LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
DEPARTMENT OF MECHANICAL ENGINEERING
Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi.
NAAC & NBA Accredited Certified by ISO 9001:2015

Programme Assessment Committee (PAC)

Regulation (R17)

Action Taken Report (ATR) on Programme Outcomes (POs) and Programme Specific Outcome (PSOs) attainments of the batch: 2017-21.

A.Y:2020-21

POs	Target Level (%)	Attainment Level (%)	Observations
PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.			
	71	74	**Target reached.** It is observed that 8 courses are contributing more than 80%. 23 courses are contributing between 70% to 80% and 20 Courses are in between 60 to 70%. Around six courses are contributing less than 60% to this PO1 attainment, The courses like problem assisted learning, Kinematics of Machines, Dynamics of Machines, Non-conventional energy sources and comprehensive Viva Voce courses contributed less than 60% attainments.
	Action 1: The courses like Problem assisted learning, Kinematics of Machines, Dynamics of Machines, Non-conventional energy sources and Comprehensive Viva Voce courses contributed less than 60% attainments. It is recommended that the module and course coordinators have to look for nnecessary modifications in teaching-learning methodology for the above courses to improve the PO attainment for the next batches. **Action 2:** Engineering domain connected mathematical problems as well as the knowledge of engineering sciences is highly useful for solving problems. These things can be improved by providing tutorial questions from standard text books and assignments though the contributed courses. **Action 3:** Students are encouraged to participate in Co-curricular events organized by student chapter (ISHRAE), club (robotic club) and association (AMEL) activities, where they gain the knowledge of application of fundamental science and engineering. **Action 4:** Workshops on engineering mathematics connected to engineering domain are recommended to improve the PO1 attainments.		
PO2: Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.			
	71	74	**Target reached.** It has observed that 53 courses are contributing

			to this PO2. Out of this, 8 courses are contributing more than 80%. 18 courses are contributing 70% to 80%. 22 Courses are in between 60 to 70%. Two courses are contributing less than 60% to this PO2 attainment, Kinematics of Machines and Dynamics of Machine courses have contributed less than 60% attainments.
	Action 1: It is instructed to concerned course instructors/coordinators to use the developed prototype models in the Kinematics and Dynamics area related in the class room to improve the problem analysis level questions to improve the PO2. **Action 2:** Use the different pedagogical methods to improve the attainment levels of PO2. **Action 3:** Complex problems and its analysis are practiced for few courses in the classroom through the tutorials/Assignment problems. **Action 4:** Gained knowledge on complex engineering problems and solutions by sending the students to various industries and encouraging the students to industrial internships.		
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.			
	70	74	**Target reached.** It has observed that 51 courses are contributing to this PO3. Out of this, 8 courses are contributing more than 80%. 18 courses are contributing 70% to 80%. 20 Courses are in between 60 to 70%. Four courses are contributing less than 60% to this PO3 attainment. Dynamics of Machines, Theory of Machines and Mechanical Engineering Design courses have less attainments levels.
	Action 1: The concerned faculty are suggested to use the video lectures for making students better understand the level of design principles and improve the learning process and also to enhance the student skill set in design and development of various systems. **Action 2:** Design of Experiments is added as an Add on Course and Project based Learning course is added in curriculum to develop skills in design/ development solutions. **Action 3:** A design/development of workshop/contest can be conducted to further enhance the attainment level of PO3.		
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 for complex problems.			
	70	73	**Target reached.** It is observed that, 47 courses are contributing to

			this PO4. Out of 47, 7 courses are contributed more than 80%, 14 courses are in between 80 and 70%, 19 courses are contributing 60 to 70% and only 6 courses are contributing less than 60% to the attainment of PO4.Courses like Industrial/ in-house training, Machine tools and Dynamics lab, Production Technology lab, Metallurgy and Material Science laboratory, Basic Electrical engineering courses are to be improved.
	Action 1: It is instructed to the concerned course and module coordinators that the target not reached courses must think for improvement of conduct and investigations of problems especially in labs and problematic courses to improve the attainment level of PO4. **Action 2:** Investigation of complex problems using software tools and the implementation of skill-oriented programs could be improving the skill set of graduates to solve complex design problems. **Action 3:** Technical events are organized to develop skills on solving real world problems (Lakshya/ ISHRAE etc are organized) **Action 4:** Lab courses (Thermal Engineering, Metallurgy and material science and Dassault system and Ansys Lab) beyond syllabus experiments were performed in order to enhance research-based skills.		
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.			
	72	75	**Target reached.** Around 13 courses are contributing to this PO5. Only 4 courses are contributing in between 60 to 70%. Problem based learning, seminars; CAD/CAM Lab, Robotics and Simulation lab course are weakly contributing to this PO5.
	Action 1: Prepare some case studies or solve some numerical problems using freely available software tools such AUTO CAD, CATIA, PRO-E, ANSYS. to motivate the graduates to use the modern tools in academic activities. **Action 2:** Some video lectures are to be given based on the criticality of the courses in software tool usage. **Action 3:** Conduct workshops on Robotic Simulations, CFD/ANSYS, and some more software tools like CATIA, MATLAB and Skill oriented experiments, targeting complex Engineering Problems. **Action 4:** Project Based Learning courses are to be aligned to strengthen modern tool usage.		
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.			
	74	77	**Target reached.** Only 15 courses are contributing to this PO6.

