LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
NAAC Accredited with 'B++' grade, accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

Programme Assessment Committee (PAC)

Action Taken Report on POs & PSOs Attainment Levels

A.Y:2019-20

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	72	**Target reached** It is observed that 25 courses are strongly contributed to this PO1 attainment, and 23 courses are moderately and slightly correlated towards the PO1. The courses like Applied Mathematics – III, Probability &Statistics, modern machining process, Mini Project Internship etc are higher attainment values in reaching the target of PO1.
	Action 1: The courses having less than 71% POs attainment are identified such as Robotics, Heat Transfer, Dynamics of machines, Machine design I; Estimation, Costing and Engineering Economics, Electrical & Electronics Engineering, and these details are forwarded to the concerned course coordinators through the module coordinators. Necessary changes in teaching-learning methodology for the above courses are made to improve the PO attainment for the next batches **Action 2:** Basic principles of engineering domain as well as the knowledge of mathematics are highly useful for solving complex problems. These things can be improved by providing more tutorials and assignments though the contributed courses. **Action 3:** students are encouraged to participate in technical events organized by ISHRAE, Robotic club and AMEL where they gain the knowledge of application of fundamental science and engineering. **Action4: Mr.V.Sethu Ram, Team Lead, Quest global, (Alumni)** have delivered **a** guest lecture on **"Opportunities for mechanical Engineers in Industries".** He emphasized the importance of engineering fundamentals in the industry.		
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.			
	72	71	**Target is not reached** Total47courses are contributing to this PO2. 25 courses such as Applied Mathematics, P&S, ICGT, Modern machining process etc are strongly correlated to PO2. Further,22 courses are moderately and slightly contributed towards the attainment of PO2. However, It is found that 29 courses are lower attainment value than target attainment of

			PO2. Among the courses, Mechanics of Materials, Electrical & Electronics Engineering, Estimation, Costing and Engineering Economics, Robotics, Dynamics of Machines, Machine Design-1, Heat Transfer, and Machine Tools and Dynamics Lab, Material Testing and Metallurgy lab, Electrical & Electronics Engineering Lab and Heat Transfer Lab are least contributing to the attainment of PO2.
	Action 1: It is instructed to concerned course coordinators and course instructors to use different pedagogical methods to improve the attainment level of PO2 contributed courses. **Action 2:** Formulation of problems and its analysis in some courses are made in the classroom by conducting the group discussions/tutorials/Assignment problems. **Action 3:** Gained knowledge on complex engineering problems and solutions by sending the students to various industries and also encouraging the students to industrial internships. **Action 4:** Encourage the students to perform proper literature survey for analyzing and solving complex engineering problems.		
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.			
	71	72	**Target reached** It is found that41courses are contributing to this PO3. Out of 41, 18 courses have contributed strongly and reached the above average PO attainment of 71%. The strong contribution of courses like Metrology and Instrumentation, Production Planning and Control, Comprehensive Viva-Voce, Main Project and Seminar, the target of PO3 could have been reached.
	Action 1: The concerned course coordinators that the target not attained courses must implement improved teaching methodology such that higher cognitive level problems especially design orientation like model developments related to mechanical engineering systems are to be discussed in the classrooms. **Action 2**. Project based Learning course is added in curriculum to develop skills on design/ development solutions. **Action 3:** A Software coding contest was conducted for the students along with few workshops and technical sessions on C programming skills. **Action4: Dr.P.Ravindra Kumar** and **Mr.J.Subba Reddy** have conducted three day online student workshop on Design And Fabrication of All Terrain Vehicle Model to improve the design skills and its implementation.		
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.			
	71	70	**Target is not reached**

			It is observed 39 courses are contributing to this PO4. Out of 39, 20 courses are least contributed to the attainment of PO4.Courses like Renewable energy sources, CAD/CAM, Heat Transfer, MD-1, DOM, KOM, Thermal Engineering, EEE and Thermodynamics etc… are not reached the target level of PO4.
	Action 1: It is instructed to the concerned course and module coordinators that the target not reached courses have to 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 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.			
	69	77	**Target reached** It is found very few courses are contributed to the attainment of PO5. Courses like Production Technology and Modelling Lab, CAD/CAM, CAD/CAM Lab, Mini project and main project, Internship strongly contributing to this PO5. These courses attainment values are more than the target level of 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:** Conducted workshop on CFD Modelling & Analysis More Simulations with software tools like CATIA, MATLAB, ANSYS etc and Skill Level experiment, targeting complex Engineering Problems to be introduced in the above said courses. **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.			

