6. BoS members questioned about the need for proposing R19 Curriculum.
7. Comparison of R16, AICTE, and R19 curriculum was explained in briefly in meeting by N B Prakash Tiruveedula.
8. Dr. A. Veeresh Babu questioned about the less credits allotted to Basic Engineering and clarifications regarding the query has been given.
9. Dr. R V S Subrahmanyam appreciated the incorporation of sports and assigning credits towards the improvement of physical fitness for students.
10. Dr. R V S Subrahmanyam pointed out about the involvement of the students in learning/doing projects.
11. BoS members enquired about the storage procedure of documentation of projects.
12. Mr. S Rama Krishna suggested that Engineering Mechanics to be studied in I-II for Mechanical stream students as per the requirement/availability of faculty of the subjects that are to be interchanged for first year two semesters.
13. Mr. S Rama Krishna briefed Mr. Naveen (III B.Tech) about the importance of student activeness in learning.
14. Mr. S Rama Krishna & Dr. R V S Subrahmanyam queried about the evaluation procedure of projects & seminar.
15. Mr. S Rama Krishna & Dr. R V S Subrahmanyam emphasized strict evaluation procedure for Engineering Graphics to all streams without any compromise during continuous assessment of hands on practice.
16. **Engineering Mechanics** – Mr. S Rama Krishna, Dr. R V S Subrahmanyam, Dr. A. Veeresh Babu
    - Applications of Moment of Inertia is to be incorporated in the EM syllabus.
    - Incorporation of engineering mechanics by Timoshenko in reference book.
17. **Workshop Technology** – Change of R16 to R19 practical to theory (appreciated by BoS external members to make it as theory.
    - Mr. S Rama Krishna suggested to build clay/thermo-coal prototype model as one of the practice jobs.

18. **Manufacturing Technology – BoS members suggested to incorporate ISO, BIS standards for casting, welding and forming process.**
    - Dr. R V S Subrahmanyam suggested to incorporate monitoring instruments for casting in Unit – II.
    - Dr. M Jagannatham suggested to include open and closed die forging for automotive applications in Unit – III. Also, suggested characterization and properties of weld zones in Unit – IV.
19. **Material Science & Metallurgy -**
    - Dr. M. Jagannatham raised why powder metallurgy is incorporated in Unit-IV
    - Dr. M. Jagannatham recommended to incorporate types of fatigue in Unit – I
    - Dr. R V S Subrahmanyam enquired about Nano powders and clarification is given that it is in Nano Technology course.
    - Students concerned about the vast content of proposed syllabus.
    - Dr. M. Jagannatham recommended, Physical Metallurgy text book authored by V. Raghavan to be incorporated.
20. **Engineering Thermodynamics –**
    - Dr. A. Veeresh Babu suggested Stirling cycle, Atkinson cycle and Ericsson cycle are to be included in Unit – V.
21. **Mechanisms & Machines**
    - Dr. R V S Subrahmanyam suggested Shock theory basics and Random Vibrations is to be incorporated in Unit – V
22. **Machine Drawing**
    - Mr. S Rama Krishna & Dr. R V S Subrahmanyam suggested strict evaluation procedures to be followed.
    - Dr. R V S Subrahmanyam suggested to add one lab exercise on real time study of engineering drawing.
23. **Machining Technology**
    - BoS members suggested to incorporate latest tools and fixtures used in CNC machines
24. **Solid Mechanics**
    - Dr. R V S Subrahmanyam suggested to include both internal and external pressure loads on pressure vessels in Unit - V
    - One Lab exercise on calculation of strain using strain gauges.

25. **Mechanics of Fluids and Hydraulic Machines (Cavitation)**
    - Dr. R V S Subrahmanyam stressed on including the cavitation and its effect on performance of pumps.

26. **Design and Modelling of Machine Elements.**
    - BoS members suggested to incorporate Design of springs and shock absorbers

27. **Automation in Manufacturing** - Dr. R V S Subrahmanyam recommended following changes
    - Introduction to CIMS
    - Simulation of part programming using software (Shop Mill Master Cam)
    - Virtual programming in manufacturing
    - Networking of machines

28. **Applied Thermodynamics**
    - Dr. A Veeresh Babu suggested unit 3 topics can be remodified.
    - Topics on Binary cycle and co-generation are to be included.
    - Gas dynamics, NCES, Fuel cells courses can be offered as Electives
    - Dr. A Veeresh Babu & Dr. R V S Subrahmanyam recommended a text book titled "Treatise on Heat Engineering" by V P Varadani.

