programs / activities are undertaken.

This data analysis done at entry stage is passed subsequently to Mentors of next classes. The mentors of second year onwards carry forward the activities at individual departments. Students' attendance is also being monitored through CMS portal on every week and list of defaulter students are displayed on department notice board. Attendance of students is regularly being informed to the parents through SMS facility. The career development center make special provision of exhaustive soft skill training and exclusive counselling, to mould the slow and advanced learners to plan their careers and placements. Through this process slow learner are identified and following activities are carried out for them.

Activities for Slow learners:

- Tutorial
- Special lecture notes
- Question bank
- Extra lectures
- Extra Practical sessions
- Make-up test for improvement
- Personal Attention in teaching
- Remedial and Make-up classes
- Mock practical examination
- Counselling – special hints and techniques
- Guidance for project presentation
- Assignments and solving previous question papers

ENCOURAGEMENT TO ACTIVE LEARNERS

In order to promote advanced teaching and learning methodologies to give motivation to learn, higher retention of knowledge through better understanding, increasing depth of knowledge and developing positive attitude to the subject taught, the following activities to be planned.

a) Active learning: We adopt active learning by involving students in the learning process more directly through following activities:

- Activities on technical content of syllabus like brain storming, quiz, debate, group discussions, role play, games, model making, mini project, presentations, essay, elocutions, case studies
- Encouragement to complete NPTEL certification courses.

- Additional Honors and Minor degree program.
 - Career and employability training for Skill-up and Skill-Bridge.
 - Active participation in Competitive Coding Platforms (like Codechef, Hacker Rank, Code Forces, Interview Bit etc.).
 - Implementation of research papers.
 - Participation in Seminars and Conferences.
 - Motivational guest talks.
 - Paper publication and presentation.
 - Workshop and seminar on current trends.
 - Innovative model making / building leading to industrial designs.
 - Motivation and Guidance for higher studies (GRE, GATE, competitive exams).
 - Industry visits and field visits.
 - Industry sponsored research project.
 - In house Mini-projects (over and above the syllabus).
 - Participate in state, national and international level competitions such as SAE, SUPRA, GO-CART, HACKTHONS, etc.
 - Project competition like SAE, SUPRA, GO-CART, BAHA, etc.
 - Encourage students to participate in professional body activities and memberships such as, ISTE, SAE, CSI, IEEE, Institute of Engineers, IETE, ACM, etc.
- a) **Honors and Minor degree:** Additional learning leading to B.Tech degree with HONORS / MINOR in engineering.
- b) **Collaborative Learning:** We implement collaborative learning by forming student teams working together to solve a problem, complete a task, or design a product. Team works are done in activities like group projects, joint problem solving, debates etc.
- c) **Inquiry-based Learning:** We make our classrooms as open systems where students are encouraged to search and make use of resources beyond the classroom for investigation of open questions / problems, developing their critical thinking and increasing understanding levels by performing review of research papers, Surveys etc.
- d) **Problem based Learning:** We assign students different tasks, assignments, portfolios, activities in which students engage in complex, challenging problems and collaboratively work toward their resolution by using inter-disciplinary knowledge to solve problems. Example SAE, SUPRA, GO-CART, BAHA projects.
- e) **Peer Led Team Learning:** We provide an environment for students to engage in intellectual discussions and work in problem-solving teams under the guidance of a peer leader to perform activities like designing and developing software for different competitions in our technical fest.
- f) **Experiential learning (ExL):** We provide the opportunity for active experimentation and concrete experience through a variety of carefully designed projects-based learning experiences, problem-based learning experiences, game-based learning experiences, laboratory experiments, service-based learning and other activities.
- g) **Full Semester Internship (FSI):** The mandatory semester long B.Tech project is converted to a learning platform by using various tools of project management, solving real time challenges and giving the satisfaction of achieving the goal at the end of completing the project.

FEEDBACK PROCESS

Students' feedback about teaching a course is taken twice in semester through CMS portal. Early semester feedback is to take between first 15 to 20 days of commencement of classwork. Corrective action is to take after this feedback. Outcome Based (OBE) course questionnaire is taken on the attainment of Course Outcomes at the end of the semester. Following questionnaire is set for feedback.

