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## XXIV Academic Council - Annexure A4

## Department of Mechanical Engineering

## Minutes of the 14th BOS meeting

The Department BOS meeting held on 29th June 2018 at 10:00 AM in Room No.M118.

The following Members were present:

1. Dr. Pranveer Singh Satvat, Dean, Academics, KLEF-Patron
2. Dr. A. Srinath, Head of the Dept., and Professor ME - Chairman
3. Dr. S. S. Rao, Alt. HOD ME and Professor ME - Secretary
4. Dr. K. L. Narayana, Dean - R & D and Professor ME
5. Dr. K. Rama Krishna, Dean - Quality and Professor ME
6. Dr. N. B. V. Prasaad, Dean – Placements & Progression and Professor ME
7. Dr. Y. V. Hanumantha Rao, Associate Dean – Practice School and Professor ME
8. Dr. K. V. Narasimha Rao, Group Head, Energy & CFD and Professor ME
9. Dr. G. Diwakar, Group Head, Design Engineering and Professor ME
10. Dr. G. Yedukondalu, Group Head, Robotics & Mechatronics and Associate Professor ME
11. Dr. B. Nageswara Rao, Chairman RPAC ME and Professor ME
12. Dr. S. N. Padhi, HoD BES-II and Professor ME
13. Dr. P. Issac Prasad, Professor ME
14. Dr. D. Kiran Kumar, Associate Professor ME
15. Dr. Y. Kalyan Chakravarthy, Assistant Professor ME
16. Mr. P. Ratna Prasad, Assistant Professor ME
17. Dr. A. Venu Gopal, Professor, Dept. of ME, NIT Warangal (Alumni)
18. Dr. R. Vijaya Kumar, Manager, R & D, HAL, Bangalore (Alumni)
19. Dr. Srinivasa Rao Perla, Global Training Head, Cyient Technologies, Hyderabad
20. Dr. Solaikutty Dhanabal, Academic Program Manager, National Instruments, Chennai
21. Dr. K. Subramanyam, Professor, Dept. of CSE
22. Dr. A. S. C. S. Sastry, Professor, Dept. of ECE
23. Dr. V. S. Bhagavan, Professor, Dept. of Mathematics
24. Dr. K. R. S. Prasad, Professor, Dept. of Chemistry
25. Dr. G. Sunita Sundari, Associate Professor, Dept. of Physics
26. Dr. B. Loveswara Rao, Associate Professor, Dept. of EEE
27. Dr. P. V. Rama Rao, Professor ME
28. Dr. T. Babu Rao, Group Head, Manufacturing and Associate Professor ME
29. Mr. D. V. A. Rama Sastry, Associate Professor ME

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The following members were absent.

1. Dr. Gnanamurthy, Professor, Dept. of ME, IIT-Madras
2. Dr. K. Ravi Teja, Manager R & D, Hyundai R & D Division, Hyderabad

## AGENDA & RESOLUTIONS

### AGENDA ITEM-1

| | |
|---|---|
| Considered and approved DAC minutes held on 08-03-2018 | Resolution Passed: Approved DAC minutes and recommended to Academic Council for approval |

- Chairman of BOS opened the meeting by welcoming and introducing the external members, to the internal and co-opted members and thanked them for accepting to become the member of the Board of Studies.
- Chairman of the BOS informed the members present about the Department Academic Committee (DAC) meeting held on 8th March 2018 (Agenda Item No: 1) and highlighted the major resolutions of discussion as brought to the notice of the DAC by the student members.

It is resolved to approve the recommendations made by DAC. **Annexure-1 DAC minutes (dt: 08-03-2018)**

### AGENDA ITEM-2

| | |
|---|---|
| Consider and approve DAC minutes held on 05-04-2018 | Resolution Passed: Approved DAC minutes and recommended to Academic Council for approval |

- Chairman of the BOS informed the members present about the subsequent Department Academic Committee (DAC) meeting held on 5th April 2018 (Agenda Item No: 2) and highlighted the major resolutions of discussion as brought to the notice of the DAC by the student members.

It is resolved to approve the recommendations made by DAC **Annexure-2 DAC minutes(dt:05-04-2018)**

### AGENDA ITEM-3

| | |
|---|---|
| Courses introduced for 2018 admitted B.Tech. Mechanical Engineering students | Resolution Passed: Approved the introduced courses for 2018-19 admitted batch and the same is recommended to Academic Council for approval. |

The following is the feedback of stakeholders on courses introduced in 2018-19 admitted batch student's curriculum.

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I) Department placement in charge Mr. B. Sreekar Reddy suggested to include courses on English Communication Skills and English proficiency to enhance the skills of students during placement drives.

It is resolved to introduce the courses English Proficiency and professional Communication Skills for 2018-19 admitted batch students.

(ii) Y16 Batch students suggested to include concepts of vibrations in the curriculum for campus placements in core companies
It is resolved to introduce Vibration and Control (L-T-P-S: 3-0-0-0) course to 2018-19 admitted batch students. The syllabus of the course is given in Annexure-3(c).

(iii) Dr.P. Srinivas Rao, Industry Person, suggested including courses on Measurements, Robotics and Product Design as these are the emerging areas in Mechanical Engineering.
It is resolved to introduce Robotics and Control (L-T-P-S: 3-0-0-0), Product Design and Development (L-T-P-S: 0-0-0-12) and Measurements and Instrumentation ((L-T-P-S: 2-0-2-0) for 2018-19 admitted batch students, in place of Introduction to Robotics (L-T-P-S: 3-0-2-0), Finite Element Analysis of Solids and Fluids (L-T-P-S: 3-0-2-0) courses which were offered to 2017-18 admitted batch students. The syllabus of the courses is given in Annexure-3(c).

(iv) Faculty, Mr.S.Ramesh Kumar suggested to include courses on coding to improve the coding capabilities of students.
It is resolved to approve new courses Technical Skill-Coding-1 and Technical Skills-Coding-II to 2018-19 admitted batch students.

(v) Parents of Y17 batch students suggested to include co-curricular activity courses in the curriculum to encourage students in different activities
It is resolved to approve the new courses, Co-curricular activites-5, and Co-curricular activites-6 to 2018-19 admitted batch students.

(vi) Dr. R. Vijay Kumar, Alumni, suggested to include a course on Biology, to make students understand the technical needs in the medical field.
It is resolved to approve the new course, Biology for Engineers to 2018-19 admitted batch students.

(vii) It is resolved to approve the proposed course structure for 2018-19 admitted batch. The curriculum has the following salient features.

a. Three Mathematics courses where the 3rd course that will be purely department specific (focused on theory and applications of Differential equations to Mechanical Engineering).
b. 14 Professional Core Courses.

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c. Six Professional Electives with lab associated to each course with an L–T–P structure of 2–0–2.

d. There will be Six Open Electives out of which one is a Communication Course, one is a Foreign Language course (keeping in view the Alumni feedback, who requested such courses owing to potential jobs abroad, as well as out of the states of AP and TS within India, for Mechanical Engineering graduates) and one is a Management Elective.

e. A course on Indian Heritage and Culture based on the recommendations of Hon'ble Supreme Court of India will also be offered.

f. Six Technical Skills courses of which four are department specific and two are coding/ Computing based.

g. One course on Biology for Engineers,

h. Term Paper - A Literature review paper in 6th semester with 2 credits (0 – 0 – 4).

i. Minor Project in 7th semester with 2 credits (0 – 0 – 8).

j. Major Project / Practice School in 8th semester with 8 credits (0 – 0 – 32).

**Courses Introduced for 2018-19 admitted batch based on the feedback of stake holders.**

| S.No. | Course Code | Course Title | Course Type | Remarks |
|---|---|---|---|---|
| 1 | 18ME3116 | Robotics and Controls | Core | Based on the feedback of industry person this course is Introduced in place of Introduction to Robotics Course |
| 2 | 18ME3117 | Product Design and Development | Core | Based on the feedback of industry person this course is Introduced in place of Finite Element Analysis of Solids and Fluids |
| 3 | 18ME2213 | Vibrations and Controls | Core | Introduced as new course as per the feedback of Y16 students |
| 4 | 18UC2103 | Professional Communication Skills | HSS | Based on the recommendation of faculty this course is introduced |
| 5 | 18BT1001 | Biology for Engineers | BS | Based on the recommendation of Alumni this course is introduced |
| 6 | 18UC1202 | English Proficiency | HSS | Based on the suggestion of faculty, this course is introduced |

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**The detailed Course Structure of 2018-19 is given in Annexure-3(a)**
**The Syllabus of new courses for 2018-19 admitted batch is given in Annexure-3(b)**

**AGENDA ITEM-4**

| | |
|---|---|
| Revisions proposed in 2018-19 admitted batch students curriculum | Resolution Passed: Approved the revisions proposed in the courses for 2018-19 admitted batch and the same is recommended to Academic Council for approval. |

(i) Department placement in charge Mr. B. Sreekar Reddy suggested to include topics on Interactive grammar and language laboratory to improve the communication and grammar of students which helps them in placement drives.

It is resolved to revise the syllabus of Basic English course by incorporating the suggested topics.

(ii) Mr.Khadar Basha, Industry person Suggested to include topics on smart materials, composite materials, Kinematics and Machine Design to make the mechanical students industry ready.

It is resolved to introduce Materials for Mechanical Engineering Applications (L-T-P-S: 2-0-2-0) in place of Engineering Materials by incorporating the suggested topics for 2018-19 admitted batch students. The syllabus of the course is given in Annexure-3(b).

It is resolved to Introduce Kinematics and Dynamics of Machines (L-T-P-S: 3-0-2-0) course by merging Dynamics and Control-1(L-T-P-S: 3-0-2-0) and Dynamics and Control-II (L-T-P-S: 3-0-2-0) courses for 2018-19 batch admitted students. The syllabus of the course is given in Annexure-3(b).

It is resolved to offer the Machine Design course in place of Elements of Machine Design by incorporating the suggested changes.

**Proposed to revise the syllabus of Y18 courses based on the feedback received from stake holders.**

| S.No. | Course Code | Course Title | Course Type | Percentage of revision | Remarks |
|---|---|---|---|---|---|
| 1 | 18ME2109 | Kinematics and Dynamics of Machines | Core | 75 | Based on the recommendation of Industry person revision is proposed in the course. |

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| | | | | | |
|---|---|---|---|---|---|
| 2 | 18PH2007 | Materials for Mechanical Engineering Applications | Core | 75 | Based on the recommendation of Industry person revision is proposed in the course. |
| 3 | 18UC1101 | Basic English | HSS | 75 | Based on the recommendation of the faculty revision is proposed in the course. |
| 4 | 18ME3114 | Machine Design | Core | 20 | Based on the recommendation of Industry person revision is proposed in the course. |

**The detailed revisions in the courses are given in Annexure-4**
**The detailed feedback and action taken report is presented in Annexure-5**

**AGENDA ITEM-5**

| | |
|---|---|
| Minor changes proposed for curriculum structure and syllabus of 2017 admitted B.Tech. Mechanical Engineering students | Resolution Passed: Approved 2017-18 structure and recommended for Academic Council. |

- To consider the revisions proposed in Curriculum Structure and Syllabus of the Professional Electives, Professional Core courses for the 2017 admitted B.Tech. Mechanical Engineering students according to the recommendations of the Department Academic Committee (DAC) and feedback from the stakeholders and the same are approved to be put up and implemented as it is for that of 2018 admitted B.Tech. Mechanical Engineering Students, as listed out in above minute points.
  It is resolved to approve the revisions proposed for 2017 admitted batch. The course structure of 2017-18 is given in **Annexure-6.**

**AGENDA ITEM-6**

| | |
|---|---|
| Minor revisions proposed for Curriculum Structure, Syllabus for the 2016 admitted B.Tech. Mechanical Engineering students | Resolution Passed: Approved 2016-17 admitted batch structure and is recommended for Academic council for approval |

- To Consider changes in Curriculum Structure and Syllabus of the Professional Electives, for the 2016 admitted B.Tech. Mechanical Engineering students made

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according to the recommendations of the Department Academic Committee (DAC) and feedback from the stakeholders.

It is resolved to approve the revisions proposed for 2017 admitted batch. The course structure of 2017-18 is given in **Annexure-7.**

**AGENDA ITEM-7**

| | |
|---|---|
| New Program-MTech-Machine Design | Resolution Passed: Approved the New MTech-Machine Design program and recommended to Academic Council for Approval. |

- Based on the identified local, regional, national, and global needs a new program M. Tech Machine Design is suggested by the stakeholders-Faculty, with 8 Core courses, 4 Electives, One term paper and one seminar in first year and Dissertation in second year with a total of 84 credits

  It is resolved to approve the new Program MTech-Machine Design with the proposed structure & syllabus for 2018-19 admitted PG students and recommend the same to Academic Council for approval. **(Annexure-8(a): M. Tech Machine Design 2018-19 Course Structure, Annexure-8(b) M. Tech Machine Design 2018-19 Syllabus)**

**AGENDA ITEM-8**

| | |
|---|---|
| MTech Mechatronics | Resolution Passed: Resolution for MOOC's Course and the M. Tech Robotics and Mechatronics is approved and recommended to Academics Council for approval |

- To change in the name of MTech. Mechatronics program as MTech. Robotics and Mechatronics as approved by AICTE in 2018 approval process with Curriculum Structure, Syllabus remaining the same in line with the earlier MTech. Mechatronics batches.

  It is resolved to approve the change in the name of MTech. Mechatronics program as MTech. Robotics and Mechatronics and recommend the same to Academics Council

**AGENDA ITEM-9**

| | |
|---|---|
| CO-PO Attainment | Resolution Passed: It is resolved to approve the CO-PO attainment of previous semester and the same is recommended to Academic Council for approval |

**AGENDA ITEM-10**

| | |
|---|---|
| Value Added/ Certification Courses | Resolution Passed: It is resolved to the value added courses to Y18 admitted batch students and the same is recommended to Academic Council for approval (Annexure-9) |

**AGENDA ITEM-11**

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| | |
|---|---|
| Other Points | Resolution Passed: Resolution for MOOC's Course s is approved and recommended to Academics Council for approval |

- Y13 Students requested to provide additional credits citing to a shortage of credits while applying for master's program in foreign countries.
  It is resolved to recommend such students to be given permission to register for additional courses either online (through MOOCs/Coursera etc.) or offline at the university, giving them a chance to augment the required credit limit. Further it is also resolved that the same procedure is applicable for the present students of 2015, 2014 B. Tech admitted batch. The resolution is recommended to the Academic Council for approval.

25/6/2018

Chairman-BOS

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**Annexure-1**

**K L (Deemed to be University) DEPARTMENT OF MECHANICAL ENGINEERING**

**DEPARTMENT ACADEMIC COMMITTEE MEETING MINUTES**

The department academic committee meeting was held from 10:00 A.M. on 08/03/2018 in the HOD Chamber, with Dr. A.Srinath, HOD-ME in the chair.

The following members were present:

**Faculty:**

1. Dr. G. Diwakar, Group Head, Design Engg.
2. Dr. K. V. Narasimha Rao, Group Head, Energy and CFD
3. Dr. T. Babu Rao, Group Head, Manufacturing
4. Dr. G. Yedukondalu, Group Head, Robotics & Mechatronics
5. Dr. Abhijeet Ganguly, Professor
6. Mr. P. Ratna Prasad, Asst. Professor
7. Mr. P. Kasi V. Rao, Professor In Charge-Academics- Dept.of ME.

**Student Members:**

8. Mr. E. L. N. Rohit Madhukar (14004289), IV/IV B.Tech.
9. Ms. S. Naga Lalitha Devi (14004636), IV/IV B.Tech.
10. Mr. G. Vivek (14007280), IV/IV B.Tech.
11. Mr. B. Chandubabu (14007522), IV/IV B.Tech.
12. Mr. A. Mani Krishna (150070033), III/IV B.Tech.
13. Mr. G. Raj Kumar (150070111), III/IV B.Tech.
14. Mr. K. Taraka Sriram (150070177), III/IV B.Tech.
15. Mr. P. Mahati Aditya (150070307), III/IV B.Tech.
16. Mr. J. Kiran Datta (150070374), III/IV B.Tech.
17. Mr. A. Dharmendra (160070004), II/IV B.Tech.
18. Mr. S. N. Murthy (160070331), II/IV B.Tech.
19. Mr. Gaya Prasad Kurmi (160070419), II/IV B.Tech.

The following points were discussed by the student members:

1. Final year student members suggested separating of the Internal Combustion Engines and Gas Turbines course into two separate courses, keeping in view the requirements for GATE.
2. All the Student members requested for arranging for Industrial Visits from right from II year I Semester onwards once in every semester, for better practical learning of the courses.
3. Final year student members requested offering of additional courses to fulfil the 180 credit requirements so that they could fulfil the minimum qualifying rule, for applying for master's program in European countries, in particular, Germany. They requested that these courses, be preferably offered offline, as they have no satisfaction about the courses, that they are right now taking for fulfilling this requirement, through MOOCS / Coursera.
4. Final year student members requested for conducting of GATE /GRE/ IELTS coaching within the University, by senior faculty members, and expressed their

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dissatisfaction about the currently ongoing coaching through Competitive Exams Cell of our university wherein some outside faculty are being called for imparting coaching who are not competent enough.

5. Third year student members requested for separation of Kinematics and Dynamics of Machines course into Two different courses for better understanding of the depth of the subject.

6. Final year student members suggested that Mechanical Vibrations be made a Professional Core course keeping in view of the good number of core companies visiting the campus for placement, and all of whom are posing main frame questions in technical rounds, from this course.

7. All the student members requested that Coding Skills course should be taught by the faculty members of the CSE department and not by faculty of ME dept, which will make the course effective and useful in structured way rather than offering it in a self-learning mode which is being done right now. Moreover, all the student members complained that this course has no syllabus, no evaluation pattern.

And credit structure finalized so far, and the students are henceforth not finding this course to be included in their CGPA and thus are not taking it seriously.

8. Student members requested for better implementation of the Communication and Soft Skills courses rather than just making them writing notes in those classes, which is right now being done in all CSS / English courses by the faculty of these courses.

9. Student members are in Favor of continuing the present two test evaluation procedure without any choice so that they can concentrate on studying the entire syllabus rather than limiting themselves to half of the syllabus when the exams are held with 50% choice.

10. Student members requested to have certificate courses whenever offered, spread across the entire semester in the timetable rather than having them for one week at a stretch. They have also requested to offer those Software tools as certificate courses which are not associated with any course (such as LS Dyna, NASTRAN, NISA) and to properly structure which course to take in which semester / level rather than giving the choice to the students, who without any knowledge are taking analysis related courses prior to their completing the modelling related courses.

11. Student members have requested for more practical oriented teaching in Manufacturing and Automobile engineering courses for better understanding of the concepts, wherein only PPTs are being used right now with some videos, whereas they expressed that if faculty who teach these courses, take them to the labs and demonstrate the course topic through a lab set up and it would be understood by them much more effectively.

12. Student members had expressed satisfaction with the syllabus content of the labs offered under each course and only requested for proper restructuring of the experiments based on the course outcomes.

13. Student members also suggested elimination of writing records as well as observation notes in the lab. Instead HOD suggested them that starting from next year every lab manual will be given as a soft copy by the course coordinators through LMS so that the students need not duplicate the observation notes in the record again.

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14. Student members also suggested that at least 10 viva questions at the end of each experiment to be included in the manuals that will be useful for them to prepare for practical exams as well as for competitive exams.

15. III-year students expressed happiness and shared the advantages of the SWEAR analysis which was conducted over the past 2 weeks. HOD informed that the same SWEAR analysis will also be carried out for the II-year students in the forthcoming week.

16. Students members are in favour of implementing the attainment of a certain minimum number of credits at the end of the second and third years for being eligible to register for III year and final years which puts the responsibility on the students to progress to III and IV years of B.Tech, without which the current batches of students are not taking academics seriously and this is one of the main reasons for many students having accumulated backlogs as on date.

17. III Year students have requested that they did not undergo OOPS course, and for software placements in 2018-19 they will need this course knowledge, hence the HOD informed that for the III-year students, OOPS course will be taught during the summer CRT training classes as it was not covered in their curriculum, and which is important keeping placements in view.

18. The HOD informed that the term paper batches are to be evaluated based on the review paper they write by referring to a minimum of 5-6 papers in their chosen specialization areas.

19. Student members requested for an orientation program on the opportunities of being an entrepreneur and suggested introducing a course on entrepreneurship for the benefit of the students.

20. The HOD informed to the student members that seminars, group discussions, debates, mock interviews will be organized as a part of the association activities under MESA so that the students can take advantage of these to improve their communication skills which will help them during their placement drives.

21. Student members requested for having weekly off days on Saturday and Sunday, rather than on Wednesday and Sunday, so that they can take training classes for competitive exams at a stretch for two days if this is implemented.

22. The HOD informed the student members that the DAC meeting will be held on the 2nd Wednesday of every month at 10:00 AM in the HOD's chamber and all faculty, students' members must attend this meeting without fail.