			The courses like Problem assisted learning, Problem based learning Project, Internship, mini project, Communication and Presentation Skills Lab, Seminar are contributed positively to attain the PO6. The courses like metallurgy and material science and thermal engineering courses contributed 50 to 60 % attainments.
	Action 1: More number of students are encouraged to participate in co-curricular and extracurricular activities and recommended for good internship participation. **Action 2:** Motivate the students to actively participate in social services and the interaction between industry and society. **Action 3:** Students are encouraged to do projects with concerns on society like electric car and wind turbines etc. Students are encouraged to participate in societal activities through NSS, Blood Donation Camps and other Student Clubs to understand the problems in the society and the courses like Environmental science are included in curriculum to enrich their understanding of the society. **Action 4:** Students are encouraged to participate in technical club events organised within and outside the college.		
PO 7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.			
	70	76	**Target reached.** Total 18 curses are contributing towards the attainment of PO7. Only 4 courses are strongly correlated means more than 80% towards the PO7. 12 courses are contributing 60% to 80%. However the target is reached but the courses like Non-conventional Energy sources, and problem assisted learning courses have lower attainment value than the target value of 70.
	Action 1: Students are motivated to acquire knowledge on environment and sustainability issues by attending the various events organized by the inter-institutes. **Action 2:** Students are encouraged to do projects on alternate fuels. Workshops on non-conventional energy, sustainable engineering designs were conducted for inculcating thoughts on sustainable development. **Action 3:** Conduct some activities/workshops on environmental science and sustainability engineering under environmental club are recommended to enrich their understanding of the society.		
PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
	69	74	**Target reached.** 11 courses are contributing to this PO8. Out of 11, 3 courses are contributed strongly towards the attainment of PO8. Though the target is reached but the courses like Mechanical Engineering Design -I and II, Basic Electronics

			Engineering and thermodynamics have some lower attainment levels.
	Action 1: It is recommended for the Course/Module Coordinators about the importance of Data hand book usage in Engineering practicing the problems and Professional Ethics and Human Values importance in the engineering. Encouraging more students to participate in sports and cultural activities. **Action 2:** While solving the engineering practice-oriented problems graduates have to follow the code of ethics. **Action 3:** Improve the ethical principles and methodology in the contributed courses like main project, mini project, laboratories, and internship. **Action 4:** Technical Societies like ISHRAE, ISTE and automobile club are started and conducted few programs to ensure ethical practices in engineering		
PO 9: Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.			
	74	73	**Target not reached.** Out of 50 courses, only 15 courses are contributing to this PO9. Out of 15, courses like Material testing lab, Fluid Mechanics and Hydraulic Machines Lab, , Thermal Engineering Lab, Heat Transfer Lab, Seminar, Communication and Presentation Skills Lab, Mini project, main project, CAD\CAM Lab, Internship, Comprehensive Viva-Voce courses are positively contributed in the attainment of PO9. But there are Metallurgy and Material Science laboratory, Problem Assisted Learning, Internship, Mini project, Machine Tools & Dynamics Lab, Production Technology Lab contributed less than 70% attainments.
	Action 1: Increasing emphasis on seminars/ group discussions and to carry out the lab experiments individually or in some cases as team members. **Action 2:** Students will be encouraged to organize and participate in technical events to improve their leadership and personal development. **Action 3:** Faculty are instructed to use different pedagogical techniques to improve the teaching-learning process of not attained courses such as EEE Lab, Material Testing, Metallurgy lab and Thermal Engineering Lab.		
PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.			
	72	70	**Target not reached.** It is found that a total of 21 courses are contributing towards the attainment of PO10. 8 courses are strongly correlated, 7 courses are moderately correlated, and 12 course are slightly

