ACADEMIC REGULATIONS (R-20)
COURSE STRUCTURE
AND
DETAILED SYLLABI

M.Tech Regular (Full Time) Two Year Post Graduate Degree Programme

(For the Batches Admitted From the Academic Year 2020-2021)

CAD/CAM

Department of Mechanical Engineering

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Accredited by NBA, New Delhi, Accredited by NAAC, Bengaluru|Affiliated to JNTUA, Ananthapuramu, Recognized by UGC under 12(B) & 2(F) | Approved by AICTE, New Delhi)

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FOREWORD

The autonomy is conferred on Sri Venkateswara College of Engineering & Technology by JNT University, Anantapur based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like UGC and AICTE. It reflects the confidence of the affiliating University in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own curriculum, examination system and monitoring mechanism, independent of the affiliating University but under its observance.

Sri Venkateswara College of Engineering & Technology is proud to win the confidence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, the standards and ethics for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies like Academic Council and Boards of Studies are constituted with the guidance of the Governing Body of the College and recommendations of the JNTUA, Anantapur to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several expertise solicited from academics, industry and research, to produce quality engineering graduates to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications needed are to be sought at appropriate time and with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the college and brighter prospects of engineering graduates.

Principal

VISION

Carving the youth as dynamic, competent, valued and knowledgeable professionals who shall lead the Nation to a better future.

MISSION

- ✓ Providing Quality Education, student-centred teaching-learning processes and state-of-art infrastructure for professional aspirants hailing from both rural and urban areas.
- ✓ Imparting technical education that encourages independent thinking, develops strong domain of knowledge, hones contemporary skills and positive attitudes towards holistic growth of young minds.
- ✓ Evolving the Institution into a Centre of Academic and Research Excellence.

QUALITY POLICY

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY strides towards excellence by adopting a system of quality policies and processes with continued improvements to enhance students' skills and talent for their exemplary contribution to the society, the nation and the world.

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
(AFFILIATED TO JNTUA, ANANTAPUR)
ACADEMIC REGULATIONS – R20
MASTER OF TECHNOLOGY (M.TECH)
REGULAR (Full-Time) TWO YEAR POST GRADUATE DEGREE PROGRAMME
(For the batches admitted from the Academic Year 2020-2021)

The Jawaharlal Nehru Technological University Anantapur, Ananthapuramu shall confer M.Tech Post Graduate degree to candidates who are admitted to the Master of Technology Program and fulfill all the requirements for the award of the degree.

1.0 **Applicability:** All the rules specified herein, approved by the Academic Council, shall be in the force and applicable to the students admitted from the Academic Year 2020-2021 onwards. Any reference to "College" in these rules and regulations stands for SVCET.

2.0 **Extent:** All the rules and regulations, specified hereinafter shall be read as a whole for the purpose of interpretation. As and when a doubt arises, the interpretation of the Chairman, Academic Council shall be final and ratified by the Academic Council in the forthcoming meeting. As per the requirements of statutory bodies, Principal, Sri Venkateswara College of Engineering College shall be the Chairman, Academic Council.

3.0 **Admission:** Admission into the first year of two year M.Tech degree programme is based on the eligibility conditions detailed below.

4.0 **Eligibility:**
Admission to the above programme shall be made subject to the eligibility, qualifications and specialization prescribed by the competent authority for each programme, from time to time. Admissions shall be made either on the basis of merit rank obtained by the qualified candidates at an Entrance Test conducted by the University or on the basis of GATE / PGECET score, subject to reservations and policies prescribed by the Government from time to time.

4.1 **Admission Procedure:**
As per the existing stipulations of AP State Council for Higher Education (APSCHE), Government of Andhra Pradesh, admissions are made into the first year as follows:
a) Category –A seats are to be filled by Convenor through APPGECET / GATE score.
b) Category-B seats are to be filled by Management as per the norms stipulated by Government of A.P.