8/3/2018

(Dr. A. Srinath)
Chairman – DAC
Dept. of ME

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**Annexure-2**

**K L E F**

**DEPARTMENT OF MECHANICAL ENGINEERING DEPARTMENT ACADEMIC COMMITTEE MEETING MINUTES**

The Department Academic Committee meeting was held from 11:15 A.M. on 05/04/2018 in the HoD Chamber, with Dr.A.Srinath, HoD-ME in the chair.

**Agenda:**

1. To discuss the feedback received from stake holders on curriculum.
2. To propose the curriculum for B.Tech 2018-19 admitting batch
3. To revise the curriculum for B.Tech 2017-18 admitted batch
4. To revise the curriculum for B.Tech 2016-17 admitted batch
5. To propose the curriculum for M.Tech Machine Design 2018-19 admitting batch
6. Any other points with the permission of the DAC chairman The following

members were present:

**Faculty Members:**

| | | |
|---|---|---|
| 1. | Dr. G. Diwakar | Group Head, Design Engg. |
| 2. | Dr. K. V. Narasimha Rao | Group Head, Energy and CFD |
| 3. | Dr. T. Babu Rao | Group Head, Manufacturing |
| 4. | Dr. G. Yedukondalu | Group Head, Robotics & Mechatronics |
| 5. | Mr. P. Ratna Prasad | Professor In-Charge, IQAC, Dept. of ME |
| 6. | Mr. P. Kasi V. Rao | Professor In Charge-Academics- Dept.of ME |

**Student Members:**

| | | |
|---|---|---|
| 7. | Mr. E. L. N. Rohit Madhukar (14004289) | IV/IV B.Tech. |
| 8. | Ms. S. Naga Lalitha Devi (14004636) | IV/IV B.Tech. |
| 9. | Mr. G. Vivek (14007280) | IV/IV B.Tech. |
| 10. | Mr. B. Chandubabu (14007522) | IV/IV B.Tech. |
| 11. | Mr. A. Mani Krishna (150070033) | III/IV B.Tech. |
| 12. | Mr. G. Raj Kumar (150070111) | III/IV B.Tech. |
| 13. | Mr. K. Taraka Sriram (150070177) | III/IV B.Tech. |
| 14. | Mr. P. Mahati Aditya (150070307) | III/IV B.Tech. |
| 15. | Mr. J. Kiran Datta (150070374) | III/IV B.Tech. |
| 16. | Mr. A. Dharmendra (160070004) | II/IV B.Tech. |
| 17. | Mr. S. N. Murthy (160070331) | II/IV B.Tech. |
| 18. | Mr. Gaya Prasad Kurmi (160070419) | II/IV B.Tech. |

5/4/2018

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The following points were discussed and resolved:

1. Based on the request made by the students in separating Kinematics of Machines and Dynamics of Machines, HOD informed them that the same will be implemented for the 2017 and 2018 admitted batches.
2. Further it is informed to the students that two units on Vibrations will be included in the syllabus of Dynamics of Machines.
3. Coding Skills for Engineers course will only by taught by the faculty of the department of Computer Science and Engineering starting from the Odd Semester of 2018 – 19 Academic Year.
4. HOD informed the members that students that will be placed under "A" category will be given an opportunity to do completely project-based courses and must take the semester end examination and must maintain 90% attendance.
5. Certificate course will be offered in tie-up with the industry, and they will be offered during the entire semester rather than for one week which is being done now.
6. OOPS course for the 2015 admitted batch will be conducted as a bridge course during the CRT classes.
7. It is informed the students that their choice of the electives will be based on the outcomes of the SWEAR analysis.
8. Training classes for IES/GATE/GRE/IELTS and all other Competitive exams will be given by the senior faculty members who are competent.
9. Chairman of DAC, put forward the requests from Y13 Batch passed out students, regarding registration for additional courses, for earning additional credits citing to a shortage of credits while applying for the master's program in ***Hochschule Rosenheim***, Germany.
10. Hence, it is resolved that students in such cases are recommended to be given permission to register for additional courses either online (through MOOCS / Coursera etc.) or Offline at the university, giving them a chance to augment the required credit limit, on the condition that the passed-out students have not taken his Original Degrees. However, in case student has already received his provisional certificate from the university, the same may be surrendered to the university and the University Academic Council is requested to permit him/ her take up additional credits for fulfilling admission requirements for their higher studies abroad. The students of this category can submit the proofs of additional credits earned thus to the HOD / Chairman BOS and pay stipulated fee as prescribed by university for this purpose and get the additionally earned credits included in their CGPA.
11. Further is it also resolved that for the present students of 2015, 2014 admitted B.Tech. batch, who face such a similar situation of falling short of the required credits for applying to get admission into foreign universities (for instance, master's in Automobile Engineering specialization in Germany) can seek permission for registering and completing the additional courses to cover the credit shortage, either through Online courses on MOOCS / COURSERA/ NPTEL etc.) or offline courses offered by department over and above their required courses as per their curriculum.
12. Faculty handling the "coding skills for engineers" course suggested offering this course as a credited course to bring the seriousness among students towards coding

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skills.

13. Thus, DAC resolved that.

- For the 2015 admitted B.Tech. batch students, the "Coding skills for Engineers" course is considered as one of the two open electives, a credited course with a course code of 15GN2205.
- For the 2016 admitted B.Tech. batch students, the "Coding skills for Engineers" course is considered as one of the three open electives, a credited course with a course code of 17CS1202.
- For 2017 admitted B.Tech. Mechanical Engineering students, Coding Course with Data Structures concept will be replacing the existing Data Structures course for the same number of credits (5) and another coding course to be offered as an open elective.

14. DAC members proposed the following Engineering Science courses for 2018-19 curriculum.

a. Engineering Graphics
b. Workshop Practice
c. Mechanics and Materials-I
d. Introduction to Computational Thinking and Data Sciences

15. DAC members proposed the following core courses for 2018-19 curriculum.

a. Measurements and Instrumentation
b. Thermal-Fluids Engineering-I
c. Thermal-Fluids Engineering-II
d. Mechanics and Materials-II
e. Dynamics and Control-I
f. Dynamics and Control-II
g. Mechanical Engineering Design
h. Design for Manufacturing-I
i. Design for Manufacturing-II
j. Introduction to Robotics
k. Finite Element Analysis of Solids and Fluids
l. Engineering Management
m. Heat Transfer

16. DAC members approved the following technical skill courses proposed by Group Heads for 2018-19 curriculum.

a. Problem Solving techniques in Design.
b. Problem Solving techniques in Thermal.
c. Manufacturing Technologies
d. Control Systems for Machines

17. Based on the inputs from Industry peers, DAC members approved the following skill-based specializations as professional electives for 2018-19 curriculum

a. Design

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b. Strategic Manufacturing
c. Automobile Engineering
d. Robotics and Mechatronics
e. Autotronics
f. Data Analytics and soft computing

18. The DAC members discussed and resolved to recommend the M. Tech Machine Design 2018-19 Curriculum for BOS approval.
19. It is resolved to approve and recommend the changes in Curriculum Structure and Syllabus of the Professional Electives, Professional Core courses for the 2017 admitted B.Tech. Mechanical Engineering students and the same are approved to be put up and implemented as it is for that of 2018 admitted B.Tech. Mechanical Engineering Students, as listed out in above minute points.
20. It is resolved to offer the technical skill courses and skill based professional electives proposed for 2017 and 2018 batch students to be implemented to 2015 and 2016 admitted batches also from current academic year onwards.
21. It is resolved to offer the following Open Electives for Y15 batch students in addition to the existing open electives.

a. Industrial Engineering techniques

b. Alternate Energy Sources

c. Materials for Engineering Applications

22. It is resolved that 2017 and 2018 admitted batch students should follow the following criteria in doing certificate courses:

- Every student must undertake one certificate course in relevant modelling and assembly of Machine components using the software like Solidworks, AutoCAD-3D, Pro-E, CATIA, Unigraphics etc., at the level of their III or IV semester.
- Every student must undertake one certificate course on software analysis solvers like ANSYS, Hyper Works, NISA, ANSYS Fluent, LS Dyna etc., which must be selected by them according to their choice of skill development specialization sector during their V semester of study.
- Every student must undertake one certificate course on Python/Java Programming language with its application to solve various Mechanical Engineering problems during their VI semester.
- Every student must undertake one certificate course on Data Analytics/Machine learning or Internet of Things (IOT) at their VII semester of study.

2018

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Dept. of ME

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# Annexure-3 (a)

**Program structure (with all Courses) containing the following categorization.**

| Annexure-3 : B.Tech Y18 Batch Course Structure | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sl No** | **Course Code** | **Course Title** | **Type** | **L** | **T** | **P** | **S** | **Cr** | **Pre-Req** | **New/ Retained/ Revised** | **Stake Holders Category** | **Justification for Considering the feedback** |
| 1 | 18UC1101 | Basic English | HSS | 0 | 0 | 4 | 0 | 2 | Nil | Revised | Faculty | As per the recommendation of faculty to impart reasoning and aptitude skills necessary for placement drives new course is introduced |
| 2 | 18UC1202 | English Proficiency | HSS | 0 | 0 | 4 | 0 | 2 | Nil | New Course | Faculty | As per the feedback received from the department placement in charge Mr. Sreekar Reddy new course is introduced to improve the students' performance in placements |
| 3 | 18UC2103 | Professional Communication Skills | HSS | 0 | 0 | 4 | 0 | 2 | Nil | New Course | Faculty | As per the feedback received from the department placement in charge Mr. Sreekar Reddy new course is introduced to improve the students' performance in placements |
| 4 | 18UC2204 | Aptitude Builder - 1 | HSS | 0 | 0 | 4 | 0 | 2 | Nil | Retained | - | |
| 5 | 18UC3105 | Aptitude Builder - 2 | HSS | 0 | 0 | 4 | 0 | 2 | Nil | Retained | - | |
| 6 | 18UC0007 | Indian Heritage and Culture | HSS | 0 | 0 | 2 | 0 | 0 | Nil | Retained | - | |
| 7 | 18UC0008 | Indian Constitution | HSS | 0 | 0 | 2 | 0 | 1 | Nil | Retained | - | |
| 8 | 18UC0009 | Ecology & Environment | HSS | 2 | 0 | 0 | 0 | 0 | Nil | Retained | - | |
| 9 | 18UC0010 | Universal Human Values & Professional Ethics | HSS | 1 | 0 | 2 | 0 | 2 | Nil | Retained | - | |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Sub-Total** | | *3* | *0* | *26* | *0* | *13* | | | | |
| 10 | 18SC1104 | Foundations of Computational Mathematics | BS | 0 | 0 | 2 | 0 | 1 | Nil | Retained | - | |
| 11 | 18PH1010 | Physics Elective (Mechanics) | BS | 3 | 0 | 2 | 0 | 4 | Nil | Retained | - | |
| 12 | 18SC1103 | Single Variable Calculus and Matrix Algebra | BS | 3 | 0 | 0 | 0 | 3 | Nil | Retained | - | |
| 13 | 18SC1105 | Logic and Reasoning | BS | 0 | 0 | 2 | 0 | 1 | Nil | Retained | - | |
| 14 | 18MT1201 | Multivariate Calculus | BS | 3 | 0 | 2 | 0 | 4 | Nil | Retained | - | |
| 15 | 18CY1002 | Solid State Chemistry | BS | 3 | 0 | 2 | 0 | 4 | Nil | Retained | - | |
| 16 | 18MT2102 | Theory of Differential Equations in Engineering and Mechanics | BS | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 17 | 18PH2007 | Materials for Mechanical Engineering Applications | BS | 2 | 0 | 2 | 0 | 3 | Nil | New Course | Industry person | A new course has been designed in place of existing generic material science course keeping in the need of mechanical engineers as per the recommendations of outgoing students |
| 18 | 18BT1001 | Biology for Engineers | BS | 2 | 0 | 0 | 0 | 2 | Nil | New Course | Alumni | As per the recommendation of Alumni, a new course is drafted to provide knowledge on technical requirements in medical field |
| | | **Sub-Total** | | *18* | *0* | *14* | *0* | *25* | | | | |
| 19 | 18ME1201 | Mechanics and Materials-I | ES | 3 | 0 | 2 | 0 | 4 | 18PH1010 | Retained | - | |
| 20 | 18ME1002 | Engineering Graphics for Mechanical Engineers | ES | 0 | 0 | 4 | 0 | 2 | Nil | Retained | - | |
| 21 | 18ME1003 | Workshop Practices for Mechanical Engineers | ES | 0 | 0 | 4 | 0 | 2 | Nil | Retained | - | |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 18SC1101 | Problem Solving and Computer Programming | ES | 3 | 0 | 2 | 0 | 4 | Nil | Retained | - | |
| 23 | 18ME1204 | Introduction to Computational Thinking and Data Sciences | ES | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 24 | 18ME2205 | Numerical Computation for Mechanical Engineers | ES | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 25 | 18EE2205 | Circuits and Electronics | ES | 3 | 0 | 2 | 0 | 4 | Nil | Retained | - | |
| | | **Sub-Total** | | ***13*** | ***0*** | ***18*** | ***0*** | ***22*** | | | | |
| 26 | 18ME2106 | Measurements and Instrumentation | PC | 2 | 0 | 2 | 0 | 3 | Nil | New Course | Industry Person | A new course has been added to give more practical exposure in measurements as per the recommendations of outgoing students |
| 27 | 18ME2107 | Thermal-Fluids Engineering-I | PC | 3 | 0 | 2 | 0 | 4 | Nil | Retained | - | |
| 28 | 18ME2108 | Mechanics and Materials-II | PC | 3 | 0 | 2 | 0 | 4 | 18ME1201 | Retained | - | |
| 29 | 18ME2109 | Kinematics and Dynamics of Machines | PC | 3 | 0 | 2 | 0 | 4 | 18PH1010 | New Course | Industry Person | A new course has been designed by combining Kinematics of Machines and Dynamics of Machines as recommended by Industry person |
| 30 | 18ME2110 | Machine Drawing | PC | 0 | 0 | 4 | 0 | 2 | 18ME1002 | Retained | - | |
| 31 | 18ME2211 | Design and Manufacturing-I | PC | 3 | 0 | 2 | 0 | 4 | 18ME1201 | Retained | - | |
| 32 | 18ME2212 | Thermal-Fluids Engineering-II | PC | 2 | 0 | 2 | 0 | 3 | 18ME2107 | Retained | - | |
| 33 | 18ME2213 | Vibrations and Controls | PC | 3 | 0 | 0 | 0 | 3 | 18ME2109 | New Course | Students | As per the feedback given by the student, requesting to cover GATE syllabus Vibration and Control course is introduced |
| 34 | 18ME3114 | Machine Design | PC | 3 | 2 | 0 | 0 | 5 | 18ME2108 | Revised | Industry Person | The Elements of Mechanical Design course |

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| | | | | | | | | | | | | is revised by merging two different courses on design of machine components based on feedback of Industry experts |
| 35 | 18ME3115 | Design and Manufacturing-II | PC | 2 | 0 | 2 | 0 | 3 | 18ME2211 | Retained | - | |
| 36 | 18ME3116 | Robotics and Controls | PC | 3 | 0 | 0 | 0 | 3 | Nil | New Course | Industry person | As per the feedback given by industry expert and external BOS member, a new course has been drafted to include Robotics technology |
| 37 | 18ME3117 | Product Design and Development | PC | 0 | 0 | 0 | 12 | 3 | Nil | New Course | Industry Person | As per the feedback given by industry expert and external BOS member, a new course has been drafted to give practical experience in end-to-end product design and development as a project based course |
| 38 | 18ME3218 | Engineering Management | PC | 3 | 0 | 0 | 0 | 3 | Nil | Retained | - | |
| 39 | 18ME3219 | Heat Transfer | PC | 3 | 0 | 2 | 0 | 4 | 18ME2107 | Retained | - | |
| | | **Sub-Total** | | ***33*** | ***2*** | ***20*** | ***12*** | ***48*** | | | | |
| 40 | PE | Professional Elective Course - 1 | PE | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 41 | PE | Professional Elective Course - 2 | PE | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 42 | PE | Professional Elective Course - 3 | PE | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 43 | PE | Professional Elective Course - 4 | PE | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 44 | PE | Professional Elective Course - 5 | PE | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | PE | Professional Elective Course - 6 | PE | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| | | **Sub-Total** | | ***12*** | ***0*** | ***12*** | ***0*** | ***18*** | | | | |
| **Open Electives** | | | | | | | | | | | | |
| 46 | OE | Open Elective - 1 | OE | 3 | 0 | 0 | 0 | 3 | Nil | Retained | - | |
| 47 | OE | Open Elective - 2 | OE | 0 | 0 | 4 | 0 | 2 | Nil | Retained | - | |
| 48 | OE | Open Elective - 3 | OE | 2 | 0 | 0 | 0 | 2 | Nil | Retained | - | |
| 49 | OE | Open Elective-4 (Management Elective) | OE | 3 | 0 | 0 | 0 | 3 | Nil | Retained | - | |
| 50 | OE | Open Elective-5 (Foreign Language) | OE | 3 | 0 | 0 | 0 | 3 | Nil | Retained | - | |
| | | **Sub-Total** | | ***11*** | ***0*** | ***4*** | ***0*** | ***13*** | | | | |
| **Projects** | | | | | | | | | | | | |
| 51 | 18IE2246 | Industrial Training | Project | 0 | 0 | 0 | 0 | 2 | Nil | Retained | - | |
| 52 | 18IE3247 | Term Paper | Project | 0 | 0 | 4 | 0 | 2 | Nil | Retained | - | |
| 53 | 18IE4048/ 18IE4050 | Project (Part I) / Practice School | Project | 0 | 0 | 12 | 0 | 6 | Nil | Retained | - | |
| 54 | 18IE4049/ 18IE4050/1 8IE4051 | Project (Part II) / Practice School/ Internship | Project | 0 | 0 | 12 | 0 | 6 | Nil | Retained | - | |
| | | **Sub-Total** | | ***0*** | ***0*** | ***28*** | ***0*** | ***16*** | | | | |
| **Technical Skills** | | | | | | | | | | | | |
| 55 | 18SC1106 | Technical Skill - 1 (Coding) | Tech . Skill | 0 | 0 | 0 | 6 | 1.5 | Nil | New Course | Faculty | Based on the suggestion of Faculty member the new course is drafted to impart coding skills to students |
| 56 | 18SC1207 | Technical Skill - 2 (Coding) | Tech . Skill | 0 | 0 | 0 | 6 | 1.5 | Nil | New Course | Faculty | Based on the suggestion of Faculty member the new course is drafted to impart coding skills to students |
| 57 | 18TS702 | Skilling for Engineers-2 (Artificail Intelligence) | Tech . Skill | 0 | 0 | 0 | 6 | 1.5 | Nil | Retained | - | |
| 58 | 18TS703 | Skilling for Engineers-3 (Problem Solving | Tech .Skill | 0 | 0 | 0 | 6 | 1.5 | 18ME2107 | Retained | - | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | techniques in Thermal) | | | | | | | | | | |
| 59 | 18TS704 | Skilling for Engineers-4 (Problem Solving techniques in Design) | Tech .Skill | 0 | 0 | 0 | 6 | 1.5 | 18ME1201 | Retained | - | |
| 60 | 18TS705 | Technical Proficiency & Training-1(Data Analytics) | Tech .Skill | 0 | 0 | 0 | 4 | 1 | Nil | Retained | - | |
| 61 | 18TS706 | Technical Proficiency & Training - 2(Machine learning) | Tech .Skill | 0 | 0 | 0 | 4 | 1 | Nil | Retained | - | |
| | | **Sub-Total** | | ***0*** | ***0*** | ***0*** | ***38*** | ***9.5*** | | | | |
| **Counseling & Cocurricular Activities** | | | | | | | | | | | | |
| 63 | 18GN1101 | Counseling -1 | CNS | 0 | 0 | 1 | 0 | 0 | Nil | Retained | - | |
| 64 | 18GN1202 | Counseling -2 | CNS | 0 | 0 | 1 | 0 | 0 | Nil | Retained | - | |
| 65 | 18GN2103 | Counseling -3 | CNS | 0 | 0 | 1 | 0 | 0 | Nil | Retained | - | |
| 66 | 18GN2104 | Counselling-4 | CNS | 0 | 0 | 1 | 0 | 0 | Nil | Retained | | |
| 67 | 18GN2105 | Counselling-5 | CNS | 0 | 0 | 1 | 0 | 0 | Nil | Retained | | |
| 68 | 18GN1107 | Cocurricular Activity -1 | CCA | 0 | 0 | 0 | 2 | 0.5 | Nil | Retained | - | |
| 69 | 18GN1208 | Cocurricular Activity -2 | CCA | 0 | 0 | 0 | 2 | 0.5 | Nil | Retained | - | |
| 70 | 18GN2109 | Cocurricular Activity -3 | CCA | 0 | 0 | 0 | 2 | 0.5 | Nil | Retained | - | |
| 71 | 18GN2110 | Cocurricular Activity -3 | CCA | 0 | 0 | 0 | 2 | 0.5 | Nil | Retained | | |
| 72 | 18GN2111 | Cocurricular Activity -4 | CCA | 0 | 0 | 0 | 2 | 0.5 | Nil | New Course | Parents | As per the feedback given by the parents of Y17 students, the Cocurricular activity is extended to II and II years also |
| 73 | 18GN2112 | Cocurricular Activity -5 | CCA | 0 | 0 | 0 | 2 | 0.5 | Nil | New Course | Parents | As per the feedback given by the parents of Y17 students, the Cocurricular activity is extended to II and II years also |
| | | **Sub-Total** | | ***0*** | ***0*** | ***3*** | ***6*** | ***1.5*** | | | | |
| | | **Total** | | **90** | **2** | **125** | **56** | **166** | | | | |