	72	76	**Target reached** The courses like main project, Internship, mini project, Communication and Presentation Skills Lab, Seminar are contributed positively to attain the PO6. Out of 50 courses, 7 courses are contributing to this PO6. Robotics course is least contributed towards the attainment of PO6.
	Action 1: Frequent conducting workshops as a part of course work can develop skills and the graduates encouraged to make some models based on societal issues. **Action 2:** More number of student participation in attending co-curricular and extracurricular activities. **Action 3:** Motivate the students to actively participate in social services and the interaction between industry and society. **Action 4:** Students are encouraged to do projects with concerns on societies like Solar Car and wind power plants. 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.		
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.			
	70	71	**Target reached** Total 9 curses are contributing towards the attainment of PO7. Out of 9 courses, 6 courses are strongly correlated, and 2 courses are moderately, and 2 courses are slightly correlated towards the PO7. Courses like Thermodynamics, Thermal Engineering and Renewable Energy sources are lower attainment value than the target value of 70.
	Action 1: Environmental activities like plantation, energy waste heat recovery model developments are initiated. **Action 2:** Students are encouraged to do projects on alternate fuels. Workshops on Renewable Energy, Sustainable Engineering Designs were conducted for inculcating thoughts on Sustainable Development. **Action 3:** Courses like Environmental science are included in curriculum to enrich their understanding of the society. **Action 4:S. Anand,** General Manager, Lanco power (India) Pvt Ltd., has delivered a guest lecture on "**Thermal Power Generation with focus on Gas Turbine based Combined Cycle Power Plant Operation & Environmental Aspects**" for the mechanical engineering students to create awareness on environmental issues. **Action 5: Dr.Harish Venu** and **Dr.D.Vinay Kumar** delivered key note presentation son "Prospects of Biofuels as an Alternative to Fossil Fuels for Future Automobiles" to motivate the students towards sustainability.		
PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
	72	71	**Target is not reached**

			Out of 50 courses, only 9 courses are contributing to this PO8. Out of 9, 6 courses are contributed strongly towards the attainment of PO8. However, courses like MD-II, EEE, and Thermodynamics are lower attainment levels results in not attainment of PO8.
	Action 1: Professional Ethics and Human Values is the course added to academic curriculum. Encouraging more students to participate more on 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 to ensure Ethical practices in Engineering are discussed in detail Sessions on plagiarism and its effect on technical society is arranged in Lower semester to create awareness Ethical principles to be followed in design and development of Mechanical System has been inculcated through the courses like mini project, PBLs, and Main Project etc.		
PO 9: Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.			
	73	78	**Target reached** Out of 50 courses, only 15 courses are contributing to this PO9. Out of 15, courses like Material testing lab, FMHM Lab, PT Lab, MT& Dynamics Lab, TE Lab, HT 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.
	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 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 and Metallurgy lab, 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.			
	73	74	**Target reached** It is found total 15 courses are contributing towards the attainment of PO10 out of 50 courses. 12 courses are strongly correlated, 2 courses are moderately correlated and 1 course

			is least contributed to PO10. Courses like Seminar, Mini project, Internship and Comprehensive Viva-Voce and main project are contributed positively to meeting the target 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. **Action3:** Continuous assessment of Mini-Projects, Internship PAL, PBL and Main Projects given to the students will help them to improve their communication, presentation and report writing skills **Action4:** 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	71	**Target reached** It is found that total 7 courses out of 50 are correlated to the PO11. Courses such as Main project, Internship, Operation Research, Mini Project and Industrial Management are strongly correlated for the attainment of 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:** Improve the teaching –learning process for the identified courses. **Action 4:** Students are encouraged to do multidisciplinary 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	70	**Target reached** It is found 37 courses are contributing to this PO12. Out of 37, 12 courses are attained more than 70%, 12 courses are attained more than 60% and 8 courses are attained the value less than the 60% attainment with respect to PO12. 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.
	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 life is nothing but learning new information. **Action 3: Dr.R.V.S.S. Prasad**, Business Head, Pavani Engineers, Hyderabad, has delivered technical presentation on "Opportunities for Mechanical Engineers in		