EVALUATION PROCESS

Internal assessment is carried out through CIE-1, CIE-2, Alternative Assessment Tool (AAT), Make-up and remedial tests etc. Semester End Examination (SEE) is conducted as per schedule prescribed in academic calendar and termed as external assessment. The AAT may include tech talk, tutorial hours/classes, seminars, assignments, term paper, open ended experiments, concept videos, partial reproduction of research work, oral presentation of research work, developing a generic tool-box for problem solving, report based on participation in create-a-thon, make-a-thon, code-a-thon, hack-a-thon conducted by reputed organizations / any other. etc. Semester End Examination and Continuous Internal Examination questions are used for mapping of CO - PO / PSO.

Assessment Tools

- a. **Direct Assessment Tools:** CIE-1, CIE-2, AAT, Semester End Examination.
- b. **Rubrics:** A Rubric explains to students the criteria against which their work will be judged with "scoring rules". This criterion helps the students in developing, revising, and judging their own work.
- c. **Indirect Assessment Tools**

Programme level statistics: At the end of semester the statistics of students who have participated in professional bodies/ student chapters / workshops / seminars / conferences / paper presentations / internships / industry visit etc. are prepared. This is considered to indirectly assess the PO's.

Survey reports: Indirect assessment strategies may be easily implemented by conducting the Course End Survey, Programme Exit Survey, Alumni Survey and Employer Survey.

IN-PUT FOR CURRICULUM DEVELOPMENT

Each course has defined COs that are mapped to the PO's. The POs are achieved through a curriculum that offers a number of core courses as well as elective courses. A set of performance criteria is used to provide quantitative measure of how well the COs are achieved. The mapping of COs with POs / PSOs of the program are considered by the individual staff and feedbacks from stake holders such as, students, alumni, parents, employers, teachers to give input in framing the syllabus which will be communicated to Board of Studies (BOS) members to modify in the syllabus through faculty participating in various syllabus design and implementation work-shops and separately through E-mail. The suggestions given by individual staff are incorporated by BOS for curriculum enrichment.

4.0 EXTENSION SERVICE ACTIVITIES

For holistic development of student, institute conduct service activities and following administrative setup is put in place to ensure the achievement of POs and PSOs

- Alumni Association
- National Social Service (NSS)
- Career Guidance and Counselling
- Industry-Institute-Interaction (III)
- Entrepreneurship Development Centre (EDC)
- Career Development Centre (CDC)
- Technology Innovation and Incubation Centre (TIIC)
- Institution Magazine, Bulletins, Newsletters etc
- Annual Day Celebrations, Graduation Day and Cultural activities
- Placement and Training Centre (PAT)
- Student Chapters of Professional Bodies and Students Technical Associations

5.0 CAREERS AND EMPLOYABILITY SKILLS TRAINING (CEST)

IARE has an excellent and fully functional Career Development Center (CDC) and Placement and Training Center (PAT) to enhance employability skills with adequate infrastructure comprising of flipped class rooms, seminar hall, discussion rooms and interview rooms. The Dean of Placement and Training maintains a database of all the registered students with all relevant details and information of companies visiting the campus. A large number of companies visit the campus every year and recruit eligible students from the campus. The number of students placed through campus recruitment activity is increasing every year. The PAT is assisted by faculty coordinators by each department. Institute had the distinction of being visited by core companies specific to each domain as well as interdisciplinary area.

The Careers and Employability Skills Training (CEST) is a unique and dedicated program under “Careers Development Center”. The advent of globalization has opened up Indian economy to the outside world. The competition among industries has become stiff; therefore, it is urgently needed to prepare engineering students for jobs in multinational companies, by exposing them to newer technologies and engineering methodologies. CEST is there to create a healthy environment by engaging Industry and Academia resources combined in skill building programs (SkillUP & SkillBridge). A gap between training and placements is usually observed in academics and to combat this gap, skill building programs are designed with industries. This approach has ensured better interaction between industry and academia, enhancing relevant skills and also innovative thinking amongst the students.

CEST is working on Industry-Institute Interaction and preparing manpower of world class in the field of science and technology by inculcating various skills required by the industry. Though availability of manpower is abundant in India, well equipped manpower with employability skills is the real need of the hour. There is a need to create avenues for close academia and industry interaction through all the phases of technology development, starting from conceptualizing to commercialization.