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**List of Professional Elective Courses**

| Sl No | Course Code | Course Title | Type | L | T | P | S | Cr | Pre-requisite | Remarks | Changes Proposed by | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 18ME4051 | Design of Transmission Elements | DESIGN | 2 | 0 | 2 | 0 | 3 | 18ME2214 | Retained | - | |
| 2 | 18ME4052 | Theory of Elasticity and Plasticity | | 3 | 0 | 0 | 0 | 3 | 18ME2108 | Retained | - | |
| 3 | 18ME4053 | Advanced Vibrations and Noise Control | | 2 | 0 | 2 | 0 | 3 | 18ME2109 | Retained | - | |
| 4 | 18ME4054 | Computer Aided Design | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 5 | 18ME4055 | Creep, Fatigue and Fracture Mechanics | | 3 | 0 | 0 | 0 | 3 | 18ME2108 | Retained | - | |
| 6 | 18ME4056 | Advanced Strength of Materials | | 2 | 0 | 2 | 0 | 3 | 18ME2108 | Retained | - | |
| 7 | 18ME4057 | Mechanics of Composite Materials | | 2 | 0 | 2 | 0 | 3 | 18ME2108 | Retained | - | |
| 8 | 18ME4061 | Modern Manufacturing Processes | STRATEGIC MANUFACTURING | 2 | 0 | 2 | 0 | 3 | 18ME1003 | Retained | - | |
| 9 | 18ME4062 | Advanced Materials | | 3 | 0 | 0 | 0 | 3 | Nil | Retained | - | |
| 10 | 18ME4063 | Additive Manufacturing | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 11 | 18ME4064 | Tool Engineering and Design | | 2 | 0 | 2 | 0 | 3 | 18ME2211 | Retained | - | |
| 12 | 18ME4065 | Flexible Manufacturing Systems | | 2 | 0 | 2 | 0 | 3 | 18ME3115 | Retained | - | |
| 13 | 18ME4066 | Geometric Dimensioning and Tolerancing | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 14 | 18ME4067 | Reverse Engineering and Rapid Prototyping | | 3 | 0 | 0 | 0 | 3 | Nil | Retained | - | |
| 15 | 18ME4071 | Automobile Engineering | AUTOMOBILE ENGINEERING | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 16 | 18ME4072 | Automobile Engine Design | | 2 | 0 | 2 | 0 | 3 | 18ME2214 | Retained | - | |
| 17 | 18ME4073 | Automotive Transmission | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 18 | 18ME4074 | Autotronics & Safety | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 19 | 18ME4075 | Alternative Energy Sources for Automobiles | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 20 | 18ME4076 | Automotive Electrical and Electronics System | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 21 | 18ME4077 | Automobile Engine System and Performance | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 22 | 18ME4081 | Automotive Sesnsor and Applications | AUTOTRONICS | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 23 | 18ME4082 | Autotronics | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | 18ME4083 | Electronic Engine Management System | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 25 | 18ME4084 | Instrumentation in Automotive Industries | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 26 | 18ME4085 | Autotronics and Vehicle Intelligence | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 27 | 18ME4086 | Automotive Systems | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 28 | 18ME4087 | Programmable Logic Controller | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 29 | 18ME4091 | Artificial Intelligence for Robotics | ROBOTICS AND MECHATRONICS | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 30 | 18ME4092 | Automation System Design | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 31 | 18ME4093 | Industrial Automation and Control | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 32 | 18ME4094 | Industrial Hydraulic and Pneumatic Systems | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 33 | 18ME4095 | Industrial Robotics and Material Handling Systems | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 34 | 18ME4096 | Micro Controllers and PLC | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 35 | 18ME4097 | Mechatronics System Design | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 36 | 18ME4101 | Programming Skills | SOFT COMPUTING & DATA ANALYTICS | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 37 | 18ME4102 | Data Analytics | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 38 | 18ME4103 | Python | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 39 | 18ME4104 | Machine Learning | | 2 | 0 | 2 | 0 | 3 | 18ME4102 | Retained | - | |
| 40 | 18ME4105 | Artificial Intelligence | | 2 | 0 | 2 | 0 | 3 | 18ME4102 | Retained | - | |
| 41 | 18ME4106 | Fuzzy Logic and Neural Networks | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |
| 42 | 18ME4107 | Robotics | | 2 | 0 | 2 | 0 | 3 | Nil | Retained | - | |

**List of Open Elective Courses**

| Sl No | Course Code | Course Title | Type | L | T | P | S | Cr | Pre-requisite | Remarks | Changes Proposed by | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 18ME40B4 | Robotics | Open Electives | 3 | 0 | 0 | 0 | 3 | NIL | Retained | - | |
| 2 | 18ME40B5 | Mechatronics | | 3 | 0 | 0 | 0 | 3 | NIL | Retained | - | |
| 3 | 18ME40B6 | Operations Research | | 3 | 0 | 0 | 0 | 3 | NIL | Retained | - | |

| | |
|---|---|
| No. of New Courses introduced in 2018-19 admitted batch curriculum | 13 |
| No. of Courses with modifications in Syllabus / L-T-P-S structure | 2 |
| Total No. of Courses in 2018-19 admitted batch curriculum | 109 |
| Percentage of Revision | 16% |

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**Annexure-3(b) Syllabus of New Courses**

## 18UC1202- ENGLISH PROFICIENCY

L-T-P-S : 0-0-4-0
Credits 2
Contact Hours 4
Pre-requisite : Nil
Mapping of Course Outcomes with PO/PSO:

| CO No | Course outcome's | PO | BTL |
|---|---|---|---|
| 1 | Apply the concepts of accurate English while writing and become equally at ease in using good vocabulary. and language skills. | PO8, PO9, PO10 | 3 |
| 2 | Understand the importance of pronunciation and apply the same day to day conversation. | PO8, PO9, PO10 | 3 |
| 3 | Apply the concepts of Ratios, Percentages, Averages and Analysing the given information, a student is required to understand the given information and thereafter answer the given questions based on comparative analysis of the data in the form of tabulation, bar graphs, pie charts, line graphs. Analyse the given data to find whether it is sufficient or not. | PO1, PO4 | 3 |
| 4 | Apply the basic functionality of Clocks and Calendars to find the solutions for the problems. Analyze the given symbols to understand the hidden meaning of the given expression and find the solutions. Analyze the given conditions and find out all the possible arrangements. in linear & circular order. | PO1, PO5 | 4 |

**Syllabus:**

**Writing Skills**: How to Write a Definition, Defining Technical Terms, Product and Process Description. Advanced Grammar Skills: Transformation of Sentences, Phrases, Clauses, Sentences Simple, Compound, Complex Sentences, Concord, Lexis 1: Synonyms, Antonyms, Analogies, Sentence Equivalence-One-Word Substitutes. **Language Laboratory Interactive:** Debate, Blind- fold, Role Play, Situation Reaction Test- -Build an Island nation. **Quantitative Aptitude**: Data Interpretation, Data Sufficiency. **Reasoning**: Symbols and Notations, Clocks and Calendars, Analytical Reasoning-II

Reference Books:

1. Dictionary of Technical Terms
2. Dr. Meenakshi Raman and Dr. Sangeetha Sarma: *Technical Communication*. Oxford University Press: Delhi.2016.
3. The Ultimate Verbal and Vocabulary Builder. Texas: Lighthouse Review.2000.
4. Rajeev Vasisth: *Interactive Vocabulary Drills*. New Delhi: Arihant Publications Limited. 2011.
5. Language Laboratory Teacher Manual, KLEFU

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## 18UC2103- PROFESSIONAL COMMUNICATION SKILLS

L-T-P-S : 0-0-4-0
Credits 2
Contact Hours 4
Pre-requisite : Nil

**Mapping of Course Outcomes with PO/PSO:**

| CO No | Course outcome's | PO No | BTL |
|---|---|---|---|
| 1 | Able to spot the common grammatical errors related to Sentence. Structure, Preposition, Concord, Relative and Conditional Clauses, and Parallel Structures. | PO9, PO10 | 3 |
| 2 | Able to read, understand, and interpret a text intrinsically as well as extrinsically. The learner can browse a text quickly to come-up with a gist and personal interpretation. | PO8 | 4 |
| 3 | Apply the concepts of Time and work, the students will be able to solve the questions related to Men-Time- Work, problems based on wages, pipes and cisterns. | PO1 | 3 |
| 4 | Apply Venn diagrams to the given statements to find out whether the given conclusions can be deducted from the given statements. Apply the logical implications and the negations of various connectives to find solutions. Analyze the given data and representing the data in the form of Venn Diagrams to find relations between any given set of elements. | PO1, PO5 | 3 |

**Grammar and Usage:** Error Analysis.

Writing Skills: Topic sentence, Linkers, Connectors and Transition, Paragraph Writing, Letter Writing, Reading Comprehension: Techniques, Skimming and Scanning, Vertical Reading, Reading Perception Tests (RPT): (Graphic) Reading Perception Tests (RPT), Semantic Interpretation of the Text, Reading Speed Enhancement. **Soft Skills**: Interpersonal Skills, Adjusting Your Attitude-Arrogance has no Place in the Workplace, Cultural Sensitivity in the Workplace, Corporate Culture: Learning How to Fit In. **Quantitative Aptitude:** Time and Work, Time and Distance **Reasoning:** Deductions, Logical Connectives, Venn Diagrams

Reference Books:

1. Gajendra Singh Chauhan and SmitaKashiramka. *Technical Communication.* Delhi:Cengage Learning India.2018.
2. Andrea Penruddocke and Christopher A. Warnasch.English for the Real World.USA:Living Language.2004
3. GeraldJ Alfred, Charles T Brusaw and Walter E.Oliu. Handbook of TechnicalWriting. USA:Betford.2000. Asher Cashdan: Language, Reading and Learning.Oxford:Basil Blackwell.1979

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**18PH2007- MATERIALS FOR MECHANICAL ENGINEERING APPLICATIONS)**

L-T-P-S: 2-0-2-0

Credits 3

Contact Hours 4

Pre-requisite : Nil

**Mapping of Course Outcomes with PO/PSO:**

| CO No | Course Outcome (CO) | PO | BTL |
|---|---|---|---|
| CO1 | Understand crystal structures and to find lattice parameters using different XRD techniques | PO1, PO4, PO11 | 2 |
| CO2 | Understand different heat treatment processes and understand the properties of smart materials | PO1, PO4, PO11 | 2 |
| CO3 | Understand different types of semiconducting materials and ceramic materials | PO1, PO4, PO11 | 2 |
| CO4 | Understand different types of composite materials and nano materials and its applications | PO1, PO4, PO11 | 2 |

**SYLLABUS:Crystallography:** Potential energy vs Inter atomic distance, difference between crystalline and amorphous materials, basic definitions, seven crystal system, bravais lattice, Inter planar spacing and problems, production and characteristics of X-rays, Bragg's law and problems, different XRD Techniques -transmission and back reflection methods using by Laue XRD technique, rotating crystal method, calculation of lattice parameters by Powder XRD method, **Heat treatments:** Constitutions of alloys, cooling curves: pure metal, solid solution, electric system electric alloy. Phase diagrams and classifications, Iron Carbon Cycle, Introduction of heat treatments, definitions and Steps involved in Heat treatments and its significance, *conventional heat treatments:* annealing, normalizing, hardening, tempering. *Special heat treatments:* superfast heat treatments - flame hardening and induction hardening, case hardening methods - carburizing, nitriding, cyaniding, and carbonitriding. **Smart Materials:** Introduction, shape memory effect, classification of shape memory alloys, compositions, properties applications of shape memory alloys. **Semiconducting Materials:** Classification of semiconducting materials, bond and energy band diagrams for intrinsic and extrinsic semiconductors, role of temperature and doping effect on conductivity, influence of temperature on mobility, factors effecting on carrier concentration, conductivity mechanism, applications. **Ceramics:** Introduction, classification, electrical and thermal conductivity, abrasive and refractory materials, applications. **Composites:** Introduction, classification, polymer matrix composites, metal matrix composites, ceramics matrix composites, carbon- carbon composites, fiber-reinforced composites and natural and made composites, applications. **Nano materials:** Introduction, properties at nano scale, advantages and disadvantages, application s of bulk materials (nano structure, nano wires, nano tubes and nano composites), preparation of nano materials and different methods, applications.

**Text books:**

1. Daniel. C., Yesudian, Harris. D.G.,Samuel, Materials science

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and engineering, Willey India, ISBN-10: 8188429449.

2. Bandyopadyay. A. K. , Nano Materials, New Age Publishers, ISBN-10: 1906574278.
3. Callister William D., Material Science and Engineering - An Intoduction,. 6th edition,2007, Wiley India Pvt.Ltd, ISBN-13: 978-0470556733.
4. Kodgire. V. D., Material Science and Metallurgy, ISBN-10: 8186314008.

**18SC1106-TECHNICAL SKILLS – 1 (CODING)**

L-T-P-S : 0-0-0-6
Credits : 1.5
Contact Hours : 6
Pre-requisite : Nil

**Mapping of Course Outcomes with PO/PSO:**

| CO No. | Course Outcomes (CO) | PO | BTL |
|---|---|---|---|
| 1 | Apply the concepts of basic programming to solve the basic problems, pattern based problems | PO1, PO2 | 3 |
| 2 | Build solutions for problems on Numbers and array based problems, functions, recursion | PO1, PO2 | 3 |
| 3 | Solve problems solutions for character/string based problems and pointers | PO1, PO2 | 3 |
| 4 | Build solutions to programs on Data structures concepts. | PO1, PO2 | 3 |

SYLLABUS:

Basic problems, Pattern based problems, Number based problems, Array based problems (one dimensional and two dimensional), character and string-based problems, functions and recursion (class and objects for java), pointer based problems, function pointers and array pointers (For C Users), linked lists, queues, stack problems.

Tools for References:

1. http://hackerrank.com

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## 18SC1207-TECHNICAL SKILLS – 2 (CODING)

L-T-P-S : 0-0-0-6
Credits : 1.5
Contact Hours : 6
Pre-requisite : Nil

### Mapping of Course Outcomes with PO/PSO:

| CO No: | Course Outcome (CO) | PO | BTL |
|---|---|---|---|
| 1 | Apply the concepts of basic programming to solve the basic problems, pattern based problems | PO1, PO2 | 3 |
| 2 | Build solutions for problems on Numbers and array based problems, functions, recursion | PO1, PO2 | 3 |
| 3 | Solve problems solutions for character/string-based problems. and pointers | PO1, PO2 | 3 |
| 4 | Build solutions to programs on Data structures concepts. | PO1, PO2 | 3 |

SYLLABUS:

Problem solving on Arrays, Array of Structures, Nested Structures, Queues: DE Queue, Circular Queue and Priority Queues, Lists: Operations on Single Linked List, Double Linked List - Operations on DLL, Circular Linked List, Problem Solving on Strings, Applications of Stacks and Queues, Implementation of Stacks and Queues using Linked List, Constructing Recursion, Heaps, Sorting: Merge Sort, Quick Sort, Heap Sort, Insertion Sort and Shell Sort, Trees: Binary Tree, Expression Tree, Binary Search Tree: Implementation- Insertion, Deletion, Tree Traversals, AVL Tree and Splay Tree , Hashing: Hash Function, Separate Chaining, Open Addressing, Re-Hashing and Extendible Hashing.

Tools & References:

1. http://hackerrank.com
2. http://codechef.com
3. http://hackerearth.com

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# 18ME1206-MEASUREMENTS AND INSTRUMENTATION

L-T-P-S : 2-0-2-0
Credits 3
Contact Hours 4
Pre-requisite : Nil

Mapping of Course Outcomes with PO/PSO:

| CO No. | Course Outcome | PO/PSO | BT L |
|---|---|---|---|
| 1 | Understand the basics of standards of measurement, limits, fits & tolerances industrial applications and identify the uses of gauges and comparators. | PO1 | 2 |
| 2 | Understand the significance of measurement system, errors, transducers, intermediate modifying and terminating devices. | PO1 | 2 |
| 3 | Interpret measurement of field variables like force, torque and pressure. | PO1 | 3 |
| 4 | Comprehend the fundamentals of thermocouple and strain measurement. | PO1 | 3 |
| 5 | Apply the theoretical concepts to conduct various experiments of Measurements practically. | PO1 | 3 |

**Syllabus:**

Definition – Introduction to measurements, precision and accuracy, generalized configuration, and functional descriptions of measuring instruments – examples. Errors in measurements – sources of error, Classification, and elimination of error. **Measurement of Displacement:** Theory and construction of various transducers to measure displacement– Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures. **Measurement of Temperature:** Classification – Ranges – Various Principles of measurement– Expansion, Electrical Resistance – Thermistor – Thermocouple – Pyrometers– Temperature Indicators **Measurement of Pressure:** Units – classification – different principles used. Manometers, Piston, Bourdon pressure gauges, Bellows – Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges – ionization pressure gauges, McLeod pressure gauge. **Measurement of Level:** Direct method – Indirect methods – capacitive, ultrasonic, magnetic, cryogenic fuel level indicators – Bubbler level indicators. **Flow Measurement:** Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot – wire anemometer, Laser Doppler Anemometer (LDA). **Measurement of Speed:** Mechanical Tachometers – Electrical tachometers – Stroboscope, Non-contact type of tachometer. **Measurement of Acceleration and Vibration:** Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle. **Stress Strain Measurements:** Various types of stress and strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge for

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bending compressive and tensile strains – usage for measuring torque, Strain gauge Rosettes.**Measurement of Force, Torque and Power:** Elastic force meters, load cells, Torsion meters, Dynamometers. Computer assisted data acquisition, data manipulation, datapresentation.

Textbooks:

1. Kumar D.S., —Mechanical Measurements and Control‖, Metropolitan Book co. Private Ltd., N. Delhi.

Reference Books:

1. Measurement systems: Application and design, Doeblin Earnest. O. Adaptation by Manik and Dhanesh
2. Instrumentation and Control systems/ S.Bhaskar/ Anuradha Agencies.
3. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.
4. Instrumentation & mech. Measurements by A.K. Tayal ,Galgotia Publications
5. Instrumentation, measurement & analysis by B.C.Nakra & K.K.Choudhary, TMH
6. Mechanical Measurements / BeckWith, Marangoni,Linehard, PHI / PE
7. Experimental methods for engineers,7th Edition/J.P.Holman/Tata Mc Graw hill

## 18ME2109-KINEMATICS AND DYNAMICS OF MACHINES

L-T-P-S : 3-0-2-0
Credits 4
Contact Hours 5
Pre-requisite : 18PH1010

Mapping of Course Outcomes with PO/PSO:

| CO No | Course Outcome | PO/PSO | BTL |
|---|---|---|---|
| 1 | Identify, select, and analyze kinematically suitable mechanisms for required motion of machinery | PO4 | 2 |
| 2 | Develop velocity and acceleration diagrams and analyze the data | PO2 | 4 |
| 3 | Develop cam profiles and Analyze gears and gear trains kinematically | PO4 | 4 |
| 4 | Analyze mechanisms dynamically | PO3 | 4 |
| 5 | Apply the theoretical concepts to design mechanisms by using the simulation software and analyzing the data | PO2 | 4 |

**Syllabus:**

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Mechanisms and Machines: Introduction to Plane and Space Mechanisms, Kinematic Pairs, Kinematic Chains and their Inversions, Mobility and range of movement - Kutzbach and Grubler's criterion, Grashof's criterion.Velocity analysis: Velocity analysis using IC and relative velocity method. Acceleration analysis. Cams: cam profiles of knife edge, roller and offset followers of reciprocating motion. Gears and Gear trains: Gears – terminology, fundamental law of gearing, involute profile. Interference and undercutting. Gear Trains – simple, compound and epicyclic gear trains. Balancing: Introduction, Static balancing, dynamic balancing, transferring of a Force from one plane to another, Balancing of Several Masses in Different planes, Balancing of Reciprocating Mass, Secondary Balancing. Dynamic force analysis: Force analysis of Slider crank mechanism. Gyroscopes: Gyroscopic Effect on Naval Ships, Stability of an Automobile, Stability of a Two-Wheel vehicle, Four-Wheeler

Textbooks:

1. David H. Myszka —Machines and Mechanisms-Applied Kinematic Analysis‖, 4th Edition, Prentice Hall
2. Robert Norton —Kinematics and Dynamics of Machinery‖ 1st Edition, Tata McGraw - Hill Education, (2009)
3. Shigley J.E., and Uicker J.J —Theory of Machines and Mechanisms‖, McGraw Hill, (1995).