			correlated to PO10. Courses like Professional communication Metallurgy and Material Science lab, Problem assisted learning Production Technology lab, Seminar, Industrial training, Mini project, Internship and Comprehensive Viva-Voce have not contributed positively to meet the target level of PO 10.
	Action 1: Change the delivery content like involving the more students in interaction/group discussion to improve the communication skill of the students. **Action 2:** Soft skill training is imparted to students to enhance various aspects of communication or technical talks by group discussion, presentation, and new learning outcomes. **Action 3:** Assessment of Mini-Projects, Internship, Problem Assisted Learning (PAL), Problem Based Learning(PBL) and Main Projects rubric sheet has to be discussed with the the students to improve their communication, presentation and report writing skills. **Action 4:** Seminars and training programs on communication, presentation skill will be arranged for the students.		
PO 11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.			
	70	74	**Target reached.** Only 10 courses are contributing to this PO11. It is found that a total of 6 courses like Industrial training, Internship have attained the attainment levels in between 60 to 80% to the PO11. Recommended the Industrial Management course to correlate this PO11.
	Action 1: Impart the knowledge and understanding of the engineering and management principles to work out projects on multidisciplinary environments. **Action 2:** Select internship activities based on the work, as a member and leader in a team to acquire the knowledge of project management principles and finance. **Action 3:** Seminars are conducted through entrepreneurship development cell on Project Management. **Action 4:** Students are encouraged to include the cost analysis of their projects.		
PO 12: Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.			
	69	74	**Target reached.** It is found 51 courses are contributing to this PO12. Out of 51, 6 courses are attained more than 80%, 39 courses have attained the attainment levels in between 60 to 80%. 5 courses are attained the less than the 60% attainments. Continuous motivation on higher studies and self-learning like MOOCS, NPTEL,

			and Course Era will be planned to strengthen to the attainment of this PO12. Seriousness on assignments and problem solving in tutorial hours is highly appreciable.
	Action 1: Encourage/Motivate the students about the lifelong learning approach through alumni interactions, invited keynote presentation from the academic experts. **Action 2:** Inculcate the students to develop the habit of self-preparation and curiosity in learning new information. **Action 3:** LAKSHYA an annual technical event is being conducted to encourage students to opt for lifelong Learning. **Action 4:** Association Activities are conducting to develop critical thinking Self-learning modules through SWAYAM & NPTEL courses are introduced to the students for inculcating the spirit of Continuing education. **Action 5:** Conduct of technical training/GATE classes for the graduates to motivate the students towards higher education and lifelong learning.		
Programme Specific Outcomes (PSOs)			
PSO 1: To apply the principles of thermal sciences to design and develop various thermal systems.			
	70	74	**Target reached.** A total of 27 courses are contributing to this PSO1. It has observed that 5 courses are contributing more than 80%. 12 courses are contributing 70% to 80%. 8 Courses are in between 60 to 70%. Around two courses are contributing less than 60% to this PSO1 attainments. Problem assisted learning and Non-Conventional Energy sources course attainment levels are less than 60%. Students have done 15 project works under thermal areas and needs to be improved on fabricated models.
	Action 1: Improve the learning methodology in problem assisted and problem based learning courses, as well as to provide more information on seminars, mini projects, comprehensive viva voce questions related to the thermal stream courses such as TD, FMHM, ATD, HT and R&AC may help in improvement of the PSO1 attainment. **Action 2:** Motivate the graduates to make design and development of various thermal systems/products by applying the basic principles of thermal sciences. **Action 3:** Thermal engineering stream industrial visits/in-house training activities are encouraged.		

<table>
<tr><td colspan="4">PSO 2: To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis, and manufacturability of products.</td></tr>
<tr><td></td><td>69</td><td>73</td><td>Target reached.
A total of 32 courses are contributing to this PSO2. It has observed that 4 courses are contributing more than 80%. 10 courses are contributing 70% to 80%. 14 Courses are in between 60 to 70%. Focus on this 14 courses to improve the attainment levels of PSO2. The courses like Metrology and Instrumentation lab, Robotic and Simulation lab, Mini projects, seminars, Machine tools and Dynamics lab, PT lab where the attainment levels have to be improved. Eleven projects done under manufacturing area need to be developed to prototype.</td></tr>
<tr><td></td><td colspan="3">Action 1: Conduct workshops on production/manufacturing science areas for the improvement of PSO2.
Action 2: Provide some videos as well as power point presentations for improving the learning strategies for the above identified courses to improve its attainment level.
Action 3: Showcase the different pedagogical methods in manufacturing area for improving the learning levels of the students.</td></tr>
<tr><td colspan="4">PSO 3: To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.</td></tr>
<tr><td></td><td>69</td><td>73</td><td>Target not reached.
A total of 41 courses are contributing to this PSO3. It is observed that 5 courses are contributing more than 80%. 16 courses are contributing 70% to 80%. 16 Courses are in between 60 to 70%. Around 4 courses are contributing less than 60% attainment levels.
The courses like mechanical engineering design, thermodynamics and energy related courses are contributing to fewer attainments.
Students have done 23 project works under design stream and needs improvement on fabricated, CATIA, ANSYS models preparation.</td></tr>
<tr><td></td><td colspan="3">Action 1: Internship in design stream is recommended.
Action 2: Industrial visits on design domain are recommended to improve the PSO2 attainments.
Action 3: Faculty should implement various pedagogical techniques to focus on higher cognitive level problems and its relevant analysis in the classrooms.
Action 4: Instructing the design faculty members for conducting the design-oriented project works relating to transmission of motion and power.</td></tr>
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Observations