29. **Advanced materials and characterisation** - All BOS members suggested to incorporate
    - ASTM standards, JAS, ISO by.
    - ODS alloys (Iron-Ni-Co)
    - TEM
    - Platinum & Iridium alloys
    - Residual stress and retained austenite measurements.
    - Hydroxy appetite- Bio materials
    - XRD crystal size measurements

30. **Computer Aided Engineering**
    - Mr. S Rama Krishna suggested Applications of CAE to be included.

31. **Heat & Mass Transfer** – Dr. A Veeresh Babu recommended following changes
    - Natural convection and non-dimensional analysis.
    - List of non-dimensional members.
    - Applications (Link up with theoretical aspects)

32. **Robotics**

- All BoS Members Enquired whether students will have hands-on experience on real time robots and assurance is given that they will be given enough hands-on experience.
- All BoS members praised the Management for taking the initiatives to start CoE in Robotics and appreciated the faculty who undergone training in robotics.

33. **OR** - Dr. R V S Subrahmanyam recommended following changes

- KNAP Sack, Graphical evaluation & Review technique (GERT)

34. **IE & Production Management**

- Dr. R V S Subrahmanyam recommended Text book by Ahuja on Network analysis.

35. **Product Perform Analysis using software packages.**

- All BoS members appreciated the idea of introducing this lab course which imparts required knowledge on software packages related to Mechanical.

36. **Department Electives**

Following recommendations have been given by BoS members

- BoS members enquired about choosing option of elective.
- Need of NPTEL (Swayam) Courses.
- CFD, CM&T, C&P are to give major emphasis for opting by students.
- Appreciated for offering "Reliability Engineering" and "Tribology" as an elective.
- Recommended to incorporate "Mechatronics" course as an elective.
- Appreciated for offering "Artificial Intelligence" as an elective.
- Appreciated for offering "Maintenance Engineering" and recommended to incorporate an elective course on "Industrial Safety".
- Suggested a topic on process cost and machining cost in unit 3 of (IEEC).

37. **Projects**

- BOS members asked why evaluation of in-house projects are not evaluated by industrial personal, also recommended to make students stick to the schedule of project.

38. Choice based credit system is implemented in the Curriculum

39. Major restructuring has taken place in the curriculum which is oriented towards Project based learning with inclusion of Intra-disciplinary, Inter-departmental and Societal centric and industry related projects. The percentage of Curriculum revision is 54 for the program B.Tech in Mechanical Engineering.

40. All the Courses in the Curriculum are designed to fall under either of the domains of employability or entrepreneurship or skill development (Appendix A)

41. Inclusion of new courses in the curriculum is reviewed and is provided as Appendix B

42. The feedback from various stakeholders is carefully collected, analyzed and their suggestions are implemented in the curriculum.

Course Structure – R19 B.Tech Mechanical Engineering Curriculum

I Year I Semester

Course Title	C
Engineering Mathematics - I (F)	5
Engineering Physics (B)	4
Basics of Electrical and Electronics Engineering	4
Basic Engineering Products	3
Engineering Graphics and Design	3
Constitution of India	1
Physical fitness, Sports & Games -1	1
Total	21

I Year II Semester

Course Title	C
Engineering Mathematics - II (F)	5
Engineering Chemistry (B)	4
C Programming for Problem Solving - I	4
Technical English Communication	3
Workshop	2
Engineering Mechanics	4
English Proficiency and Communication skills	1
Physical fitness, Sports & Games - II	1
Total	24

II Year I Semester

Course Title	C
C Programming for Problem Solving - II	4
Manufacturing Technology	4
Materials Science and Metallurgy	4
Engineering Thermodynamics	4
Mechanisms and Machines	4
Machine Drawing	2
Life Skills - I	-
Technical Seminar - I	1
Intra-Disciplinary Projects -I	1
Physical fitness, Sports & Games - III	1
Total	25

II Year II Semester

Course Title	C
Machining Technology	4
Solid Mechanics	4
Mechanics of Fluids and Hydraulic Machines	4
Environmental Studies	1
Management Science	3
Life Skills - II	1
Technical Seminar - II	1
Intra-Disciplinary Projects - II	1
Open Elective -I	3
Total	22