Reference Books:

1. Thomas Bevan —Theory of Machine‖ CBS Publications.
2. Rao, J. S —The Theory of Machines through Solved Problems‖, New Age International.
3. A.Ghosh and A.K.Mallik —Mechanisms and Machine Theory‖, 3rd edition, EWP Pvt.Ltd.

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## 18ME2213-VIBRATIONS AND CONTROL

L-T-P-S : 3-0-0-0
Credits 3
Contact Hours 3
Pre-requisite : 18ME2109

Mapping of Course Outcomes with PO/PSO:

| CO No | Course Outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Analyze one DOF free and forced undamped vibration systems | PO1, PSO1 | 2 |
| CO2 | Analyze and control of one DOF forced damped vibration systems | PO2, PSO1 | 3 |
| CO3 | Analyze and control of Two and Multi DOF vibration systems | PO2, PSO1 | 3 |
| CO4 | Analyze continuous systems and vibration measurement. | PO2, PSO1 | 2 |

Syllabus:

FUNDAMENTALS OF VIBRATION: Introduction -Sources of Vibration-Mathematical Models-Displacement, velocity, and Acceleration. Single Degree Freedom Systems: Free and Forced Vibration of Undamped systems. Forced Vibration of Damped with Harmonic Excitation System, Vibration isolation- Vibrometers and accelerometers - Response to Arbitrary and non- harmonic Excitations – Transient Vibration –Impulse loads-Critical Speed Of Shaft-Rotor systems. Vibration Isolation methods- -Dynamic Vibration Absorber, Torsional and Pendulum Type Absorber-Damped Vibration absorbers. Specification of Vibration Limits –Vibration severity standards-Vibration as condition Monitoring tool. TWO DEGREE FREEDOM SYSTEM: Introduction- – Coordinate Couplings and Principal Coordinates MULTI-DEGREE FREEDOM SYSTEM AND CONTINUOUS SYSTEM: Multi Degree Freedom System –Influence Coefficients and stiffness coefficients-Flexibility. Matrix and Stiffness Matrix – Eigen Values and Eigen Vectors-Matrix-Iteration Method – Approximate Methods: Dunkerley, Rayleigh's, and Holzer Method. Eigen Values & Eigen vectors for large system of equations using sub space, Lanczos method. Continuous System: Vibration of String, Shafts and Beams. Introduction to Active and Semi- active Vibration Control. **Vibration Measurement:** Basics, data acquisition, FFT analysis and filters

Textbooks:

1. Mechanical Vibrations,S.S. Rao,Pearson Education Inc. (4th Ed.), 2007.
2. Mechanical Vibrations by G. K. Groover. Nem Chand & Bros.
3. Vibration and Control, D. J. Inman, John Willey & Sons Inc, 2002
4. Mechanical Vibrations,S. Tamadonni& Graham S.Kelly, Schaum'sOut line Series, Mc-Graw Hill Inc, 1998.

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## 18ME3116-ROBOTICS AND CONTROLS

L-T-P-S : 3-0-0-0
Credits 3
Contact Hours 3
Pre-requisite : NIL

Mapping of Course Outcomes with PO/PSO:

| CO No | Course Outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Implement direct kinematics for robot design | PO1 | 3 |
| CO2 | Implement Inverse kinematics and Workspace analysis based robot design | PO3 | 3 |
| CO3 | Implement Artificial Intelligence in Robotic Applications | PO3 | 3 |
| CO4 | Implement the task programming for robots | PO3 | 3 |

Syllabus:

**Intelligent Robotics:** Automation and Robots, Robot Classification, Robot Specifications, Sensory perception, Robot control and Intelligence. **Direct Kinematics:** Coordinate Frames, Rotations, Homogeneous Coordinates, The armEquation, (DK analysis of - 2 Axis and 3 Axis Planar robot, Four axis SCARA Robot, Five axis Articulated robot). **Inverse Kinematics:** General Properties of Solutions, Tool Configuration, (IK analysis of - 2Axis and 3 Axis Planar robot, Four axis SCARA Robot, Five axis Articulated robot). **Workspace Analysis and Trajectory Planning:** Workspace analysis, Work envelope of 4- axis SCARA Robot, Work envelope of 5-axis articulated Robot, Workspace Fixtures, the pick-and-place operation, Continuous-Path Motion, Interpolated Motion, StraightLine Motion **Basic Concepts of Artificial Intelligence:** Intelligence, Problem representation in Artificial Intelligence, Problem-solution Techniques used in Artificial Intelligence. Elements of Knowledge Representation: Logic, Production Systems, Semantic Networks, Expert Systems. **Task Planning:** Task-Level Programming, Uncertainty, Configuration Space, Gross-Motion Planning, Grasp Planning, Fine Motion Planning, Task Planning Problem.

Textbooks:

1. —Robotics and AI||, Andrew Staugaard, PHI
2. —Fundamentals of Robotics- Analysis and Control||, Robert Schilling, Pearson Education

Reference Books:

1. —Introduction to Robotics||, J. J. Craig, Pearson Education.

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## 18ME3117-PRODUCT DESIGN AND DEVELOPMENT

L-T-P-S : 0-0-6-0 Credits 3 Contact Hours 6 Pre-requisite : NIL

Mapping of Course Outcomes with PO/PSO:

| CO No | Course Outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Identify and establish product specifications. | PO1, PO3 | 4 |
| CO2 | Selection of concept and Product architecture. | PO1, PO3 | 4 |
| CO3 | Apply Industrial design techniques. | PO1, PO3 | 4 |
| CO4 | To develop a Prototype | PO1, PO3 | 4 |

Syllabus:

Need for Integrated Product and Process Development (IPPD) – Strategic importance of Product development – integration of customer, designer, material supplier and process planner, Competitor and customer – Behaviour analysis. Understanding customer – prompting customer understanding – involve customer in development and managing requirements – Organization – process management and improvement – Plan and establish product specifications. CONCEPT GENERATION AND SELECTION: Task – Structured approaches – clarification – search – externally and internally – explore systematically – reflect on the solutions and processes – concept selection – methodology – benefits. PRODUCT ARCHITECTURE: Implications – Product change – variety – component standardization – product performance – manufacturability – product development management – establishing the architecture – creation – clustering – geometric layout development – fundamental and incidental interactions – related system level design issues – secondary systems – architecture of the chunks – creating detailed interface specifications. INDUSTRIAL DESIGN: Integrate process design – Managing costs – Robust design – Integrating CAE, CAD, CAM tools – Simulating product performance and manufacturing processes electronically – Need for industrial design – impact – design process – investigation of for industrial design – impact – design process – investigation of customer needs – conceptualization – refinement – management of the industrial design process – technology driven products – user – driven products – assessing the quality of industrial design. DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT: Definition – Estimation of Manufacturing cost – reducing the component costs and assembly costs – Minimize system complexity – Prototype basics – principles of prototyping – planning for prototypes – Economic Analysis – Understanding and representing tasks – baseline project planning – accelerating the project – project execution.

Textbooks:

1. Product Design and Development, Karl T.Ulrich and Steven D.Eppinger, McGraw – Hill International Edns.1999

Reference Books:

2. Concurrent Engg./Integrated Product Development. Kemnneth Crow, DRM Associates, 6/3,ViaOlivera, Palos Verdes, CA 90274(310) 377-569,Workshop Book
3. Effective Product Design and Development, Stephen Rosenthal, Business One Orwin, Homewood, 1992, ISBN, 1-55623-603-4
4. Tool Design – Integrated Methods for successful Product Engineering, Stuart Pugh, Addison Wesley Publishing, Neyourk,NY,1991, ISBN 0-202-41639-5

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## Annexure-4

### Course wise Revision as per the course Structure of 2018-19 Admitted Batch Students

| Course Code | Course Name | Course Category | Existing Syllabus (as per Annexure-3) | New Syllabus | Topics Added/Removed/Replaced | Change in Outcome | Justification for the Modification | *Overall Revision Percentage |
|---|---|---|---|---|---|---|---|---|
| 18UC1101 | Basic English | HSS | **Listening & Speaking Skills:** Phonetics symbols- practice- Exercises - Pronunciation- Reading Cum Speaking Practice: Enunciation- Homonyms- Homophones- Homographs: Vocabulary- Root words- Affixes- Identifying meaning from context- Synonyms & Antonyms: Word building: Escatalk: **Speaking** to persuade: Pyramid Discussion: Story-Telling and interpretation: End story: Speaking to Explain: Tell me why? **General Writing Skills:** Clarity and conciseness in writing: Paragraph Writing: Identifying Topic sentences, writing topic sentence: Linkers, Coordinates:Letter Writing & E- Mail Writing:Netiquette **Reading Skills:** Reading comprehension Practice Exercises: Reading for information: Reading for specifics –- theme, attitude: Types of Reading: Vertical Reading: Identifying the central idea: Speed Reading –- | **Interactive Grammar:** Action Words-Modifiers, Intensifiers, Connectives - 5 Passages- 5 Worksheets (Revision tests of Bridge Course topics) -Parsing Sentence Skills: Tense, Voice, Case, Gender, Reported Speech, Syntax, Types of Sentences, Syntactic Ordering Introduction to the Sounds of English: Basic English Sounds, Distinctive Sounds of English, Assimilation, Contraction, Elision, Twinning, Stress, Syllables, Word- stress, Tone and Intonation- Rising, Falling, Rise-fall and Fall-rise. **Language Laboratory Interactive:** Esca talk, JAM, Ranking, Shrinking Story, Desperate Decision, Listening for Specifics, Pronunciation Practice. **Quantitative Aptitude:** Permutations and Combinations, Probability **Reasoning:** Number and Letter Analogy, Odd Man out, Analytical Reasoning-I | **Interactive Grammar:** Action Words-Modifiers, Intensifiers, Connectives - 5 Passages- 5 Worksheets (Revision tests of Bridge Course topics) -Parsing Sentence Skills: Tense, Voice, Case, Gender, Reported Speech, Syntax, Types of Sentences, Syntactic Ordering Introduction to the Sounds of English: Basic English Sounds, Distinctive Sounds of English, Assimilation, Contraction, Elision, Twinning, Stress, Syllables, Word- stress, Tone and Intonation- Rising, Falling, Rise-fall and Fall-rise. **Language Laboratory Interactive:** Esca talk, JAM, Ranking, Shrinking | **3 outcomes revised** | As per the recommendation of Faculty to incorporate the reasoning, aptitude skills for placement drives the course is revised | **75%** |

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| | | | | | | | | |
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| | | | seven techniques to improve reading speed<br><br>**Soft Skills**: Introduction to soft skills: Verbal and Non-verbal communication: Cultural sensitivity: Empathy and understanding: Diversity and Acculturation | | Story, Desperate Decision, Listening for Specifics, Pronunciation Practice.<br><br>**Quantitative Aptitude:** Permutations and Combinations, Probability<br><br>**Reasoning**: Number and Letter Analogy, Odd Man out, Analytical Reasoning-I | | | |
| 18PH2007 | Materials for Mechanical Engineering Applications | BS | **Crystallography:** Bonding in materials, Space lattice, basis, unit cell, Seven Crystal systems, Bravais lattice system, Reciprocal lattice, Crystal directions, Miller Indices, problems, Diffraction of Crystals, Bragg's Law, XRD, Laue, Rotating Crystal and powder XRD Techniques, Problems.<br>**Crystal Imperfections:** Point Defects, Line Defects, Surface Defects, Volume Defects, and Effects of Defects on Crystalline Properties.<br>**Magnetic properties**: Origin of Magnetic Moment, Dia, Para, Ferro, Antiferro and Ferri Magnetism, Domain theory and Hysteresis Effect of Ferro and Ferri Magnetism, Soft and Hard Magnetic Materials. | Crystallography: Potential energy vs Inter atomic distance, difference between crystalline and amorphous materials, basic definitions, seven crystal system, bravais lattice, Inter planar spacing and problems, production and characteristics of X-rays, Bragg's law and problems, different XRD Techniques -transmission and back reflection methods using by Laue XRD technique, rotating crystal method, calculation of lattice parameters by Powder XRD method, Heat treatments: Constitutions of alloys, cooling curves: pure metal, solid solution, electric system electric alloy. Phase diagrams and classifications, Iron Carbon Cycle, Introduction of heat treatments, definitions and Steps involved in Heat treatments and its significance, conventional heat treatments: annealing, | Smart Materials: Introduction, shape memory effect, classification of shape memory alloys, compositions, properties applications of shape memory alloys.<br>Semiconducting Materials: Classification of semiconducting materials, bond and energy band diagrams for intrinsic and extrinsic semiconductors, role of temperature and | 3 outcomes changed | As per the recommendations of Industry Person Mr..Khadar Basha, new topics to the syllabus is added based on the industry requirements | 75% |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **Thermal properties:** Iron-Carbon Diagram, Heat capacity, Thermal Expansion and Thermal Conductivity in Metals, Ceramics and Polymers, Heat treatment of Materials, Hardening, Tempering, Quenching and Nitriding.<br>**Mechanical Properties:** Stress, Strain, Hooke's Law, Elasticity, Plasticity, Creep, Ductility, Brittle, Hardness, Strength, Modulus of Elasticity, Fracture, Fatigue, Stress-Strain Behavior of Ductile and Brittle Materials, Hardness Tests- Vickers, Rockwell and Brinell.<br>**Electrical Properties:** Energy band theory, Band structures in Conductors, Semi conductors and Insulators, Electrical properties of conductors- Ohms, Mathiessen rule, conductivity, Mobility, Electrical properties of Semi conductors, Factors effecting the carrier concentration, Conductivity and Mobility of charge carriers. Electric properties of Insulator-Dielectrics-Types of Dielectrics, Dielectric Constant, Polarization, Types of Polarizations, Frequency Dependence of Polarization, Ferro, Piezo Electrics.<br>**Optical properties**: Optical reflectance, Optical Absorption, snell's law, Total Internal reflection in optical fibers. | normalizing, hardening, tempering. Special heat treatments: superfast heat treatments - flame hardening and induction hardening, case hardening methods - carburizing, nitriding, cyaniding, and carbonitriding.<br>Smart Materials: Introduction, shape memory effect, classification of shape memory alloys, compositions, properties applications of shape memory alloys.<br>Semiconducting Materials: Classification of semiconducting materials, bond and energy band diagrams for intrinsic and extrinsic semiconductors, role of temperature and doping effect on conductivity, influence of temperature on mobility, factors effecting on carrier concentration, conductivity mechanism, applications.<br>Ceramics: Introduction, classification, electrical and thermal conductivity, abrasive and refractory materials, applications.<br>Composites: Introduction, classification, polymer matrix composites, metal matrix composites, ceramics matrix composites, carbon-carbon composites, fiber-reinforced composites and natural and made composites, applications.<br>Nano materials: Introduction, properties at nano scale, advantages and disadvantages, application s of bulk materials (nano structure, nano wires, nano tubes and nano composites), preparation of nano materials and different methods, applications. | doping effect on conductivity, influence of temperature on mobility, factors effecting on carrier concentration, conductivity mechanism, applications.<br>Ceramics: Introduction, classification, electrical and thermal conductivity, abrasive and refractory materials, applications.<br>Composites: Introduction, classification, polymer matrix composites, metal matrix composites, ceramics matrix composites, carbon-carbon composites, fiber-reinforced composites and natural and made composites, applications.<br>Nano materials: Introduction, properties at nano scale, advantages and disadvantages, | | | |

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| | | | | | application s of bulk materials (nano structure, nano wires, nano tubes and nano composites), preparation of nano materials and different methods, applications | | | |
| 18ME2109 | Kinematics and Dynamics of Machines | PC | Introduction to the dynamics and vibrations of lumped-parameter models of mechanical systems.Kinematics.Force-momentum formulation for systems of particles and rigid bodies in planar motion.Work-energy concepts.Virtual displacements and virtual work.Lagrange's equations for systems of particles and rigid bodies in planar motion.Linearization of equations of motion.Linear stability analysis of mechanical systems.Free and forced vibration of linear multi-degree of freedom models of mechanical systems; matrix eigenvalue problems. | Mechanisms and Machines: Introduction to Plane and Space Mechanisms, Kinematic Pairs, Kinematic Chains and their Inversions, Mobility and range of movement - Kutzbach and Grubler's criterion, Grashof's criterion.Velocity analysis: Velocity analysis using IC and relative velocity method. Acceleration analysis.<br>Cams: cam profiles of knife edge, roller and offset followers of reciprocating motion.<br>Gears and Gear trains: Gears – terminology, fundamental law of gearing, involute profile. Interferenceand undercutting.Gear Trains – simple, compound and epicyclic gear trains.<br>Balancing: Introduction, Static balancing, dynamic balancing, transferring of a Force from one plane to another, Balancing of Several Masses in Different planes, Balancing of Reciprocating Mass, Secondary Balancing.<br>Dynamic force analysis: Force analysis of Slider crank mechanism.<br>Gyroscopes: Gyroscopic Effect on Naval Ships, Stability of an Automobile, Stability of a Two-Wheel vehicle, Four-Wheeler | Cams: cam profiles of knife edge, roller and offset followers of reciprocating motion.<br>Gears and Gear trains: Gears – terminology, fundamental law of gearing, involute profile. Interferenceand undercutting.Gear Trains – simple, compound and epicyclic gear trains.<br>Balancing: Introduction, Static balancing, dynamic balancing, transferring of a Force from one plane to another, Balancing of Several Masses in Different planes, Balancing of Reciprocating Mass, Secondary Balancing.<br>Dynamic force analysis: Force analysis of Slider | 3 Course outcomes | As per the recommendations of Industry Person Mr..Khadar Basha, a new course has been drafted by combining the Kinematics of Machines and Dynamics of machines | 75% |

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| | | | | | crank mechanism. Gyroscopes: Gyroscopic Effect on Naval Ships, Stability of an Automobile, Stability of a Two-Wheel vehicle, Four-Wheeler | | | |
| 18ME3114 | Machine Design | PC | Advanced study of modeling, design, integration and best practices for use of machine elements such as bearings, bolts, belts, flexures and gears. Modeling and analysis is based upon rigorous application of physics, mathematics, and core mechanical engineering principles, which are reinforced via laboratory experiences and a design project in which students model, design, fabricate, and characterize a mechanical system that is relevant to a real-world application | **Shafts**: Design of solid and hollow shafts for strength and rigidity, Design of shaft for variable load, Design of shafts for gear and belt drives. **Couplings**: Design of Rigid and Flexible Couplings Design of Helical springs, Torsion springs, Spiral springs, Leaf springs. **DESIGN OF FASTENERS** **Welded joints**: Design of Welded joints, Strength of welded joints, Circular fillet welds-bending and torsion, Welded joint with eccentric loading, **Bolted joints**: Design of bolts with pre-stresses - Design for leak Proof Joints – Design ofjoints under eccentric loading - Bolt of uniform strength. **Power Screws**: Types - Mechanics of power screws, Efficiency of Square and Self-locking screw **Belt Drives:** Selection of flat and V-belts from manufacturer's catalogue, Belt tensioning methods, Construction and applications of timing belts. **Chain Drives:** Polygonal effect, Power rating of roller chains, Construction of sprocket wheels. **Bearings:** modes of Lubrication, Sliding contact bearing design, bearing materials, selection of lubricant. Rolling contact bearings- selection of | **Welded joints**: Design of Welded joints, Strength of welded joints, Circular fillet welds- bending and torsion, Welded joint with eccentric loading, **Power Screws**: Types - Mechanics of power screws, Efficiency of Square and Self-locking screw **Belt Drives:** Selection of flat and V-belts from manufacturer's catalogue, Belt tensioning methods, Construction and applications of timing belts. **Chain Drives:** Polygonal effect, Power rating of roller chains, Construction of sprocket wheels. **Brakes:** Analysis and Design of Block brakes, internal shoe Brakes, | 1 Course Outcomes | As per the recommendations of Industry Person Mr..Khadar Basha, a new course has been drafted by adding the new topics required for mechanical engineers | 20% |

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| | | | | ball, roller bearings- under static load, dynamic load.<br>**Brakes:** Analysis and Design of Block brakes, internal shoe Brakes, End shoe Brakes,Pivoted shoe Brakes, Band Brakes, Temperature raise, Friction materials.<br>**Spur Gears:** Force analysis, Beam strength (Lewis) equation, Estimation of module based on beam and wear strength.<br>**Helical Gears:** Transverse and normal module, Estimation of dynamic load by velocity factor and Buckingham's equation, Design of helical gears.<br>**Bevel Gears:** Design criteria of bevel gears, Beam and wear strengths, Dynamic tooth load by velocity factor and Buckingham's equation, Effective load, Design of straight tooth bevel gears, **Worm Gears:** Design and analysis of worm gear drive | End shoe Brakes, Pivoted shoe Brakes, Band Brakes, Temperature raise, Friction materials. | | | |

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## Annexure-5

**Report- Analysis of Feedback on curriculum – received from the stake holders prior to the commencement of the Academic Year 2018-19**