Table 1: Contributory courses towards POs and PSOs attainment levels

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Total number of contributory courses (4 years)	74	66	60	61	15	18	20	12	34	31	10	67	28	34	46
Total number of contributory courses (3 years)	57	53	51	47	13	15	18	11	22	21	10	51	27	32	41
No.of courses contributing more than 80%	9	8	9	7	4	5	4		2	3	3	6	5	5	6
No. of courses contributing in between 70% and 80%	27	23	23	19	5	6	7	1	6	2	3	25	13	12	19
No.of courses contributing in between 60% and 70%	16	18	16	16	4	2	5	6	12	11	3	15	7	11	13
No.of courses contributing in between 50% and 60%	5	4	3	5	0	2	2	1	2	5	1	5	2	3	3

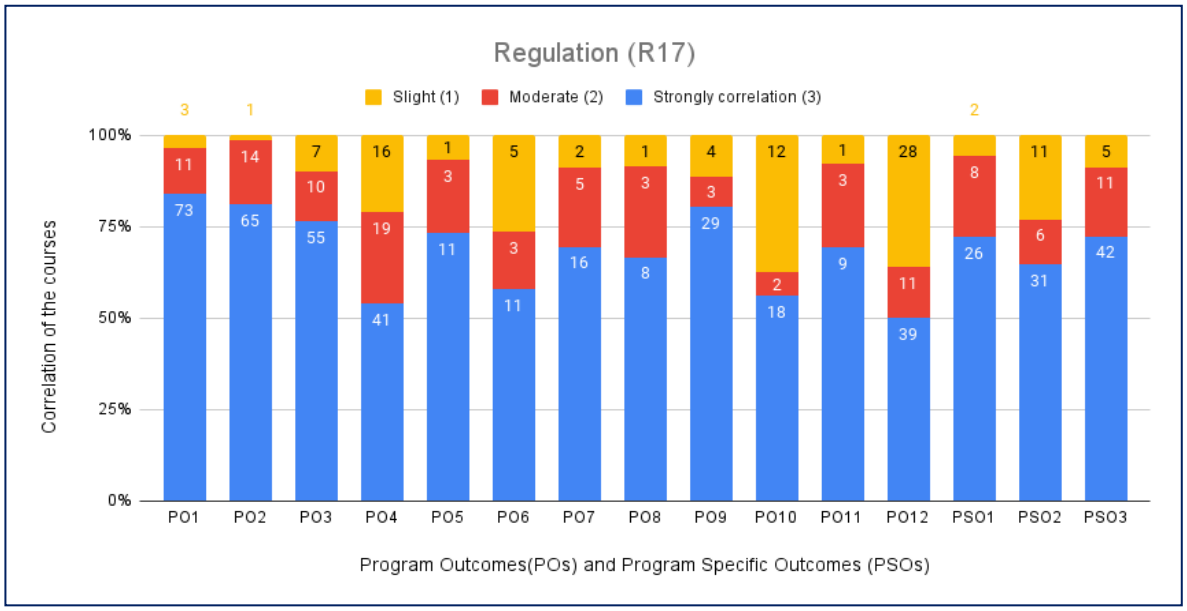

Figure 1: Representation of number of courses against Program Outcomes (POs) and Program Specific Outcomes (PSOs) for R17 Regulation with respect to the correlation.