<table>
<tr><td></td><td colspan="3">HVAC & R Domain" to the mechanical engineering graduates towards career path and lifelong learning.
Action 4: LAKSHYA an annual event conducting to encourages students to expose Lifelong Learning.
Action 5: 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 6: Department conducting technical training/GATE classes for the graduates to motivate the students towards higher education and lifelong learning.</td></tr>
<tr><td colspan="4">PSO 1: To apply the principles of thermal sciences to design and develop various thermal systems.</td></tr>
<tr><td></td><td>72</td><td>72</td><td>Target reached
It is observed that total 17 courses are contributing to this PSO1. Main project, power plant engineering, Heat transfer Lab, Internship are strongly correlated to the PSO1. However, the courses like Thermodynamics, Fluid Mechanics and Hydraulic Machinery, Renewable energy sources, Automobile Engineering are least contributed.</td></tr>
<tr><td></td><td colspan="3">Action 1: Improve the teaching methodology as well as providing more assignments 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: Motivated the graduates to make design and development of various thermal systems/products by applying the basic principles of thermal sciences.
Action 3: Mr.Vijayabaskaran, Ex-President, ISHRAE chapter Chennai has delivered a guest lecture on "World Refrigeration Day-Cold chain 4 Life" to the graduates for motivating the students about cold chain concept. The cold chain is a series of actions and equipment applied to maintain a product within a specified low temperature range from harvest/ production to consumption, including farming/fishing, food processing, cold storage, transportation, food services, and domestic uses, as well as special products like medicinal products and vaccines.</td></tr>
<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>71</td><td>Target reached
It is found that total 27 courses are contributing to this PSO2. Out of 27, 11 courses are strongly correlated, 13 courses are moderately, and 3 courses are slightly contributed towards the attainment of PSO2. Courses like Robotics, Mechanical vibrations, and Machine Design-I are to be found lower attainment values than the target level of PSO2.</td></tr>
<tr><td></td><td colspan="3">Action 1: Provide some videos as well as power point presentations for improving the teaching learning process for the above identified courses to improve its attainment level.
Action 2: Apply tribological procedures for finding the microstructures of wear and</td></tr>
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	tear of machinery components. **Action 3:** Provide some industrial tours related to the production industries to improve the practical upstanding level of the identified courses as well as arrange some industrial guest lecture from the industry experts.		
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.			
	70	69	**Target is reached** Out of 50 courses, 32 courses are contributing to this PSO3.9 courses have reached the target greater than equal to 70%. Some courses such as Mechanics of Materials, Kinematics of Machines, Machine Design-I, Dynamics of Machines and Operation Research are least contributed towards the reaching of the target of PSO3.
	Action 1: Instructing the design faculty members for conducting the design-oriented project works relating to transmission of motion and power. **Action 2:** Planned to conduct design contests and competitions for the students regularly. **Action 3:** Faculty should implement various pedagogical techniques to focus on higher cognitive level problems and its relevant analysis in the classrooms. **Action 4:P.Mohan, Expert in Design Analysis of Electric Vehicle,** has delivered an expert lecture on "Disruptive Technologies" to the graduates to enhance the design thinking skills.		