Feedback from different stake holders has been collected in respect of the curriculum offered for the academic year 2017-18

| S. No. | Type of Stake holder | Number of feedback |
|---|---|---|
| 1 | Students | 45 |
| 2 | Parents | 0 |
| 3 | Alumni | 10 |
| 4 | Faculty | 10 |
| 5 | Academic peers | 1 |
| 6 | Industry persons | 4 |
| Total | | 55 |

| S. No. | Recommendations | Action taken |
|---|---|---|
| **Students** | | |
| 1 | Y16 Batch students requested to include vibrations topic as core course for campus placements. | It is resolved to introduce new course on Vibrations and control |
| 2 | Y13 Batch students requested for additional courses, for earning additional credits citing to a shortage of credits while applying for master's program | It is resolved students in such cases are recommended to be given permission to register for additional courses either online (through MOOCs/Coursera etc.) or offline at the university, giving them a chance to augment the required credit limit. Further it is also resolved that the same procedure is applicable for the present students of 2015, 2014 B. Tech admitted batch |
| 3 | To cover the topics of GATE in the curriculum especially materials technology for mechanical engineers, Measurements | Core courses have been modified to suffice the requirement of GATE. |
| **Faculty** | | |
| 4 | Mr. Sreekar Reddy, department placement in charge, recommended to include courses on Basic English, Communication skills & English Proficiency to make students placement | It is resolved to include new courses on Basic English, Communication Skills & English Proficiency in I and II Sem of B. Tech Me Program |

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| | | |
|---|---|---|
| | ready. | |
| 5 | Mr.S.Ramesh Kumar, Assistant Professor, suggested to include courses on technical skills-coding to improve the coding capabilities of students | It is resolved to include technical skilling courses in the B. Tech Curriculum |
| 6 | Faculty handling the "coding skills for engineers" course suggested offering this course as a credited course to bring the seriousness among students towards coding skills | It is resolved that for 2015 admitted batch students, the coding course is considered as one of the two open electives, a credited course with a course code of 15GN2205.It is resolved that for 2016 admitted students, the coding course is considered as one of the three open electives, a credited course with a course code of 17CS1202. It is resolved that for 2017 admitted B.Tech Mechanical Engineering students, coding course with data structures concept will be replacing the existing Data Structures course for the same number of credits(5) and another coding course is to be offered as an open elective. |
| **Academic Peers & Industry Persons** | | |
| 7 | Dr.P. Srinivas Rao, Global training Head, Cyient Technologies, suggested to include courses on Robotics, Instrumentation, and Product Design. | It is resolved to include new courses Robotics, Instrumentation and Product design in the curriculum of B. TechY18 admitted batch students. |
| 8 | Mr. Khadar Basha Abdul, Manager, Rolls Royce suggested to include Kinematic & dynamics of machines. Mechanical Materials, Machine Design | It is resolved to include new courses Kinematics& Dynamics of Machines, Mechanical materials, and Machine design in the curriculum of B. TechY18 admitted batch students |
| 9 | Industry peers and Employers in their feedback recommended "Automobile Engineering" course to be offered to students based on Core Engineering job market and Industry demand | It is resolved to offer automobile Engineering course under automobile specialization |
| 10 | Industry peers suggested some skill-based areas to offer to students keeping in view the current demand in industry for mechanical engineers | It is resolved to offer Skill based Professional electives by mapping those elective courses with the software tool which are currently used in mechanical industries. |

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| | | |
|---|---|---|
| **Alumni** | | |
| 11 | Dr. R. Vijay Kumar, HAL, Banglore suggested to include course on Biology for engineers. | It is resolved to include Biology for Engineers course to B.Tech Y18 admitted batch students. |
| 12 | Foreign language courses should be given importance with credits to become confident enough to work at different places | A Foreign/Non-Native language course with credits to be offered, keeping in view the Alumni feedback, who requested such courses owing to potential jobs abroad, as well as out of the states of AP and TS within India, for Mechanical Engineering graduates |
| **Parents** | | |
| 8 | Parents of Y17 batch students suggested to include Counselling & Co Curricular activities courses in every semester. | It is resolved to offer Co-Curricular activities & counselling course with no credits to Y18 admitted batch students. |

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## Annexure-6

### B.Tech Mechanical Engineering 2017-18 Program Structure

| S.No | Course Code | Course Name | L | T | P | S | Cr | Pre-requisite |
|---|---|---|---|---|---|---|---|---|
| | | **HUMANITIES & SOCIAL SCIENCES** | | | | | | |
| 1 | 17EN1201 | Building Blocks for Communication Skills | 0 | 0 | 4 | 0 | 2 | NIL |
| 2 | 17EN3102 | Instant Communication Skills | 0 | 0 | 4 | 0 | 2 | NIL |
| 3 | 17EN3203 | Corporate Communication Skills | 0 | 0 | 4 | 0 | 2 | NIL |
| 4 | 17MB4057 | Economics for Engineers | 2 | 0 | 0 | 0 | 2 | NIL |
| 5 | 17GN1001 | Ecology And Environment (will be offered Online) | 2 | 0 | 0 | 0 | 2 | NIL |
| 6 | 17UC0010 | Universal Human Values & Professional Ethics | 0 | 0 | 2 | 0 | 1 | NIL |
| | **Total** | | **4** | **0** | **14** | **0** | **11** | |
| | | **AUDIT COURSES** | | | | | | |
| 1 | 17AC1001 | Indian Heritage and Culture | 0 | 0 | 2 | 0 | 0 | NIL |
| 2 | 17AC1002 | Indian Constitution | 0 | 0 | 2 | 0 | 0 | NIL |
| 3 | 17AC1003 | Environment and Sustainability | 2 | 0 | 0 | 0 | 0 | NIL |
| 4 | 17AC1004 | Gender Sensitization | 2 | 0 | 0 | 0 | 0 | NIL |
| | **Total** | | **4** | **0** | **4** | **0** | **0** | |
| | | **BASIC SCIENCES** | | | | | | |
| 1 | 17MT1101 | Single Variable Calculus and Matrix Algebra | 3 | 0 | 2 | 0 | 4 | NIL |
| 2 | 17MT1102 | Foundations of Computational Mathematics | 3 | 0 | 0 | 0 | 3 | NIL |
| 3 | 17MT1203 | Multivariate Calculus | 3 | 1 | 0 | 0 | 4 | NIL |
| 4 | 17MT1204 | Logic and Reasoning | 2 | 0 | 0 | 0 | 2 | NIL |
| 5 | 17MT2012 | Theory of Differential Equations for Engineering and Mechanics | 2 | 0 | 2 | 0 | 3 | NIL |
| 6 | 17PH1001 | Engineering Materials | 3 | 0 | 2 | 0 | 4 | NIL |
| 7 | 17CY1001 | Engineering Chemistry | 3 | 0 | 2 | 0 | 4 | NIL |
| | **Total** | | **19** | **1** | **8** | **0** | **24** | |
| | | **ENGINEERING SCIENCES** | | | | | | |
| 1 | 17CS1101 | Problem Solving through Computer Programming | 2 | 2 | 2 | 0 | 5 | NIL |
| 2 | 17GN1204 | Coding Skills for Engineers | 0 | 0 | 10 | 0 | 5 | 17CS1101 |
| 3 | 17ME1001 | Engineering Mechanics | 3 | 0 | 2 | 0 | 4 | NIL |
| 4 | 17ME1002 | Engineering Graphics and Design | 1 | 0 | 4 | 0 | 3 | NIL |
| 5 | 17ME1003 | Workshop Practice | 0 | 0 | 2 | 0 | 1 | NIL |
| 6 | 17ME1104 | Introduction to Mechanical Engineering | 2 | 0 | 2 | 0 | 3 | NIL |
| 7 | 17GN1003 | Basic Engineering Measurements | 2 | 0 | 2 | 0 | 3 | NIL |
| 8 | 17ME2005 | Computational Thinking and Data Sciences | 2 | 0 | 2 | 0 | 3 | NIL |
| 9 | 17ME2206 | Numerical Computation for Mechanical Engineers | 3 | 0 | 2 | 0 | 4 | NIL |
| 10 | 17EE2205 | Circuits and Electronics | 3 | 0 | 2 | 0 | 4 | NIL |
| | **Total** | | **18** | **2** | **30** | **0** | **35** | |
| | | **PROFESSIONAL CORE COURSES** | | | | | | |
| 1 | 17ME2107 | Machine drawing | 0 | 0 | 4 | 0 | 2 | 17ME1002 |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | 17ME2108 | Thermal-Fluids Engineering-I | 3 | 0 | 2 | 0 | 4 | NIL |
| 3 | 17ME2109 | Mechanics and Materials-I | 3 | 0 | 2 | 0 | 4 | 17ME1001 |
| 4 | 17ME2110 | Dynamics and Control-I | 3 | 0 | 2 | 0 | 4 | 17ME1001 |
| 5 | 17ME2211 | Dynamics and Control-II | 3 | 0 | 2 | 0 | 4 | 17ME2110 |
| 6 | 17ME2212 | Thermal-Fluids Engineering-II | 3 | 0 | 2 | 0 | 4 | 17ME2108 |
| 7 | 17ME2213 | Mechanics and Materials-II | 3 | 0 | 2 | 0 | 4 | 17ME2109 |
| 8 | 17ME3114 | Design and Manufacturing-I | 3 | 0 | 2 | 0 | 4 | 17ME2109 |
| 9 | 17ME3115 | Engineering Management | 3 | 0 | 0 | 0 | 3 | NIL |
| 10 | 17ME3116 | Heat Transfer | 3 | 0 | 2 | 0 | 4 | 17ME2108 |

| S.No | Course Code | Course Name | L | T | P | S | Cr | Pre-requisite |
|---|---|---|---|---|---|---|---|---|
| 11 | 17ME3117 | Finite Element Analysis of Solids and Fluids | 3 | 0 | 2 | 0 | 4 | 17ME2108, 17ME2109 |
| 12 | 17ME3118 | Introduction to Robotics | 3 | 0 | 2 | 0 | 4 | NIL |
| 13 | 17ME3219 | Design and Manufacturing-II | 3 | 0 | 2 | 0 | 4 | 17ME3114 |
| 14 | 17ME3220 | Elements of Mechanical Design | 2 | 0 | 2 | 0 | 3 | 17ME2213 |
| | **Total** | | **38** | **0** | **28** | **0** | **52** | |
| | | **TECHNICAL SKILL COURSES** | | | | | | |
| 1 | 17TS701 | Skilling for Engineers-1 (Manufacturing Technologies) | 0 | 0 | 0 | 8 | 2 | NIL |
| 2 | 17TS702 | Skilling for Engineers-2 (Control Systems for Machines) | 0 | 0 | 0 | 8 | 2 | NIL |
| 3 | 17TS703 | Skilling for Engineers-3 (Problem Solving techniques in Thermal) | 0 | 0 | 0 | 8 | 2 | 17ME2108 |
| 4 | 17TS704 | Skilling for Engineers-4 (Problem Solving techniques in Design) | 0 | 0 | 0 | 8 | 2 | 17ME2213 |
| 5 | 17TS705 | Technical Proficiency & Training-1(Automobile Design and Building) | 0 | 0 | 0 | 4 | 1 | NIL |
| 6 | 17TS706 | Technical Proficiency & Training -2(Robot Design) | 0 | 0 | 0 | 8 | 2 | NIL |
| | **Total** | | **0** | **0** | **0** | **44** | **11** | |
| | | **Counseling & Cocurricular Activities** | | | | | | |
| 1 | 17GN2103 | Counseling -1 | 0 | 0 | 1 | 0 | 0 | NIL |
| 2 | 17GN2204 | Counseling -2 | 0 | 0 | 1 | 0 | 0 | NIL |
| 3 | 17GN3105 | Counseling -3 | 0 | 0 | 1 | 0 | 0 | NIL |
| 4 | 17GN3206 | Counseling -4 | 0 | 0 | 1 | 0 | 0 | NIL |
| 5 | 17GN2109 | Cocurricular Activity -1 | 0 | 0 | 0 | 2 | 0 | NIL |
| 6 | 17GN2210 | Cocurricular Activity -2 | 0 | 0 | 0 | 2 | 0 | NIL |
| 7 | 17GN3111 | Cocurricular Activity -3 | 0 | 0 | 0 | 2 | 0.5 | NIL |
| 8 | 17GN3212 | Cocurricular Activity -4 | 0 | 0 | 0 | 2 | 0.5 | NIL |
| | **Total** | | **0** | **0** | **4** | **8** | **1** | |
| | | **PROFESSIONAL ELECTIVES** | | | | | | |
| 1 | PE | Professional Elective-1 | 2 | 0 | 2 | 0 | 3 | NIL |
| 2 | PE | Professional Elective-2 | 2 | 0 | 2 | 0 | 3 | NIL |
| 3 | PE | Professional Elective-3 | 2 | 0 | 2 | 0 | 3 | NIL |
| 4 | PE | Professional Elective-4 | 2 | 0 | 2 | 0 | 3 | NIL |
| 5 | PE | Professional Elective-5 | 2 | 0 | 2 | 0 | 3 | NIL |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Total** | | **10** | **0** | **10** | **0** | **15** | |
| | | **OPEN ELECTIVES** | | | | | | |
| 1 | OE | Open Elective -1 | 3 | 0 | 0 | 0 | 3 | NIL |
| 2 | OE | Open Elective -2 | 3 | 0 | 0 | 0 | 3 | NIL |
| 3 | OE | Open Elective -3(Foreign Lang.) | 3 | 0 | 0 | 0 | 3 | NIL |
| | **Total** | | **9** | **0** | **0** | **0** | **9** | |
| | | **PROJECT** | | | | | | |
| 1 | 17IE2246 | Industrial Training | 0 | 0 | 0 | 0 | 2 | NIL |
| 2 | 17IE3247 | Term Paper | 0 | 0 | 4 | 0 | 2 | NIL |
| 3 | 17IE4048/ 17IE4050 | Project (Part I) / Practice School | 0 | 0 | 0 | 24 | 6 | NIL |
| 4 | 17IE4049/ 17IE4050/ 17IE4051 | Project (Part II) / Practice School/ Internship | 0 | 0 | 0 | 24 | 6 | NIL |
| | **Total** | | **0** | **0** | **4** | **48** | **16** | |
| | **GRAND TOTAL** | | **102** | **3** | **102** | **100** | **174** | |

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## Annexure-7

## B.Tech Mechanical Engineering 2016-17 Program Structure

| S.No | Course Code | Course Name | L-T-P | Cr | Pre-Req. |
|---|---|---|---|---|---|
| I | | **HUMANITIES & SOCIAL SCIENCES** | | | |
| 1 | 15EN1101 | Rudiments of Communication Skills | 2-0-0 | 2 | NIL |
| 2 | 15EN2103 | Professional Communication Skills | 0-0-4 | 2 | NIL |
| 3 | 15EN1202 | Interpersonal Communication Skills | 2-0-0 | 2 | NIL |
| 4 | 15EN3206 | Corporate Communication Skills | 0-0-4 | 2 | NIL |
| 5 | 16MB4057 | Economics for Engineers | 2-0-0 | 2 | NIL |
| 6 | 16GN1001 | Ecology and Environment | 2-0-0 | 2 | NIL |
| 7 | 15GN1002 | Human Values and Professional Ethics | 2-0-0 | 2 | NIL |
| | | **Credits** | | **14** | |
| II | | **BASIC SCIENCES** | | | |
| 1 | 15MT1001 | Single Variable Calculus and Matrix Algebra | 2-2-2 | 4 | NIL |
| 2 | 15MT1203 | Multivariate Calculus | 2-2-2 | 4 | NIL |
| 3 | 15CY1001 | Engineering Chemistry | 2-2-2 | 4 | NIL |
| 4 | 16MT2002 | Complex Variables And Transforms | 3-0-0 | 3 | NIL |
| 5 | 16MT2104 | Probability and Numerical Methods | 3-1-0 | 4 | NIL |
| | | **Credits** | | **19** | |
| III | | **ENGINEERING SCIENCES** | | | |
| 1 | 15PH1001 | Engineering Materials | 2-2-2 | 4 | NIL |
| 2 | 15CS1101 | C Programming & Data Structures -I | 2-4-2 | 5 | NIL |
| 3 | 15CS1201 | C Programming & Data Structures -II | 2-4-2 | 5 | NIL |
| 4 | 15GN1004 | Introduction to Engineering | 2-0-2 | 3 | NIL |
| 5 | 15ME1001 | Mechanics | 2-2-2 | 4 | NIL |
| 6 | 15ME1002 | Engineering Graphics | 0-0-6 | 3 | NIL |
| 7 | 15GN1003 | Measurements | 0-0-4 | 2 | NIL |
| 8 | 16ME1003 | Thermodynamics | 3-0-2 | 4 | NIL |
| 9 | 15EE2202 | Basics of Electrical and Electronics Engineering | 2-2-2 | 4 | NIL |
| | | **Credits** | | **34** | |
| IV | | **PROFESSIONAL CORE COURSES** | | | |
| 1 | 16ME2106 | Strength of Materials | 3-0-2 | 4 | 15ME1001 |
| 2 | 16ME2104 | Fluid Mechanics & Hydraulic Machines | 3-0-2 | 4 | NIL |
| 3 | 16ME2207 | Machine Drawing | 0-0-4 | 2 | 15ME1002 |
| 4 | 16ME2105 | Metallurgy | 3-0-2 | 4 | 15PH1001 |
| 5 | 16ME2108 | Manufacturing Technology | 3-0-2 | 4 | NIL |
| 6 | 16ME2210 | Kinematics of Machines | 3-0-2 | 4 | 15ME1001 |
| 7 | 16ME2211 | Metal Cutting and Metal Forming | 3-0-0 | 3 | NIL |
| 8 | 16ME2212 | Vapour Power Systems | 3-0-2 | 4 | 16ME1003 |
| 9 | 16ME3114 | Gas Power Systems | 3-0-2 | 4 | 16ME1003 |
| 10 | 16ME3115 | Dynamics of Machines | 3-0-2 | 4 | 16ME2210 |
| 11 | 16ME3116 | Machine Tools & Metrology | 3-0-2 | 4 | NIL |
| 12 | 16ME3117 | Internal Combustion Engines | 3-0-2 | 4 | 16ME1003 |
| 13 | 16ME3118 | Operations Research | 3-2-0 | 4 | NIL |

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| | | | | | |
|---|---|---|---|---|---|
| 14 | 16ME3219 | Robotics | 3-0-0 | 3 | 16ME2210 |
| 15 | 16ME3220 | Heat Transfer | 3-0-2 | 4 | 16ME2104 |
| 16 | 16ME3221 | Design of Machine Elements | 3-2-0 | 4 | 16ME2106 |
| 17 | 16ME3222 | Computer Integrated Manufacturing | 3-0-2 | 4 | 16ME3116 |
| 18 | 16ME3223 | Production and Operations Management | 3-2-0 | 4 | NIL |
| 19 | 16ME4124 | Mechatronics | 3-0-2 | 4 | NIL |
| 20 | 16ME4125 | Design of Transmission Elements | 3-2-0 | 4 | 16ME3221 |
| | | **Credits** | | **76** | |
| | | | | | |
| **V** | **TECHNICAL SKILL COURSES** | | | | |
| 1 | 16TS701 | Problem Solving techniques in Design | 1-0-2 | 2 | NIL |
| 2 | 16TS702 | Problem Solving techniques in Thermal | 1-0-2 | 2 | NIL |
| 3 | 16TS703 | Manufacturing Technologies | 1-0-2 | 2 | NIL |
| 4 | 16TS704 | Control Systems for Machines | 1-0-2 | 2 | NIL |
| | | **Credits** | | 8 | |
| **Counseling & Cocurricular Activities** | | | | | |
| 1 | 16GN3105 | Counseling -1 | 0-0-1 | 0 | NIL |
| 2 | 16GN3206 | Counseling -2 | 0-0-1 | 0 | NIL |
| 3 | 16GN3111 | Cocurricular Activity -1 | 0-0-2 | 0 | NIL |
| 4 | 16GN3212 | Cocurricular Activity -2 | 0-0-2 | 0 | NIL |
| **VI** | **PROFESSIONAL ELECTIVES** | | | | |
| 1 | | Prof. Elective-1 | 2-0-2 | 3 | NIL |
| 2 | | Prof. Elective-2 | 2-0-2 | 3 | NIL |
| 3 | | Prof. Elective-3 | 2-0-2 | 3 | NIL |
| | | **Credits** | | 9 | |
| **VII** | **OPEN ELECTIVES** | | | | |
| 1 | 15GN2205 | Open Elective -1(Coding Skills) | 0-0-10 | 5 | NIL |
| 2 | | Open Elective -2 | 3-0-0 | 3 | NIL |
| 3 | | Foreign Language | 3-0-0 | 3 | NIL |
| | | **Credits** | | **11** | |
| **VIII** | | **PROJECT** | | | |
| 1 | 16IE2246 | Industrial Training | 0-0-4 | 2 | NIL |
| 2 | 16ME3145 | Mini Project | 0-0-4 | 2 | NIL |
| 3 | 16IE3247 | Term Paper | 0-0-4 | 2 | NIL |
| 4 | 16IE4048 | Minor Project | 0-0-4 | 2 | NIL |
| 5 | 16ME4049/16ME4050 | Practice School/PROJECT | 0-0-20 | 10 | NIL |
| | | **Credits** | | **18** | |
| | | **Total Credits** | | **189** | |

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## Annexure-8(a)