III Year I Semester

Course Title	C
Design and Modeling of Machine Elements	4
Automation in Manufacturing	4
Applied Thermodynamics	4
Soft Skills Lab	1
Employability Skills - I	-
Inter - Departmental Projects - I	2
Modular Course	1
Department Elective - I	3
Open Elective - II	3
Total	22

III Year II Semester

Course Title	C
Heat and Mass Transfer	4
Advanced Materials and Characterization	3
Computer Aided Engineering	3
Professional Communications Lab	4
Human Values, Professional Ethics & Gender Equity	2
Employability Skills - II	1
Inter-Departmental Projects - II	2
Department Elective - II	3
Open Elective - III	3
Total	23

IV Year I Semester

Course Title	C
Operations Research	3
Robotics	4
Industrial Engineering and Production Management	3
Product Performance Analysis Using Software Packages	2
Societal - Centric and Industry Related Projects	3
Department Elective - III	3
Department Elective - IV	3
Total	21

IV Year II Semester

Course Title	C
Internship / Project work	12
Total	12

Courses under Choice Based Credit System are highlighted in the structure

Department Electives

Course Title	C
Internal Combustion Engines	3
3D Printing and Design	3
Ceramics and Polymers	3
Industrial Engineering & Estimating and Costing	3
Artificial Intelligence for Mechanical Engineering	3
Tribology in Design	3
Jet and Rocket Propulsions	3
Metrology and Surface Engineering	3
Micro-Electro Mechanical Systems	3
Refrigeration & Air-Conditioning	3
Computational Fluid Dynamics	3
Cryogenics	3
Composite Materials Technology	3
Nano Technology	3
Lean Manufacturing	3
Maintenance Engineering	3

Open Electives offering other programs

Course Title	C
Biomechanics & Kinesiology	3
Basics in Robotics	3
Advances in Robotics	3
Reliability Engineering	3
Field and Service Robots	3
Energy Audit & Management	3
Supply Chain Management	3

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List of Courses where Theory integrated with Lab

S.No	Year	Title of the Course
1	I	Engineering Mathematics - I (F)
2	I	Engineering Physics (B)
3	I	Basics of Electrical and Electronics Engineering
4	I	Basic Engineering Products
5	I	Engineering Graphics and Design
6	I	Engineering Mathematics - II (F)
7	I	Engineering Chemistry (B)
8	I	C Programming for Problem Solving - I
9	I	Technical English Communication
10	I	Workshop
11	II	C Programming for Problem Solving - II
12	II	Manufacturing Technology
13	II	Materials Science and Metallurgy
14	II	Engineering Thermodynamics
15	II	Mechanisms and Machines
16	II	Machining Technology
17	II	Solid Mechanics
18	II	Mechanics of Fluids and Hydraulic Machines
19	III	Design and Modeling of Machine Elements
20	III	Automation in Manufacturing
21	III	Applied Thermodynamics
22	III	Heat and Mass Transfer
23	III	Computer Aided Engineering
24	IV	Robotics

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APPENDIX - A

List of courses that enable employability or entrepreneurship or Skill development in the R-19 B.Tech – Mechanical Engineering

S.No	Year	Semester	Course Name	Course Nature
1	I	I	Engineering Graphics and Design	Skill development
2	I	II	Engineering Mechanics	Skill development
3	I	II	Workshop	Skill development
4	II	I	Manufacturing Technology	Skill development
5	II	I	Materials Science & Metallurgy	Skill development
6	II	I	Engineering Thermodynamics	Skill development
7	II	I	Mechanisms & Machines	Skill development
8	II	I	Machine Drawing	Employability
9	II	I	Technical Seminar - I	Skill development
10	II	I	Intra-Disciplinary Projects - I	Skill development
11	II	II	Machining Technology	Skill development
12	II	II	Solid Mechanics	Skill development
13	II	II	Mechanics of Fluids and Hydraulic Machines	Skill development
14	II	II	Technical Seminar – II	Skill development
15	II	II	Intra-Disciplinary Projects - II	Skill development
16	III	I	Design and Modelling of Machine Elements	Employability
17	III	I	Automation in Manufacturing	Employability
18	III	I	Applied Thermodynamics	Skill development
19	III	I	Inter-Departmental Projects – I	Employability
20	III	I	Modular Course	Employability
21	III	II	Advanced Materials & Characterization	Employability
22	III	II	Computer Aided Engineering	Employability
23	III	II	Heat and Mass Transfer	Skill development
24	III	II	Inter-Departmental Projects – II	Employability
25	IV	I	Robotics	Employability
26	IV	I	Operations Research	Employability