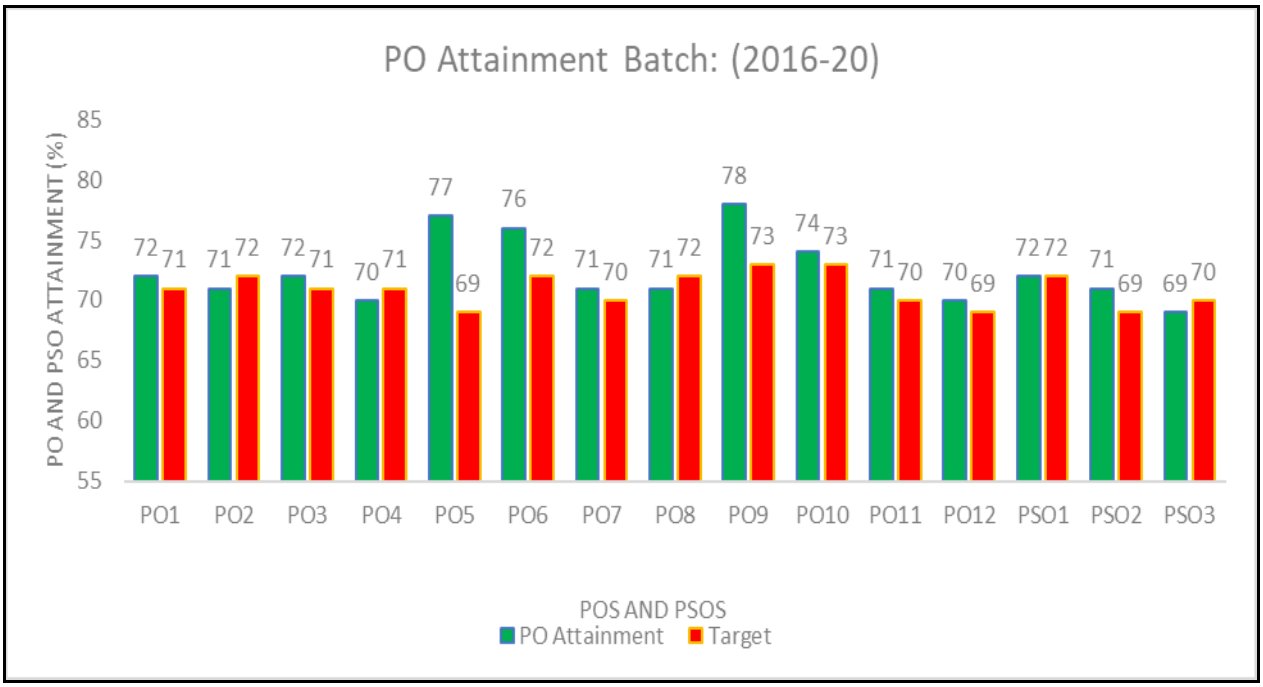

Figure 1: Representation of attainment levels of Program Outcomes (POs) and Program Specific Outcomes (PSOs) for the batch (2016-20)

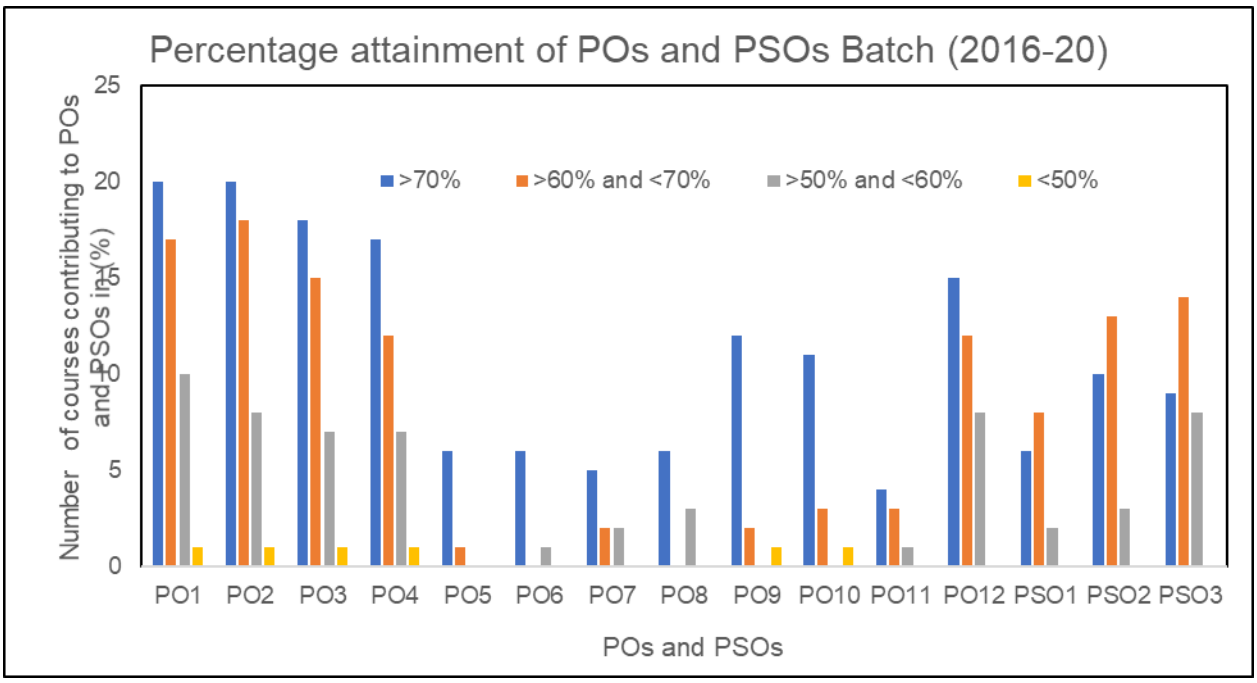

Figure 2: Number of courses contributing to the Program Outcomes (POs) and Program Specific Outcomes (PSOs) for the batch (2016-20)

PAC Signatures HOD