## M.Tech – Machine Design 2018-19 Course Structure

| S. No. | Course Code | Course Title | Periods | | | Cr | Retained/Revised/New Course | Suggested by |
|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | | |
| 1 | 18 ME 5117 | Design Methods | 4 | 0 | 0 | 4 | New Course | Faculty-Group heads |
| 2 | 18 ME 5118 | Design with Advanced materials | 3 | 0 | 0 | 3 | New Course | Faculty-Group heads |
| 3 | 18 ME 5119 | Theory of Elasticity and Plasticity | 3 | 1 | 0 | 4 | New Course | Faculty-Group heads |
| 4 | 18 ME 5120 | Modeling & Analysis-1 (CAD) | 4 | 0 | 2 | 5 | New Course | Faculty-Group heads |
| 5 | 18 ME 5221 | Mechanical Vibrations | 3 | 0 | 0 | 3 | New Course | Faculty-Group heads |
| 6 | 18 ME 5222 | Design for Optimization | 3 | 1 | 0 | 4 | New Course | Faculty-Group heads |
| 7 | 18 ME 5223 | Advanced strength of materials | 3 | 1 | 0 | 4 | New Course | Faculty-Group heads |
| 8 | 18 ME 5224 | Modeling & Analysis-2 (FEM) | 4 | 0 | 2 | 5 | New Course | Faculty-Group heads |
| 9 | | Elective-1 | 3 | 0 | 0 | 3 | | |
| 10 | | Elective-2 | 3 | 0 | 0 | 3 | | |
| 11 | | Elective-3 | 3 | 0 | 0 | 3 | | |
| 12 | | Elective-4 | 3 | 0 | 0 | 3 | | |
| 13 | 18 IE 5149 | Seminar | 0 | 0 | 4 | 2 | New Course | Faculty-Group heads |
| 14 | 18 IE 5250 | Term Paper | 0 | 0 | 4 | 2 | New Course | Faculty-Group heads |
| 15 | 21IE6150/ 21IE6250 | Major project | 0 | 0 | 36 | 36 | New Course | Faculty-Group heads |
| | | | 39 | 3 | 48 | 84 | | |

**ELECTIVE COURSES:**

| S.No | Course Code | Course Name | L | T | P | Cr | Retained/Revised/New Course | Suggested by |
|---|---|---|---|---|---|---|---|---|
| Elective – 1 | | | | | | | | |
| 1 | 18 ME 51I1 | Precision and Quality Engineering | 3 | 0 | 0 | 3 | New Course | Faculty-Group heads |
| 2 | 18 ME 51I2 | Advanced Mechanisms | 3 | 0 | 0 | 3 | New Course | Faculty-Group heads |
| 3 | 18 ME 51I3 | Concurrent Engineering | 3 | 0 | 0 | 3 | New Course | Faculty-Group heads |
| Elective – 2 | | | | | | | | |
| 1 | 18 ME 51J1 | Design of Pressure Vessels and Plates | 3 | 0 | 0 | 3 | New Course | Faculty-Group heads |
| 2 | 18 ME 51J2 | Tribological System Design | 3 | 0 | 0 | 3 | New Course | Faculty-Group heads |
| 3 | 18 ME 51J3 | Product Design and Development | 3 | 0 | 0 | 3 | New Course | Faculty-Group heads |
| Elective – 3 | | | | | | | | |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 18 ME 52K1 | Mechanics of Composite Materials | 3 | 0 | 0 | 3 | New Course | Faculty-Group heads |
| 2 | 18 ME 52K2 | Machine Tool Design | 3 | 0 | 0 | 3 | New Course | Faculty-Group heads |
| 3 | 18 ME 52K3 | Fracture Mechanics | 3 | 0 | 0 | 3 | New Course | Faculty-Group heads |
| **Elective – 4** | | | | | | | | |
| 1 | 18 ME 52L1 | Engineering Noise & Control | 3 | 0 | 0 | 3 | New Course | Faculty-Group heads |
| 2 | 18 ME 52L2 | Engineering Failure Analysis and prevention | 3 | 0 | 0 | 3 | New Course | Faculty-Group heads |
| 3 | 18 ME 52L3 | Design for Manufacturing, Assembly and Environment | 3 | 0 | 0 | 3 | New Course | Faculty-Group heads |

**Percentage of Syllabus Revision: (Total No. of New Courses + Total Np. Of Revised Courses)*100/(Total No. of Courses) =(24+0)*100/24=100%**

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## Annexure-8(b)

## M.Tech-MD Syllabus of New Courses

### 18ME5117-DESIGN METHODS

**L-T-P: 4-0-0** **Credits: 4** **Pre-requisite: NIL**

**Mapping of CO-PO table:**

| CO# | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Understand Phases of design and associated requisites | PO2 | 2 |
| CO2 | Understand Types of design and modelling of the problems | PO1 | 3 |
| CO3 | Understand Material and manufacturing considerations | PO2 | 3 |
| CO4 | Understand Reliability of design and quality concepts | PO6 | 3 |

**Syllabus:**

THE DESIGN PROCESS: Morphology of design – Design Drawings – Computer Aided Engineering -Design of Standards – Concurrent Engineering – Product Life Cycle – Technological Forecasting – Market Identification – Competition bench marking – System engineering – Life Cycle Engineering – Human Factors in Design – Industrial Design. DESIGN METHODS: Creativity and Problem Solving – Product Design Specification – Conceptual Design – Decision Theory – Decision Tree – Embodiment Design – Detail Design – Mathematical Modeling – Simulation – Geometric Modeling – Fine Element Modeling – Optimization – Search Methods – Geometric Programming – Structural and shape Optimization. MATERIAL SELECTION PROCESS AND DESIGN: Material Selection Process – Economics – Cost Vs Performance – Weighted Property Index – Value Analysis – Role of Processing in Design – Classification of Manufacturing Process – Design of Manufacture – Design of Assembly – Design for Casting, Forging, Metal Forming, Machining and Welding –Stresses – Fatigue, Fracture and Failure. ENGINEERING STATISTICS AND RELIABLITY Residual: Probability – Distributions – Test of Hypothesis – Design of Experiments – Reliability Theory – Design for Reliability – Reliability Centered Maintenance. LEGAL AND ETHICAL ISSUES IN DESIGN AND QUALITY ENGINEERING: Introduction- the Origin of Laws – Contracts – Liability – Tort Law – Product Liability – Protecting Intellectual Property – Legal and Ethical Domains – Codes of Ethics – Solving Ethical Conflicts – Case Study. Total Quality Concept – Quality Assurance – Statistics Processes Control – Taguchi Methods – Robust Design – Failure Model Effect Analysis.

**Textbooks**

1. Dieter, George E, Engineering Design – "A Material and Processing Approach" McGrawHill, International Editions, Singapore, 2000.
2. Karl T. Ulrich and Steven D. Eppinger "Product Design and Development" McGraw HillEdition 2000.

**Reference books:**

1. Pahl, G, and Betiz, W.," Engineering Design", Springer – Verlag, NY 1984.
2. Ray, MS, "Elements of Engg. Design", Prentice Hall Inc. 1985.
3. Suh, N.P., "The Principles of Design", Oxford University Press, NY 1990.

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## 18ME5118-DESIGN WITH ADVANCED MATERIALS

**L-T-P: 3-0-0** **Credits: 3** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO # | Course outcome | PO/PSO | BT L |
|---|---|---|---|
| CO 1 | Understand the properties of Ferrous and Nonferrous materials for suitable applications. | PO1,PO5 | 2 |
| CO 2 | Understand mechanical behavior of the polymer materials and ceramics for engineering applications. | PO1,PO5 | 2 |
| CO 3 | Design composites, functionally graded materials and smart materials for advanced applications. | PO1,PO5 | 5 |
| CO 4 | Design with intermetallic, super alloys and Nano materials to develop a suitable product. | PO1,PO5 | 5 |

**Syllabus:**

FERROUS MATERIALS AND ALLOYS: Aluminum: Wrought and cast aluminum alloys- Properties. Copper: Propertied of wrought copper alloys and copper alloy casting. Selection and application of copper alloys. Zinc and Tin: Properties, selection, and application. **PLASTICS:** General properties of plastic: Introduction, Polymeric materials to designer and selection of Plastics. Plastic additives, Mechanical behavior of plastic. **COMPOSITES:** Introduction; conventional engineering materials, what are composites? Function of fiber and matrix special features, drawbacks, procession, product fabrication, application. **INTERMETALLIC:** Properties and application of titanium aluminides, Nickel aluminides, Iron Luminides, Beryllides and silicides. **SUPER ALLOYS:** Properties, Selection and Engineering application of Nickel based super alloy, cobalt based super alloy and iron based super alloy. **CERAMICS:** Oxides surfaces, Ceramic forming and metal ceramic interface.

TEXT BOOK:

1. Engineering materials, properties and selection- Ken Budinski and Michael K.Budinski, Prentice Hall.

REFERENCE BOOK:

1. Material selection in machine design- Michael Ash by Butterworth- Heinemann.
2. Material selection and application in Machanical Engineering – Dr. A. Raman, Industrial Press Inc.
3. Selection and use of Engineering Materials – F.A.A. Crane, J.A.Charles and JustinFurness, Butterworth – Heinemann.

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## 18ME5119-THEORY OF ELASTICITY AND PLASTICITY

**L-T-P: 3-1-0** **Credits: 4** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO# | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Understand the significance of compatibility and equilibrium equations. Evaluation of factor of safety against yielding in multi-axial stress state. | PO1 | 4 |
| CO2 | Solve 2-D elasticity problems in Cartesian and Polar coordinate systems | PO2 | 4 |
| CO3 | Analyze the bending of cantilever beams having rectangular and circular cross- sections; Axisymmetric stress and deformation in a solid of revolution; and simple 3-D stress analysis problems | PO1 | 4 |
| CO4 | Understand the plastic deformation and plastic yielding. Solving problems using the characteristic methods and engineering methods. | PO1 | 4 |

**Syllabus:**

**ELASTICITY:** Two dimensional stress analysis - Plane stress - Plane strain – Equations of compatibility - Stress function - Boundary conditions. **PROBLEM IN RECTANGULAR COORDINATES** - Solution by polynomials - Saint Venent'sprinciples - Determination of displacement - Simple beam problems. **PROBLEMS IN POLAR COORDINATES** - General equations in polar coordinates – Stress distribution symmetrical about axis - Strain components in polar coordinates - Simple andsymmetric problems. **ANALYSIS OF STRESS AND STRAIN IN THREE DIMENSIONS:** Principal stresses -Homogeneous deformations - Strain spherical and deviatoric stress - Hydrostatic strain. **General theorems:** Differential equations of equilibrium and compatibility - Displacement - Uniqueness of solution - Reciprocal theorem. **BENDING OF PRISMATIC BARS:** Stress function - Bending of cantilever beam - Beam of rectangular cross-section - Beams of circular cross-section. **PLASTICITY:** Plastic deformation of metals - Structure of metals - Deformation - Creep stress relaxation of deformation - Strain rate condition of constant maximum shear stress - Condition of constant strain energy - Approximate equation of plasticity. **METHODS OF SOLVING PRACTICAL PROBLEMS:** The characteristic method – Engineering method - Compression of metal under press - Theoretical and experimental data drawing.

REFERENCE BOOKS:

1. Theory of Elasticity/Timoshenko S.P. and Goodier J.N./Koakusha Publishers
2. An Engineering Theory of Plasticity/E.P. Unksov/Butterworths
3. Applied Elasticity/W.T. Wang/TMH
4. Theory of Plasticity for Engineers/Hoffman and Sacks/TMH
5. Theory of Elasticity and Plasticity/Sadhu Singh/ Khanna Publishers
6. Theory of Elasticity and Plasticity/Harold Malcolm Westergaard/Harvard University Press

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## 18ME5120-MODELING AND ANLALYSIS – I (CAD)

**L-T-P: 4-0-2** **Credits: 5** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO# | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | To understand various evaluation criteria for CAD/CAM system and need of graphics standard. | PO4 | 3 |
| CO2 | To represent different curves and surfaces of geometric models mathematically. | PO1,PO2 | 3 |
| CO3 | To represent solid models using different solid represent schemes | PO1,PO2 | 3 |
| CO4 | To recognize and apply various data exchange formats in geometric modeling and also will be able to apply finite element modeling and mechanical assembly concepts in design applications | PO1,PO3 | 3 |
| CO5 | To apply concepts of geometric modeling in designing using CAD tools | PO4 | 4 |

**Syllabus:**

CAD TOOLS: Definition of CAD Tools, Types of System, CAD/CAM system evaluation criteria, brief treatment of input an output devices. Graphics standards, functional areas of CAD, Modeling and Viewing, Software documentation efficient use of CAD Software. GEOMETRIC MODELING: Types of Mathematical representation of curves, wire frame models, wire frame entities, parametric representation of synthetic curves hermit cubic splines, Bezier curves, B-Splines rational curves. SURFACE MODELING: Mathematical representation surfaces, surface model, surface entities, surface representation, parametric representation of surfaces, plane surface, rule surface, surface of revolution, tabular cylinder. PARAMETRIC REPRESENTATION OF SYNTHETIC SURFACES: Hermit Bi-Cubic surface, Bezier curve surface, B- Spline surface, COONs, Blending Surface, Sculptured surface, Surface Manipulation- Displaying, segmentation, trimming, intersection, Transformations (2D and 3D). GEOMETRIC MODELING 3D: Solid modeling, solid representation, Boundary Representation (B-Rep), Constructive Solid Geometry. CAD/CAM DATA EXCHANGE: Evaluation of data – Exchange format, IGES Data representations and structure, STEPArchitecture, Implementation, ACIS and DXF. DESIGN APPLICATIONS: Finite Element Modeling and Analysis and Mechanical Assembly. COLLABORATIVE ENGINEERING: Collaborative Design, Principles, Approaches, tools, designs system.

**Reference books:**

1. CAD/CAM Theory and Practice/Ibrhim Zeid/Mc Graw Hill International.
2. MASTERING CAD/CAM / Ibrahim Zeid / Mc Graw Hill International.
3. CAD/CAM PN Rao / TMH.
4. CAD/CAM Principles, Practice and Manufacturing Management / Chris Mc. Mohan,Jimmie Browne / Pearson edu. (LPE)
5. Concurrent Engineering Fundamentals: Integrated Product Development/ Prasad /Prentice Hall.

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6. Successful implementation of concurrent Product and Process/Sammy G Sinha/Wiley John and Sons Inc.

## 18M5221- MECHANICAL VIBRATIONS

**L-T-P: 3-0-0** **Credits: 3** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO # | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO 1 | Analyze the behavior of single degree of freedom undamped and damped free vibrations using basic principles. | PO1,PO2 | 4 |
| CO 2 | Analyze the behavior of single degree of freedom damped forced vibrations using basic principles | PO1,PO2 | 4 |
| CO 3 | Analyze the behavior of two degree of freedom and multi-degree of freedom vibrations for frequencies and amplitudes. | PO1,PO2 | 4 |
| CO 4 | Analyze the the shafts for critical speeds as well as analysis of transient vibrations based on laplace transform approach. | PO1,PO2 | 4 |

**Syllabus: Review of Mechanical Vibrations:** Basic concepts; Free vibration of single degree offreedom systems with and without damping, Forced vibration of single DOF-systems. Force and motion isolation. Two DOF-system: natural frequency. **Transient Vibration of single Degree-of freedom systems:** Impulse excitation, arbitrary excitation, Laplace transforms formulation, Pulse excitation and rise time, Shock response spectrum, Shock isolation, Finite difference numerical computation. **Non Linear Vibrations:** Introduction, Sources of nonlinearity, Qualitative analysis of nonlinear systems. Phase plane, Conservative systems, Stability of equilibrium, Method of isoclines, Perturbation method, Method of iteration, Self-excited oscillations. **Random Vibrations:** Random phenomena, Time averaging and expected value, Frequency response function, Probability distribution, Correlation, Power spectrum and power spectral density, Fourier transforms, FTs and response. **Continuous Systems:** Vibrating string, Longitudinal vibration of rods, Torsional vibration of rods, Suspension bridge as continuous system, Euler equation for beams, Vibration of membranes. **Vibration Control:** Introduction, Vibration isolation theory, Vibration isolation theory for harmonic excitation, practical aspects of vibration analysis, shock isolation, Dynamic vibration absorbers, and Vibration dampers. **Modal analysis & Condition Monitoring:** Dynamic Testing of machines and Structures, Experimental Modal analysis, Machine Condition monitoring and diagnosis.

**Textbooks:**

1. Theory of Vibration with Application, - William T. Thomson, Marie Dillon Dahleh,Chandramouli Padmanabhan, 5th edition Pearson Education.
2. Fundamentals of Mechanical Vibration. - S. Graham Kelly. 2nd edition McGrawHill.
3. Mechanical Vibrations, - S. S. Rao., 4th edition Pearson Education.

**Reference Books:**

1. Mechanical Vibrations - S. Graham Kelly, Schaum's Outlines, Tata McGraw Hill,2007

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## 18ME5222-DESIGN FOR OPTIMIZATION

**L-T-P: 3-1-0** **Credits: 4** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO # | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO 1 | Understanding the basic principles of optimizations and applying various design constraints for solving optimization problems. | PO2 | 2 |
| CO 2 | Applying various optimization techniques for solving real time applications through Matlab and Python programming. | PO3,PO 4 | 3 |
| CO 3 | Designing of various structural applications by considering static conditions. | PO3,PO 5 | 5 |
| CO 4 | Designing of various structural applications by considering dynamic conditions. | PO1 | 5 |

Syllabus:

INTRODUCTION: General Characteristics of mechanical elements, adequate and optimum design, principles of optimization, formulation of objective function, design constraints- Classification of Optimization problem. OPTIMIZATION TECHNIQUES:Single variable and multivariable optimization, techniques of unconstrained minimization- Golden selection, Random, Patter and Gradient search methods- interpolation methods, Optimization with equality and inequality constraints. Single variable and multivariable optimization, techniques of unconstrained minimization- Golden selection, Random, Patter and Gradient search methods- interpolation methods, Optimization with equality and inequality constraints. MULTI OBJECTIVE OPTIMIZATION: Direct methods – Indirect methods using penalty functions, Lagrange multipliers, Geometric programming and stochastic programming, multi objective optimization, Genetic algorithms and stimulated Annealing techniques. STATIC APPLICATION: Structural applications – Design of simple truss members, Design applications – Design of simple axial, transvers loaded members for minimum cost, maximum weight- Design of shafts and torsion ally loaded members- Design of springs. DYNAMIC APPLICATION

: Dynamic applications- Optimum design of single, two degree of freedom systems, vibration absorbers. Application in mechanisms – Optimum design of simple linkage mechanisms.

**Text Books:**

1. Sigeresus S.Rao "Engineering Optimization – Theory and Practice" New age Intl.Ltd., Published, 2000.

**Reference books:**

1. Johnson Ray. C., "Optimum Design of mechanical elements", Wiely, John &sons,1990.
2. Goldberg. D.E., "Genetic algorithms in search optimization and machines", Barnen,Addison Wesley, New York, 1989.

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3. Kalyanamoy Deb, "Optimization for Engineering Design algorithm and Examples",Prentice Hall of India Pvt. 1995.

## 18ME5223-ADVANCED STRENGTH OF MATERIALS

**L-T-P: 3-1-0** **Credits: 4** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO # | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO 1 | Analyse the stresses and deflections in the beams under unsymmetrical bending and determination of shear centre. | PO2 | 4 |
| CO 2 | Analyse the stresses induced in curved beams subjected to loading. | PO1,PO2 | 4 |
| CO 3 | Analyse the torsional stresses in beams and determine the contact stresses. | PO1,PO2 | 4 |
| CO 4 | Apply principles of elasticity to determine stresses in two-dimensional and three dimensional problems. | PO2 | 4 |

**Syllabus:**

SHEAR CENTER: Bending axis and shear center- shear center of axisymmetric and unsymmetrical sections. UNSYMMETRICAL BENDING: Bending stress in beams subjected to non-symmetrical bending, deflection of straight beams due to non-symmetrical bending. CURVED BEAM THEORY: Winkler Bach formula for circumferential stress- limitation – correct factors- radial stress in curved beams – closed ring subjected to concentrated and uniform loads- stress in chain links. Torsion: Linear elastic solution, Pradtl elastic membrane (Soap-Film) Analogue, Narrow rectangular cross section, Hollow thin wall torsion members, multiply connected cross section. CONTACT STRESS:

Introduction, problem of determining contact stresses, assumptions on which a solution for contact stresses is based, expression for principal stresses, method of computing contact stresses, deflections of bodies in point contact, stresses for two bodies in contact over narrow rectangular area (Line of contact). Loads normal to area, stressed for two bodies in line contact normal and tangent to contacts area. **TWO DIMENSIONAL ELASTICITY PROBLEMS:** Plane stress and plain strain – problems in rectangular Coordinates bending of cantilever beam loaded at the end, bending of a beam by uniform load. **TWO DIMENSIONAL ELASTICITY PROBLEMS:** In polar coordinates, general equations in polar coordinates, stress distribution symmetrical about the axis, pure bending of curved bars, and displacements for symmetrical stress distributions, rotating discs. **INTRODUCTION TO THREE DIMENSIONAL PROBLEMS:** Uniform stress stretching of a prismatic bar by its own weight, twist of circular shafts of constant cross section, pure bending of plates.