5.0 **Specializations:**

S. No.	Branch	Specialization
1	CE	Structural Engineering
2	EEE	PE&ED
3	ME	CAD/CAM
4	ECE	VLSI Design
5	CSE	Computer Science and Engineering
6	CSE	CSE(Data Science)

6.0 **Course Work:**
A Candidate after securing admission must pursue the M.Tech course of study for Four Semesters duration. Each semester shall have a minimum of 16 instructional weeks.
A candidate admitted to a programme should complete it within a period equal to twice the prescribed duration of the programme from the date of admission.

7.0 **Contact Periods:**
Depending on the complexity and volume of the course, the numbers of contact periods per week are assigned.

7.1 **Credit Courses:** Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Course in an L: T: P: C (Lecture Hours: Tutorial Hours: Practical Hours: Credits) structure, based on the following pattern.

7.2 **Theory Courses:** One hour Lecture (L) per Week in a Semester = 01 Credit.

7.3 **Practical Courses:** One Practical hour (P) per Week in a Semester = 0.5 Credit.

7.4 **Audit Courses (AC) = NOCREDITS** are awarded

7.5 **Mini Project:** For Mini Project, where formal contact periods are not specified, credits are assigned based on the complexity of the work to be carried out.

7.6 **Dissertation Work:** For Dissertation Work, where formal contact periods are not specified, credits are assigned based on the complexity of the work to be carried out.

7.7 The Two year curriculum of Post Graduate Degree Program M. Tech shall have total of 68 credits.

8.0 **Choice Based Credit System (CBCS):**

8.1 Choice Based Credit System (CBCS) is introduced in line with UGC guidelines in order to promote:

- Student centered learning
- Students to learn courses of their choice

A Student has a choice of registering for courses comprising basic science, program core and professional elective.

9.0 **Evaluation:**

The performance of the candidate in each semester shall be evaluated subject wise, with a maximum of 100 marks for Theory and 100 marks for practical's, on the basis of Internal Evaluation and End Semester Examination.

For the theory subjects, 60% of the marks will be for the External End Examination. While 40% of the marks will be for Internal Evaluation. Internal marks for midterm examinations shall be arrived at by considering the marks secured by the student in both the midterm examinations with 80% weightage to the better midterm exam and 20% to the other. First midterm examinations will be conducted in the middle of the Semester (first two units) and second midterm examinations immediately after the completion of instruction (last three units) with four questions with internal choice, either or type, are to be answered in 2 hours, evaluated for 40 marks.

For semester end examination five questions shall be given for a maximum of 60 marks with one question from each unit with internal choice i.e. either or type. All questions carry equal marks.

For practical subjects, 60 marks shall be for the End Semester Examinations and 40 marks will be for internal evaluation based on the day to day performance (25 marks) and practical test at the end of the semester (15 marks).

For Mini Project there will be an internal evaluation for 100 marks. A candidate has to secure a minimum of 50% to be declared successful. The assessment will be made by a board consisting of HOD, Mini Project supervisor and one senior faculty of the department.

A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

In case the candidate does not secure the minimum academic requirement in any of the subjects, he has to reappear for the Semester Examination either supplementary or regular in that subject, or repeat the subject when next offered or do any other specified subject as may be required.

In case of audit course, students will be able to register for courses outside the prescribed range of Credits for audit only, when interested to supplement their knowledge / skills; any student who wishes

to pursue audit course can register for the same with the concerned teacher and attend to the classes regularly. No examination will be conducted; no grade will be given for the audit courses. However such of those students who have registered and got the requisite attendance of 75% in the audit course, it will be mentioned in their grade sheet.

10.0 Dissertation Work:

10.1 Registration of Dissertation work

A candidate shall register for the dissertation work at the beginning of the second year, only after satisfying the attendance requirement of all the courses up to II Semester. The duration of the dissertation work is for two semesters.

10.2 The candidate has to submit, in consultation with the supervisor, the title, objective and plan of action of dissertation work to the Department Evaluation Committee (DEC) for its approval. Only after obtaining the approval from DEC, the student can initiate the dissertation work.