27	IV	I	Industrial Engineering and Production Management	Employability
28	IV	I	Product Performance Analysis using Software Packages	Employability
29	IV	I	Societal-Centric and Industry Related Projects	Employability
30	IV	II	Internship	Employability
31	IV	II	Project work	Employability
32	III	I	IC Engines	Skill development
33	III	I	3D printing & Design	Employability
34	III	I	Ceramics & Polymers	Skill development
35	III	I	Industrial Engineering & Estimating and Costing	Skill development
36	III	II	Artificial Intelligence for Mechanical Engineers	Employability
37	III	II	Tribology in Design	Skill development
38	III	II	Jet and Rocket Propulsions	Skill development
39	III	II	Metrology & Surface Engineering	Employability
40	IV	I	Composite Materials & Technology	Skill development
41	IV	I	Maintenance Engineering	Employability
42	IV	I	Micro-Electro Mechanical Systems	Skill development
43	IV	I	Refrigeration and Air-conditioning	Skill development
44	IV	I	Computational Fluid Dynamics	Skill development
45	IV	I	Cryogenics	Skill Oriented
46	IV	I	Nano Technology	Skill Oriented
47	IV	I	Lean Manufacturing	Employability
48	II	II	Biomechanics & Kinesiology	Skill Oriented
49	III	I	Reliability Engineering	Skill Oriented
50	III	II	Energy Audit & Management	Employability
51	III	II	Supply Chain Management	Employability

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APPENDIX - B

List of new courses in the R-19

B.Tech – Mechanical Engineering Curriculum including open electives offered to other programs

S.No	Year	Semester	Course Name
1	I	I	Engineering Graphics and Design
2	I	II	Engineering Mechanics
3	I	II	Workshop
4	II	I	Manufacturing Technology
5	II	I	Materials Science & Metallurgy
6	II	I	Engineering Thermodynamics
7	II	I	Mechanisms & Machines
8	II	I	Machine Drawing
9	II	I	Technical Seminar - I
10	II	I	Intra-Disciplinary Projects - I
11	II	II	Machining Technology
12	II	II	Solid Mechanics
13	II	II	Mechanics of Fluids and Hydraulic Machines
14	II	II	Technical Seminar – II
15	II	II	Intra-Disciplinary Projects - II
16	III	I	Design and Modelling of Machine Elements
17	III	I	Automation in Manufacturing
18	III	I	Applied Thermodynamics
19	III	I	Inter-Departmental Projects – I
20	III	I	Modular Course
21	III	II	Advanced Materials & Characterization
22	III	II	Computer Aided Engineering
23	III	II	Heat and Mass Transfer
24	III	II	Inter-Departmental Projects – II
25	IV	I	Robotics

26	IV	I	Operations Research
27	IV	I	Industrial Engineering and Production Management
28	IV	I	Product Performance Analysis using Software Packages
29	IV	I	Societal-Centric and Industry Related Projects
30	IV	II	Internship
31	IV	II	Project work
32	III	I	IC Engines
33	III	I	3D printing & Design
34	III	I	Ceramics & Polymers
35	III	I	Industrial Engineering & Estimating and Costing
36	III	II	Artificial Intelligence for Mechanical Engineers
37	III	II	Tribology in Design
38	III	II	Jet and Rocket Propulsions
39	III	II	Metrology & Surface Engineering
40	IV	I	Composite Materials & Technology
41	IV	I	Maintenance Engineering
42	IV	I	Micro-Electro Mechanical Systems
43	IV	I	Refrigeration and Air-conditioning
44	IV	I	Computational Fluid Dynamics
45	IV	I	Cryogenics
46	IV	I	Nano Technology
47	IV	I	Lean Manufacturing
48	II	II	Biomechanics & Kinesiology
49	III	I	Reliability Engineering
50	III	II	Energy Audit & Management
51	III	II	Supply Chain Management

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