**Reference books:**

1. Advanced Mechanics of materials by Boresi and Sidebottom- Wiely International.

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2. Theory of Elasticity by Timoschenko S.P. and Goodier J.N Mc Grawhill Publishers.
3. Advanced strength of material by Den Hortog J.P..
4. Theory of plates- Timoshenko.
5. Strength of Materials and Theory of Structures (Vol I&II) by B.C Punmai.

## 18ME5224-MODELING AND ANALYSIS- 2 (ADVANCED FEM)

**L-T-P: 4-0-2** **Credits: 5** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO# | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Apply finite element method to solve problems in Bending of plates and shells and Conforming and Non- Conforming elements. | PO3 | 3 |
| CO2 | Formulate and solve the Non Linear problems in - Elasto Plasticity and Large displacement formulation. | PO3,PO4 | 3 |
| CO3 | Formulate the Dynamic Problems problems in free, transient, and forced vibration. | PO3,PO5 | 4 |
| CO4 | Interpret and evaluate the quality of fluid mechanics and heat transfer and error estimates and adaptive refinement. | PO1 | 4 |
| CO5 | Gain hands on experience in converting a given structure into desired shape and size by applying suitable ANSYS APDL software. | PO6 | 4 |

**Syllabus: BENDING OF PLATES AND SHELLS: Review** of Elasticity equation – Bending of plates and shells – Finite Element formulation of plates and shell elements – Conforming and Non-Conforming elements- $C_0$ and $C_1$ Continuity elements – application and examples. **NON-LINEAR PROBLEM:** Introduction- Iterative Techniques – Material Non- Linearity – Elasto Plasticity – Plasticity – Viscos Plasticity – Geometric Nonlinearity – Large displacement formulation – application in metal forming process and contact problems. **DYNAMIC PROBLEMS:** Direct formulation- free, transient, and forced response – Solution procedures- Subspace iterative Techniques – Houbot, Wilson, Newmark – Methods – Examples. **FLUID MECHANICS AND HEAT TRANSFER:** Governing equations of fluid mechanics – in viscid and incompressible flow – Potential formulations – Slow Non- Newtonian Fluid Flow – Metal and Polymer forming – Navier stocks equation – Steady and Transient solution. **ERROR ESTIMATES AND ADAPTIVE REFINEMENT:** Error norms and convergence rates- N Refinement with adaptively – Adaptive refinement.

**Textbooks:**

1. Zienkiewicz, O.C. and Taylor, R.L., "The Finite Element Method", Fourth Edition,Volume I and 2, McGraw Hill International Edition, Physics services, 1991.

**Reference books:**

1. Cook R.D., "Concept and Applications of Finite Element Analysis:, John Wiely andSons Inc., New York 1989.

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2. Bathe K.J., "Finite Element Procedure in Engineering Analysis", Prentice Hall, 1990.

## 18ME51I1-PRECISION AND QUALITY ENGINEERING

**L-T-P: 3-0-0** **Credits: 3** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO# | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Understand and apply the measuring tools to machines and instruments. | PO3 | 3 |
| CO2 | Understand the different methods and solve the problems of Quality control. | PO3 | 3 |
| CO3 | Relate the Quality and Reliability and it's associated failure modes. | PO3 | 3 |
| CO4 | Understand and implement the ISO 9000 series of total quality management. | PO3 | 3 |

**Syllabus: INTRODUCTION:** Importance of Precision Engineering, Tolerance and Technology, Definition of Tolerance, Impact of specifying Tolerance. **MEASUREMENT OF PRECISION:** Application of displacement transducers to machines and instruments, introduction to Precision Machine Design, Principles of Precision of Machine Design, Principle of Accuracy, Repeatability and resolution. **INTRODUCTION TO QUALITY:** Quality of design, Quality of Conformance to Design, Quality of Performance, Growth of Quality Control, Process Monitoring, Acceptance Sampling, Quality of Performance Reliability, Management of Quality, Quality and Productivity. **FUNDAMENTAL OF STATISTICS AND PROBABILITY IN QUALITY CONTROL:** Events and Probability, Laws of Probability, Distribution and Frequency, Binomial Distribution, Normal Distribution, Poisson's Distribution, Exponential and Weibull and Distribution, Random Experiments, Probability, Random Variable, Distribution Functions, Discrete Distributions, Continuous Distribution, Uniform Distribution, Numerical Characteristics of Random Variables. **STATISTICAL QUALITY CONTROL:** Variability in Materials, Machines and people, Statistical Understanding of Variability, Basicform of control chart, use of Control charts, Development of a Control Chart, Control charts for Variable and attributes. **BASIC CONCEPT OF RELIABILITY:** Introduction, Reliability and Quality, Failures and Failure Modes, Causes of Failures and Un reliability, maintainability and Availability, History of Reliability, Reliability literature. **TOTAL QUALITY MANAGEMENT:** Objectives of TQM, Management in TQM, Implementation of TQM. I.S.O 9000 Series. Introduction Characteristics, Area covered in ISO 9000

**Text Books:**

1. Basics of precision Engineering., Richard Leach, Stuart T. Smith., CRC Press
2. Quality Engineering-Integrating Statistical and management Method of Quality Engineering., K.S.KrishanMoorthi, V.Ram Krishnamurthi, Arun Pennathur., CRC press

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## 18ME51I2-ADVANCED MECHANISMS

**L-T-P: 3-0-0** **Credits: 3** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO# | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Develop the concepts of different types of mechanism with the mobility and motion parameters along with their application in kinematic analysis | P02 | 4 |
| CO2 | Analyze the coupler motion of links by analytical and graphical method. | P03,P04 | 4 |
| CO3 | Apply different method to evaluate the path generation of four bar Mechanism. | P03,P04 | 3 |
| CO4 | Analyze the Kinematic mechanism using ADAMs and different application of ROBOT by D-H notation by contrast with forward and inverse kinematics | P03 | 4 |

**Syllabus: Introduction:** Elements of Mechanisms; Mobility Criterion for Planar mechanisms and manipulators; Mobility Criterion for spatial mechanisms and manipulators. Spherical mechanisms-spherical trigonometry.

**Advanced Kinematics of plane motion- I:** The Inflection circle ; Euler – Savary Equation; analytical and graphical determination of di ; Bobillier's Construction; collineastion axis ; Hartmann's Construction ;Inflection circle for the relative motion of two moving planes; Application of the Inflection circle to kinematic analysis**Advanced Kinematics of plane motion - II:** Polode curvature; Hall's Equation; Polode curvature in the four bar mechanism; coupler motion; relative motion of the output and input links; Determination of the output angular acceleration and its Rate of change; Freudenstein's collineation –axis theorem; Carter – Hall circle; The circling – point curve for the Coupler of of a four bar mechanism. **Introduction to Synthesis-Graphical Methods - I:** The Four bar linkage; Guiding a body through Two distinct positions; Guiding a body through Three distinct positions; TheRotocenter triangle; Guiding a body through Four distinct positions; Burmester's curve. **Introduction to Synthesis-Graphical Methods - II:** Function generation-Generaldiscussion; Function generation: Relative– Rotocenter method, Overlay's method, Function generation- Velocity – pole method; Path generation: Hrones's and Nelson's motion Atlas, Roberts's theorem. **Introduction to Synthesis - Analytical Methods:** Function Generation: Freudenstien's equation, Precision point approximation, Precision – derivative approximation; Path Generation: Synthesis of Fourbar Mechanisms for specified instantaneous condition; Method of components; Synthesis of Four-bar Mechanisms for prescribed extreme values of the angular velocity of driven link; Method of components. **Manipulator kinematics – I:** D-H notation, D-H convention of assignment of co-ordinate frames and link parameters table; D-H transformation matrix; Direct and Inverse kinematic analysis of Serial manipulators: Articulated, spherical & industrial robot manipulators- PUMA, SCARA, STANFORD ARM, MICROBOT. **Manipulator kinematics – II:** Differential kinematics Formulation of Jacobian for planarserial manipulators and spherical manipulators; Singularity analysis.

**Textbooks:**

1. Jeremy Hirschhorn, Kinematics and Dynamics of plane mechanisms, McGraw-Hill,1962.

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2. L.Sciavicco and B.Siciliano, Modelling and control of Robot manipulators,Secondedition, Springer - Verlag,London,2000.
3. Amitabh Ghosh and Ashok Kumar Mallik, Theory of Mechanisms and Machines.E.W.P.Publishers.

**Reference Books:**

1. Allen S.Hall Jr., Kinematics and Linkage Design, PHI,1964.
2. J.E Shigley and J.J . Uicker Jr., Theory of Machines and Mechanisms, McGraw-Hill,1995.
3. Mohsen Shahinpoor, A Robot Engineering Text book,Harper & Row Publishers, NewYork,1987.

## 18ME5113-CONCURRENT ENGINEERING

**L-T-P: 3-0-0** **Credits: 3** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO# | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Understand the benefits of Concurrent Engineering and solve the relevant problems. | PO3 | 3 |
| CO2 | Understand the concurrent engineering organization and its Philosophies. | PO3 | 2 |
| CO3 | Understand the System engineering and its Complexity | PO3 | 2 |
| CO4 | Understand the Conventional Design and Development Process. | PO3 | 2 |

**Syllabus: Concurrent Engineering Definitions:** Introduction. Basic Principles of CE. Components of CE. Concurrency and Simultaneity. Modes of Concurrency. Modes of Cooperation. Benefits of Concurrent Engineering. References. Test Problems: CE Definitions. **Cooperative Work Teams:** Introduction. Cooperative Concurrent Teams. Program Organization. Supplier Rationalization. Types of CE Organization. Management Styles or Philosophies. Workplace Organization and Visual Control. Employee Excellence Development (New Technologies and Team Capabilities). References. Test Problems: Cooperative Work Teams. **System Engineering:** Introduction. An Automobile Manufacturing Process. System Engineering. Systems Thinking. Approaches to System Complexity. Sharing and Collaboration in CE 300. System Integration. Management and Reporting Structure. Agile Virtual Company. References. Test Problems: System Engineering. **Information Modeling- Introduction:** Information Modeling. Modeling Methodology. Foundation of Information Modeling. Concurrent Engineering Process Invariant. Enterprise Model-Class. Specification Model-Class. Product Model-Class. Process Model- Class. Cognitive Models. Merits and Demerits. Summary. References. Test Problems: Information Modeling. **The Whole System:** Introduction. Conventional Design and Development Process. A Transformation Model for a Manufacturing System. CE Enterprise System Taxonomy. Integrated Product and Process Development. Transformation System for Product Realization. Key Dimensions of a CE Specification Set. Artifact's Intent Definitions. References. Test Problems: The Whole System.

REFERENCES:

1. Biren Prasad – "Concurrent Engineering Fundamentals: Integrated Product andProcess Organization" Volume I - Prentice Hall, 1996.

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## 18ME51J1-DESIGN OF PRESSURE VESSELS AND PLATES

**L-T-P: 3-0-0** **Credits: 3** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO # | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO 1 | Analyze stresses in cylindrical shells and its components | P01 | 4 |
| CO 2 | Design pressure vessel under various pressure loads | P01,P03 | 4 |
| CO 3 | Formulate basic equations for bending of plate | P01,P05 | 4 |
| CO 4 | Analyze bending of circular plate | P01,P03 | 4 |

**Syllabus: INTRODUCTION**: Methods for determining stresses – Terminology and Ligament Efficiency – Applications. STRESSES IN PRESSURE VESSELS: Introduction – Stresses in a circular ring, cylinder – Membrane stress Analysis of Vessel Shell components – Cylindrical shells, spherical Heads, conical heads – Thermal Stresses – Discontinuity stresses in pressure vessels. DESIGN OF VESSELS: Design of Tall cylindrical self-supporting process columns – supports for short vertical vessels – stress concentration – at a variable Thickness transition section in a cylindrical vessel, about a circular hole, elliptical openings. Theory of Reinforcement – pressure vessel Design. BASIC EQUATIONS OF THIN PLATE THEORY: Introduction-assumptions-slopes and curvatures of bent plate-strain curvature relations- moment curvature relations- equilibrium equations-rectangular plate, circular plate-boundary conditions- rectangular plate, circular plate-summery of basic equations-basic equations in Cartesian coordinate system-basic equations in polar co-ordinate system. Bending of plates: Introduction-pure bending and cylindrical bending of rectangular plates-navier solution for anall-round simply supported rectangular plate-levy solution for rectangular plates- Method of superposition for the analysis of rectangular plates with arbitrary boundary conditions. BENDING OF CIRCULAR PLATES: Circular plates subjected to an arbitrary load- Symmetric bending of circular plates, circular plate subjected to asymmetric load.

TEXT BOOKS

1. John F. Harvey, Theory and Design of Pressure Vessels, CBS Publishers andDistributors, 1987.
2. K Chandrashekara, "Theory of plates", University Press, 2001

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1. Henry H. Bedner, "Pressure Vessels, Design Handbook, CBS publishers andDistributors, 1987.
2. Stanley, M. Wales, "Chemical process equipment, selection and Design. Butterworthseries in Chemical Engineering, 1988.
3. William. J., Bees, "Approximate Methods in the Design and Analysis of PressureVessels and Piping", Pre ASME-Pressure Vessels and Piping Conference, 1997.
4. Timoshenko S.P. and Goodier J.N, "Theory of elasticity" McGraw-Hill Publishers
5. Timoshenko S, " Theory Of Plates And Shells" McGraw-Hill Publishers.

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## 18ME51J2-TRIBOLOGICAL SYSTEM DESIGN

**L-T-P: 3-0-0** **Credits: 3** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO# | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Understand the surface wear and its treatment. | PO3 | 2 |
| CO2 | Analyze the lubricant flow and delivery in different bearings. | PO3 | 4 |
| CO3 | Understand the rolling bearings and its failure criterion. | PO3 | 2 |
| CO4 | Understand the tools to measure the bearing performance. | PO3 | 2 |

**Syllabus: SURFACES, FRICTION AND WEAR:** Topography of Surfaces – Surface features – Surface interaction – Theory of Friction – Sliding and Rolling Friction, Friction properties of metallic and non-metallic materials – friction in extreme conditions – wear, types of wear – mechanism of wear – wear resistance materials – surface treatment – Surface modifications – surface coatings. **LUBRICATION THEORY:** Lubricants and their physical properties lubricants standards – Lubrication Regimes Hydrodynamic lubrication – Reynolds Equation, Thermal, inertia and turbulent effects – Elasto hydrodynamic and plasto hydrodynamic and magneto hydrodynamic lubrication – Hydro static lubrication – Gas lubrication. **DESIGN OF FLUID FILM BEARINGS:** Design and performance analysis of thrust and journal bearings – Full, partial, fixed and pivoted journal bearings design – lubricant flow and delivery – power loss, Heat and temperature rotating loads and dynamic loads in journal bearings – special bearings – Hydrostatic Bearing design. **ROLLING ELEMENT BEARINGS:** Geometry and kinematics – Materials and manufacturing processes – contact stresses – Hertzian stress equation – Load divisions – Stresses and deflection – Axial loads androtational effects, bearing life capacity and variable loads – ISO standards – Oil films and their effects – Rolling Bearings Failures. **TRIBO MEASUREMENT INSTRUMENTATION:** Surface Topography measurements – Electron microscope and friction and wear measurements – Laser method – instrumentation - International standards – bearings performance measurements – bearing vibration measurement.

REFERENCES:

1. Cameron, A. "Basic Lubrication Theory", Ellis Herward Ltd., OK, 1981
2. Hulling, J. (Editor) – "Principles of Tribology ", Macmillian – 1984.
3. Williams J.A. " Engineering Tribology", Oxford Univ. Press, 1994.
4. Neale, M.J. "Tribology Hand Book", Butterworth Heinemann, 1995.

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## 18ME51J3-PRODUCT DESIGN & DEVELOPMENT

**L-T-P: 3-0-0** **Credits: 3** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO# | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Understand the Product lifecycle management. | PO3 | 2 |
| CO2 | Understand the product design and development. | PO3 | 2 |
| CO3 | Understand the customer needs to establish the engineering specifications. | PO3 | 2 |
| CO4 | Understand and apply the rapid prototyping technique. | PO3 | 3 |

**Syllabus: COLLABORATIVE PRODUCT DESIGN:** Productlifecycle management-concepts,benefits, value addition to customer. Lifecycle models-creation of projects and roles, usersand project management, system administration, access control and its use in life cycle.Product development process and functions. Data transfer. Variants of e-commerce. Multisystem information sharing. Workgroup collaboration. Development of standardclassification for components and suppliers. Model assembly process-link product and operational information. Customization factors-creation of business objects, user interfaces, search facile ties as designed by the enterprise. Software- PDM/PLM and their comparison. **PRODUCT DEVELOPMENT:** Quality function deployment-quality project approach and the problem solving process. Design creativity-innovations in design alternatives. Concurrent engineering, industrial design principles. Product development versus design, types of designand redesign, modern production development process, reverse engineering and redesign product development process, examples of product development process, scoping product development – S-curve, new product development. **UNDERSTANDING CUSTOMER NEEDS:** Gathering customer needs, organizing and prioritizing customer needs, establishing product function, FAST method, establishing system functionality. **PRODUCT TEAR DOWN AND EXPERIMENTATION:** Tear down method, post teardown report, benchmarking and establishing engineering specifications, product portfolios. GENERATING CONCEPTS: Information gathering, brain ball, C-sketch/6-3-5 method, morphological analysis, concept selection, technical feasibility, ranking, measurement theory, DFMA, design for robustness. PHYSICAL PROTOTYPES: Types of prototypes, use of prototypes, rapid prototyping technique scale, dimensional analysis and similitude, physical model and experimentation- design of experiments, statistical analysis of experiments.

REFERENCE BOOKS:

1. John W Gosnay and Christine M Mears, Business Intelligence with Cold Fusion, Prentice Hall India, New Delhi, 2000.
2. David S Linthicum, "B2B Application Integration", Addison Wesley, Boston, 2001.
3. Alexis Leon,Enterprise Resource Planning, Tata McGraw Hill, New Delhi, 2002.
4. David Ferry and Larry Whipple,Building and Intelligent e-business, PrimaPublishing, EEE Edition, California, 2000.
5. David Bedworth, Mark Hederson and Phillip Wolfe, Computer Integrated Design andManufacturing, McGraw Hill Inc., New York, 1991.
6. Kevin Otto and Kristin Wood, Product Design – Techniques in Reverse Engineeringand New Product Development, Pearson Education, New Delhi.
7. Karl T Ulrich and Stephen D Eppinger, Product Design and Development, McGrawHill, New York, 1994.

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## 18ME52K1-MECHANICS OF COMPOSITE MATERIALS

**L-T-P: 3-0-0** **Credits: 3** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO # | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO 1 | Understand the micromechanics of Composites. | PO3 | 2 |
| CO 2 | Understand the mechanical properties of composites and its characterization. | PO3 | 2 |
| CO 3 | Understand the Macro-mechanics of Composite lamina. | PO3 | 2 |
| CO 4 | Understand the strength of Unidirectional lamina and apply the failure theories to determine the strength of composite lamina. | PO3 | 3 |

**Syllabus: Basic concepts and characteristics:** Geometric and Physical definitions, natural and man-made composites, Aerospace and structural applications, types and classification of composites, **Reinforcements:** Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites. **Micromechanics:** Unidirectional composites, constituent materials and properties, elastic properties of a lamina, properties of typical composite materials, laminate characteristics and configurations. **Characterization and Testing of Composite Materials** Characterization of Constituent Materials, Physical Characterization of composite materials, Determination of Tensile, Compressive and shear properties of Uni-dimensional lamina, InterLamina Fracture Toughness, Bi-Axial Testing, Characterization of Composites with Stress Concentration, Structural Testing. **Elastic Behavior of Composite Lamina- Macro mechanics:** Stress Strain Relations, Relations between Mathematical and Engineering constants, Stress-strain Relations for a thin Lamina (Two-Dimensional), Transformation of Stress and Strain (Two-Dimensional), Transformation of Elastic Parameters (Two-Dimensional), Transformations of stress-strain Relations in Terms of Engineering Constants (Two- Dimensional), **Strength of Uni Directional Lamina.** Introduction, Longitudinal tension-Failure Mechanisms and strength, Longitudinal Compression, Transverse Tension and compression, In- plane shear, Out-of-plane Loading, **Strength of Composite Lamina** Failure Theories, Maximum Stress theory, Max Strain theory, Tsai-Hill, Tsai-Wu, Hashin-Rotem Failure theories, Evaluation and Applicability of Lamina Failure Theories.

**Textbooks:**

1. Isaac M Daniel and Ishai, "Engineering Mechanics of Composite Materials", OxfordUniversity Press, 1994.
2. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites,WileyInter-science, New York, 1980.

**Reference Books:**

1. R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, New York,1975.
2. L. R. Calcote, Analysis of Laminated Composite Structures, Van Nostrand Rainfold,New York, 1969.