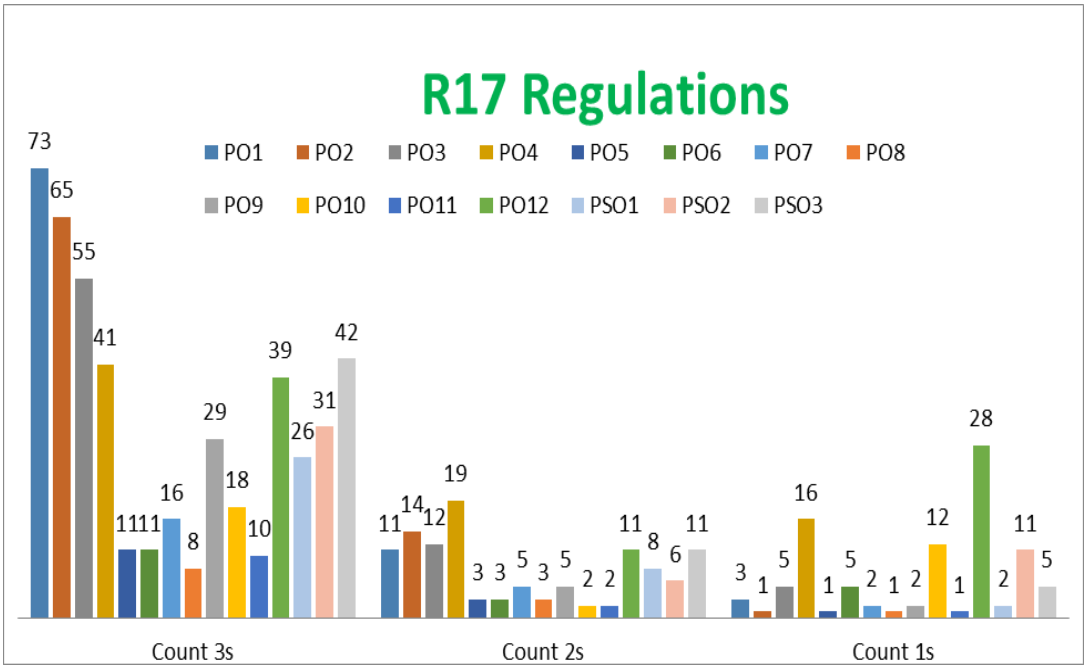

Figure 2: Distribution of correlation of courses towards Program Outcomes (POs) and Program Specific Outcomes (PSOs) for (2017-21) admitted batch.

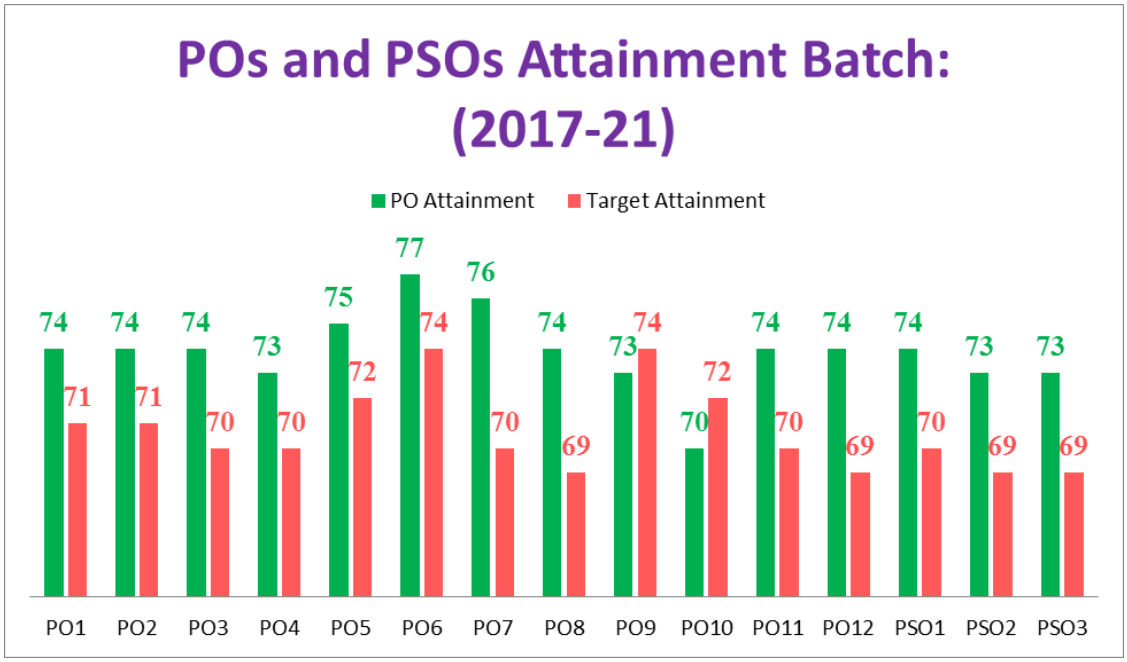

Figure 3: Attainments of Program Outcomes (POs) and Program Specific Outcomes (PSOs) for (2017-21) admitted batch against the target level.