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## 18ME52K2-MACHINE TOOL DESIGN

**L-T-P: 3-0-0** **Credits: 3** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO# | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Understand the design of machine tools and its manufacturing. | PO3 | 2 |
| CO2 | Design the machine tool structures and speed & feed rate regulation. | PO3 | 5 |
| CO3 | Design the machine tools beds and guide ways. | PO3 | 5 |
| CO4 | Understand numerical control of machine tools. | PO3 | 2 |

**Syllabus: FUNDAMENTALS OF MACHINE TOOL DESIGN:** Introduction, working motions in machine tools, machine tool drives: electric motor, transmission arrangement, Hydraulic transmission of elements: pumps, hydraulic cylinders, throttles. General requirements of machine tool design: Productivity, accuracy, simplicity of design, safety, low cost of manufacturing, engineering process applied to machine tools. **DESIGN OF SPEED & FEED RATES:** Aim of speed & feed rate regulation; various laws of stepped regulation of speed-Design of speed box, Design of feed box, classification of speed & feed boxes. Stepless regulation of speed & feed rates for hydraulics. **DESIGN OF MACHINE TOOL STRUCTURES:** Functions of machine tool structures & their requirements, Design criteria for machine tool structures, Basic design procedure of machine tool structures. **DESIGN OF BEDS, TABLES, COLUMNS:** Various types of beds used in machine tools- their construction & design feature; Determination of forces acting on horizontal table, Column design of milling machine & maximum deflection error in milling machine. **DESIGN OF GUIDE WAYS & HOUSINGS:** Functions & types of guide ways, Design of guide way-shapes, materials. Design of guide ways for wear resistance, stiffness. Design of housing- solid. **DESIGN OF POWER SCREWS OF MACHINE TOOLS:** Types & classifications, Design of sliding friction power screws, Design of rolling friction power screws. **DESIGN OF SPINDLE UNITS IN MACHINE TOOLS:** Functions, requirements, materials for spindles, Design calculations of spindles: deflection of spindle axis due to bending, due to compliance of spindle supports. **NUMERICAL CONTROL OF MACHINE TOOLS:** Fundamentals, classification &structure of NC systems, Program readers, Decoder, Buffer storage, comparators. Extension of numerical control systems: Introduction to DNC, CNC, Machining centers.

**Textbooks:**

1. NK Mehta," Machine Tool Design and Numerical Control', second Edition, TataMcGraw Hill book Company, (1997)
2. Gopal Chandra sen & Amitabha Bhattacharya,"Principles of Machine Tools", NewCentral Book agency, Calcutta,(1998)

**Reference Books:**

1. SK Basu, DK Pal," Design of Machine Tools", Oxford & IBH Publication Co PvtLtd, New Delhi (1995)
2. CMTI "Machine Tool design Course, Vol 4,5 & 6, Central Machine Tool Institute,Bangalore. (1997)

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## 18ME52K3-FRACTURE MECHANICS

**L-T-P: 3-0-0** **Credits: 3** **Pre-requisite: NIL**

Mapping of CO-PO table:

| CO# | Course outcome | PO/PSO | BT L |
|---|---|---|---|
| CO1 | Understand Crack growth and fracture mechanics | P02 | 4 |
| CO2 | Development of stress field equations in fracture mechanics | P01 | 4 |
| CO3 | Know the various methods for evaluating stress intensity factors | P01 | 4 |
| CO4 | Understand how to perform fracture toughness testing and crack growth phenomenon | P02 | 4 |

**Syllabus: ELEMENTS OF SOLID MECHANICS:** The geometry of stress and strain, elastic deformation, plastic and elasto- plastic deformation -limit analysis. **STATIONARY CRACK UNDER STATIC LOADING:** Two dimensional elastic fields – Analytical solutions yielding near a crack front – Irwin's approximation - plastic zone size – Dugdale model – J integral and its relation to crack opening displacement. **ENERGY BALANCE AND CRACK GROWTH:** Griffith analysis – Linear Fracture Mechanics-Crack Opening displacement – Dynamic energy balance – crack arrest. **FATIGUE CRACK GROWTH CURVE:** Empirical Relation describing crack growth by fatigue – Life calculations for a given load amplitude – effects of changing the load spectrum – Effects of Environment. **ELEMENTS OF APPLIED FRACTURE MECHANICS:** Examples of crack-growth Analysis for cyclic loading - leak before break – crack Initiation under large scale yielding – Thickness as a Design parameter – crack instability in Thermal or Residual – stress fields.

REFERENCES:

1. David Broek, "Elementary Engineering Fracture Mechanics", Fifthoff andNoerdhoff International Publisher, 1978.
2. Kare Hellan, "Introduction of Fracture Mechanics", McGraw-Hill BookCompany, 1985.
3. Preshant Kumar, "Elements of Fracture Mechanics", Wheeler Publishing, 1999.

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# 18ME52L1-ENGINEERING NOISE AND CONTROL

**L-T-P: 3-0-0** **Credits: 3** **Pre- requisite: NIL**

Mapping of CO-PO table:

| CO# | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Understand the Noise-Control Strategies. | PO3 | 2 |
| CO2 | Understand and apply the instruments for noise measurement and analysis. | PO3 | 2 |
| CO3 | Understand the harmful effects of Noise. | PO3 | 2 |
| CO4 | Understand and estimate the Noise of Noise associated devices and their control. | PO3 | 3 |

**Syllabus: FUNDAMENTALS AND BASIC TERMINOLOGY:** Introduction, Noise-Control Strategies, Acoustic Field Variables and the Wave Equation, Plane and Spherical Waves, Mean Square Quantities, Energy Density, Sound Intensity, Sound Power, Units, Spectra, Combining Sound Pressures, Impedance, Flow Resistance. **INSTRUMENTATION FOR NOISE MEASUREMENT AND ANALYSIS:** Microphones, Weighting Networks, Sound Level Meters, Grades of Sound Level Meter, Sound Level Meter Calibration, Noise Measurements Using Sound Level Meters, Time- Varying Sound, Noise Level Measurement, Statistical Analysers, Noise Dosimeters, Tape Recording of Noise, Spectrum Analysers, Intensity Meters, Energy Density Sensors. **CRITERIA:** Introduction, Hearing Loss, Hearing Damage Risk, Hearing Damage Risk Criteria, Implementing a Hearing Conservation Program, Speech Interference Criteria, Psychological Effects of Noise, Ambient Noise Level Specification, Environmental Noise Level Criteria, Environmental Noise Surveys. **SOUND POWER AND SOUND PRESSURE LEVEL ESTIMATION PROCEDURES:** Introduction, Fan Noise, Air Compressors, Compressors for Refrigeration Units, Cooling Towers, Pumps, Jets, Control Valves, Pipe Flow, Boilers, Turbines, Diesel and Gas-Driven Engines, Furnace Noise, Electric Motors, Generators, Transformers, Gears, Transportation Noise. **ACTIVE NOISE CONTROL:** Introduction, Active Control of Sound Propagation in Ducts, Active Control of Sound Radiation from Vibrating Structures, Sound Transmission into Enclosed Spaces, Active Vibration Isolation, Electronic Controller Design

**Textbooks:**

1. David A. Bies and Colin H. Hansen; "Engineering noise control: theory and practice"

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## 18ME52L2-ENGINEERING FAILURE ANALYSIS AND PREVENTION

**L-T-P: 3-0-0** **Credits: 3** **Pre- requisite: NIL**

Mapping of CO-PO table:

| CO# | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Familiarizing with Failure causes and Analysis. | PO2 | 2 |
| CO2 | Understanding Different types of failures. | PO2 | 2 |
| CO3 | Exploring Failure problems during processing | PO2 | 2 |
| CO4 | Reviewing Case studies. | PO2 | 2 |

**Syllabus:** Common causes of failure. Principles of failure analysis. Fracture mechanics approach to failure problems. Techniques of failure analysis. Service failure mechanisms ductile and brittle fracture, fatigue fracture, wear failures, fretting failures, environment induced failures, high temp. failure. Faulty heat treatment and design failures, processing failures (forging, casting, machining etc.), failure problems in joints and weldments. Case studies for ferrous and non-ferrous metallic parts and parts made from polymers and ceramic.

**Textbooks:**

1. Metals Handbook, Vol.10, "Failure Analysis and Prevention ", (10th Edition), 1994.
2. Failure Analysis of Engineering Structures: Methodology and Case Histories- V. Ramachandran
3. Practical Engineering Failure Analysis by Hani M. Tawancy, Anwar Ul-Hamid,Nureddin M. Abbas.

## 18ME52L3-DESIGN FOR MANUFACTURING, ASSEMBLY AND ENVIRONMENT

**L-T-P: 3-0-0** **Credits: 3** **Pre- requisite: NIL**

Mapping of CO-PO table:

| CO# | Course outcome | PO/PSO | BTL |
|---|---|---|---|
| CO1 | Understand the manufacturability and form design. | PO3 | 2 |
| CO2 | Design and assemble machined components. | PO3 | 5 |
| CO3 | Identify uneconomical design and redesign the cast components. | PO3 | 5 |
| CO4 | Understand different methods for design for the environment. | PO3 | 2 |

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**Syllabus INTRODUCTION:** General design principles for manufacturability - strength and mechanical factors, mechanisms selection, evaluation method, Process capability - Feature tolerances Geometric tolerances - Assembly limits -Datum features - Tolerance stacks. **FACTORS INFLUENCING FORM DESIGN:** Working principle, Material, Manufacture, Design- Possible solutions - Materials choice - Influence of materials on form design - form design of welded members, forgings andcastings. **COMPONENT DESIGN - MACHINING CONSIDERATION:** Design features to facilitate machining – drills milling cutters - keyways - Doweling procedures, counter sunk screws - Reduction of machined area- simplification by separation -simplification by amalgamation - Design for machinability - Design for economy - Designfor clamp ability - Design for accessibility - Design for assembly. **COMPONENT DESIGN - CASTING CONSIDERATION:** Redesign of castings based on Parting line considerations - Minimizing core requirements, machined holes, redesign of cast members to obviate cores. Identification of uneconomical design - Modifying the design - group technology - Computer Applications for **DFMA DESIGN FOR THE ENVIRONMENT:** Introduction – Environmental objectives – Global issues – Regional and local issues – Basic DFE methods – Design guide lines – Example application – Lifecycle assessment – Basic method – AT&T's environmentally responsible product assessment - Weighted sum assessment method – Lifecycle assessment method – Techniques to reduce environmental impact – Design to minimize material usage – Design for disassembly – Design for recyclability – Design for remanufacture – Design for energy efficiency – Design to regulations and standards.

REFERENCE BOOKS:

1. Boothroyd, G, 1980 Design for Assembly Automation and Product Design. NewYork, Marcel Dekker.
2. Bralla, Design for Manufacture handbook, McGraw hill, 1999.
3. Boothroyd, G, Heartz and Nike, Product Design for Manufacture, Marcel Dekker, 1994.
4. Dickson, John. R, and Corroda Poly, Engineering Design and Design for Manufactureand Structural Approach, Field Stone Publisher, USA, 1995.
5. Fixel, J. Design for the Environment McGraw hill., 1996.
6. Graedel T. Allen By. B, Design for the Environment Angle Wood Cliff, Prentice Hall.Reason Pub., 1996.
7. Kevien Otto and Kristin Wood, Product Design. Pearson Publication, 200

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## Annexure-8

## Syllabus of Value Added/Certificate Courses
### DEPARTMENT OF MECHANICAL ENGINEERING
### Certificate Course Syllabus for the A.Y 2018-2019

| | |
|---|---|
| **Course Title: AutoCAD** | **Course Code:** 18CC3001, 19CC3001, 20CC0006, 21CC0006 |
| **Category: Employability** | **Level-1:** for Y18, Y19, Y20, Y21 Batch of Students |
| **Mode: Offline** Teaching and CC Exam on Online | **Duration :40 Hrs** (4 Hrs/Week x 10 Week) |
| **Source:** Certified and Trained Faculty from Department | |
| **CC Outcome:** Registered students will learn about all the tool bars in AutoCAD package and able to draw Orthogonal, Sectional and Isometric Views of Machine Components as per the given dimensions. | |
| **Title of Global Certificate :** Autodesk Certified User - AutoCAD | |

### SYLLABUS

| S.No | Topic | Course Content | Duration in Hrs |
|---|---|---|---|
| 1 | **Basic Drawing Skills** | User Coordinate System, Create Selection Sets, Use Dynamic Input, Direct distance | 4 |
| 2 | **Draw Objects** | Draw Lines, Rectangles, Circles, Arcs, Poly lines and Polygons | 4 |
| 3 | **Draw with Accuracy** | Working with Grid and Snap, use object-snap tracking, Use Coordinate Systems | 4 |
| 4 | **Modify Objects** | Move and Copy objects, Rotate, Scale objects, Create and Use Array, Trim and Extend Objects, Offset, Mirror objects, Chamfer and Fillet object corner | 8 |
| 5 | **Additional Drawing Techniques** | Draw and Edit Poly lines and apply Hatches and Gradients | 8 |
| 6 | **Organize Objects** | Change Object Properties, Layers, and control the Visibility | 4 |
| 7 | **Annotate Drawings** | Add and Modify text, Use Dimension Tool | 4 |
| 8 | **Layout and Printing** | Page Set, Setting Printing and Plotting options. | 4 |
| | | **Total Course Duration:** | **40 Hrs** |

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| | |
|---|---|
| **Course Title: Autodesk Inventor (3D Modelling)** | **Course Code:** 19CC3006, 20CC0007,21CC0007 |
| **Category: Employability** | **Level-2:** for Y19, Y20, Y21 Batch of Students |
| **Mode: Offline** Teaching and CC Exam on Online | **Duration: 40 Hrs** (4 Hrs/Week x 10 Week) |
| **Source:** Certified and Trained Faculty from Department | |
| **CC Outcome:** Students will learn the procedure and techniques to Model and Assemble 3D Machine components per the given dimensions, generate orthographic views using Drawing Module. | |
| **Title of Global Certificate :** Autodesk Certified User – Autodesk Inventor | |

## SYLLABUS

| S.No | Topic | Course Content | Duration in Hrs |
|---|---|---|---|
| 1 | USER INTERFACE AND NAVIGATION | Change the viewpoint using the View Cube, change setting of the View Cube, Understand Inventor file types and standard templates | 2 |
| 2 | SKETCHING | Assign parameters Identify dimension types Share sketches Use sketch constraints Project geometry | 8 |
| 3 | PART MODELING | Create parts Apply fillets and chamfers, create a pattern of features, Create a Rib Feature, Create a shell feature Create extrude features, Create hole features | 10 |
| 4 | ASSEMBLY MODELING | Apply basic assembly constraints (mate, flush, insert, directed angle) Ground base component of an assembly Apply an offset to constrained parts, Determine the degrees of freedom of a component Create a presentation model | 10 |
| 5 | DRAWING | Control sheet size and add a title block Select and place a front view Create a drawing view from an existing view Add annotation and dimensioning to a drawing Add sheets to a drawing Create a drawing view based on an assembly and presentation file Add balloons to a drawing Create and edit a parts list in a drawing | 8 |
| 6 | BROWSER EDITING | Reorder features Delete features | 2 |
| | | **Total Course Duration:** | **40 Hrs** |

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| | |
|---|---|
| **Course Title: Autodesk Fusion 360 (Modelling)** | **Course Code :**19CC3005, 20CC0032,21CC0032 |
| **Category: Employability** | **Level-3:** for Y19, Y20, Y21 Batch of Students |
| **Mode: Offline** Teaching and CC Exam on Online | **Duration: 40 Hrs** (4 Hrs/Week x 10 Week) |
| **Source:** Certified and Trained Faculty from Department | |
| **CC Outcome:** Students will learn the procedure and techniques to Model and Assemble 3D Machine components per the given dimensions, generate orthographic views using Drawing Module. | |
| **Title of Global Certificate:** Autodesk Certified User – Autodesk Fusion 360 | |

## SYLLABUS

| S.No | Topic | Course Content | Duration in Hrs |
|---|---|---|---|
| 1 | **Sketching** | Sketch Creation Create Dimensions Constraint selection and creation Edit a sketch Project Edges Edit a Sketch | 5 |
| 2 | **Drawing** | Creating a Drawing View, Base, Projected, Section, Detail Add Annotations Editing a Created View Edit Border and Title block | 5 |
| 3 | **Sculpt** | Create a Form Edit a Form Thicken a Form | 3 |
| 4 | **Direct Modelling** | Feature Deletion Press & Pull Too | 3 |
| 5 | **Part Modelling** | Create extrude features Apply Fillets and Chamfers Create complex hole features Create revolve features Create a pattern of features Create a shell feature Create Construction Planes and Axes Inspect command; measure, and section analysis | 10 |
| 6 | **Advanced Modelling** | Sweep and Loft Boundary Fill Split and Combine bodies | 4 |
| 7 | **Assembly Modelling** | Create and Manage Top Level Assembly and Subassemblies Create a Component from a Body Align and Assembly Joints Interference Rigid Groups Motion Studies | 5 |
| 8 | **Practice Exercises** | Modelling and Assembly of Screw Jack, Stuffing Box, Single Lathe tools Post, Flanged Coupling | 5 |

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| | |
|---|---|
| | **Total Course Duration:** **40 Hrs** |

| | |
|---|---|
| **Course Title: Static and Dynamic Analysis using Altair Hyperworks** | **Course Code :**19CC3221, 20CC0034 |
| **Category: Employability** | **Level-3:** for Y19 and Y20 Batch of Students |
| **Mode: Offline** Teaching and CC Exam on Online | **Duration: 40 Hrs** (4 Hrs/Week x 10 Week) |
| **Source:** Certified and Trained Faculty from Department | |
| **CC Outcome:** Students will learn the procedure and techniques to Model, Mesh, apply load and boundary conditions and solve to generate final results and graphs. | |
| **Title of Global Certificate :** Certification from Design Tech. | |

## SYLLABUS

| S.No | Topic | Course Content | Duration in Hrs |
|---|---|---|---|
| 1 | **Introduction** | Importance of Hyper works and its advantages, Various modules in Altair Hyper works, Screen components, 7 Pages on the working screen, Various Tool Bars, and its usage during analysis., About the various stages to analyse the given problem, Step by Step procedure to solve any problem, Listing and Plotting the results with Example | 16 |
| 2 | **Solving the given problems using Radios Solver** | 1. RD-1000: Linear Static Analysis of a Plate with a Hole<br>2. RD-1010: Thermal Stress Analysis of a Coffee Pot Lid<br>3. RD-1020: Normal Modes Analysis of a Splash Shield<br>5. RD-1040: 3-D Buckling Analysis using RADIOSS<br>6. RD-1110: Setting up a Modal Analysis<br>7. RD-2000: Frequency Response Analysis of a Flat Plate<br>8. RD-2020: Transient Dynamic Analysis of a Bracket | 16 |
| 3 | **Topology Optimization (Optistruct Solver)** | 9. OS-2000: Design Concept for a Structural C-clip<br>10. OS-2005: Design Concept for a Structural C-clip with Minimum Member Size Control | 4 |
| 4 | **Advanced Topics** | Topography Optimization, Size Optimization, Shape | 4 |

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25/6/2018

| | | | |
|---|---|---|---|
| | | Optimization with example | |
| | | **Total Course Duration:** | **40 Hrs** |

| | |
|---|---|
| **Course Title: Introduction to Programming using Python** | **Course Code:** 19CC3217, 20CC0031, 21CC0031 |
| **Category: Employability** | **Level-2:** for Y19, Y20,Y21 Batch of Students |
| **Mode: Offline** Teaching and CC Exam on Online | **Duration: 40 Hrs** (4 Hrs/Week x 10 Week) |
| **Source:** Certified and Trained Faculty from Department | |
| **CC Outcome:** Students will be able to recognize and write syntactically correct Python code, recognize data types supported by Python, and be able to recognize and write Python code that will logically solve a given problem statement. | |
| **Title of Global Certificate :** Microsoft Technology Associate-Python | |

## SYLLABUS

| S.No | Topic | Course Content | Duration in Hrs |
|---|---|---|---|
| 1 | Evaluate an expression to identify the data type Python will assign to each variable. | Data types include str, int, float, and bool | 5 |
| 2 | Convert between and work with data types. | Type casting; constructing data structures; indexing and slicing operations | 5 |
| 3 | Determine the sequence of execution based on operator precedence. Select the appropriate operator to achieve the intended result. | Assignment; Comparison; Logical; Arithmetic; Identity (is); Containment (in) | 5 |
| 4 | Construct and analyse code segments that use branching statements | if elif; else; nested and compound conditionals | 5 |
| 5 | Construct and analyze code segments that perform iteration | while for; break; continue; pass; nested loops and loops that include compound conditionals | 5 |
| 6 | Construct and analyse code segments that perform file input and output operations. | open; close; read; write; append; check existence; delete; with statement | 4 |
| 7 | Construct and analyse code segments that include function definitions. | Call signatures; default values; return; def; pass Syntax errors; logic errors; runtime errors | 5 |
| 8 | Solve complex computing problems by using built-in modules. | math; date time; io; sys; os; os.path; random | 6 |
| | | **Total Course Duration:** | **40 Hrs** |

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