11.0 Evaluation of Dissertation Work

11.1 The Department Evaluation Committee (DEC) consisting of HOD, Supervisor and one internal senior faculty member shall monitor the progress of the project work. The DEC is constituted by the Principal on the recommendation of the Head of the Department.

11.2 Dissertation work Phase – I is to be completed in the III Semester. The student has to identify the topic of the project work, collect relevant literature, preliminary data, implementation tools/methodologies etc., and perform a critical study and analysis of the problem identify and submit a report.

(i) Internal Evaluation: The internal evaluation of dissertation work phase – I shall be made by the DEC on the basis of two project reviews on the topic of the project. Each review shall be conducted for a maximum of 40 marks. For a total of 40 marks, 80% of better one of the two and 20% of the other one are added and finalized.

(ii) Semester-End Evaluation: The Semester end dissertation work phase – I Viva-Voce examination shall be conducted for 60 marks, by the HOD, concerned supervisor and a senior faculty member recommended by the HOD and appointed by the Principal.

11.**3** The student shall continue to undertake the dissertation work phase – II during the IV Semester by conducting practical investigations, implementation, analysis of results, validation and report writing. The student shall submit a dissertation report at the end of the semester after approval of the DEC.

(i) Internal Evaluation: The internal evaluation of dissertation work phase – II shall be made by the DEC on the basis of two project reviews on the progress, presentation and quality of work. Each review shall be conducted for a maximum of 120 marks. For a total of 120 marks, 80% of better one of the two and 20% of the other one are added and finalized.

(ii) Semester-End Evaluation: A candidate shall be allowed to submit the dissertation on the recommendations of the DEC. Three copies of the Dissertation certified in the prescribed format by the concerned Supervisor and HOD shall be submitted to the department. The Department shall submit a panel of three experts for a maximum of 05 students to the principal for appointment of the external examiner. The Viva-voce examination shall be conducted by the board consisting of the Supervisor, Head of the Department and the external examiner nominated by the principal. The board shall jointly award the marks for 180.

11.4 A candidate shall be deemed to have secured the minimum academic requirement of project work if he secures a minimum of 40% marks in the viva-voce examination and a minimum aggregate of 50% of the total marks in the end viva-voce examination and the internal assessment marks taken together. If he fails to get the minimum academic requirement he has to appear for the viva-voce examination again to get the minimum marks. The viva voce examination may be conducted once in two months for all the candidates who have submitted thesis during that period.

12.0 Eligibility to appear for the Semester-End Examination (SEE)

12.1 A student shall be eligible to appear for semester-end examinations if he acquires a minimum of 75% of attendance in aggregate of all the courses in a semester.

12.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below75%) in each semester may be granted by the College Academic Council.

12.3 Shortage of Attendance below 65% in aggregate shall **in no case be condoned**.

12.4 Student whose shortage of attendance is not condoned in any semester is not eligible to take their end examination of that class and their registration shall stand cancelled.

12.5 A student shall not be promoted to the next semester unless he satisfies the attendance requirements of the current semester, as applicable. The student may seek readmission for the semester when offered next. He will not be allowed to register for the courses of the semester while he is in detention. A student detained due to shortage of attendance, will have to repeat that semester when offered next.

12.6 A stipulated fee shall be payable to the College towards condonation of shortage of attendance.

12.7 The attendance in Student Development Activities shall be considered for finalization of aggregate attendance.

12.8 For the calculation of a student attendance in any semester, the total number of classes conducted shall be counted as scheduled in the class-work time table.

13.0 Conduct of Semester End Examination and Evaluation

13.1 Semester end examination shall be conducted by the Controller of Examination (COE) by inviting 50% Question Papers from the External and 50% Question papers from the Internal Subject Experts. Principal will decide the External and Internal subject experts.

13.2 The answer papers of semester end examination should be evaluated externally / internally.

13.3 Marks for components evaluated internally by the faculty shall be submitted to the Controller of Examinations one week before the commencement of the End examinations. The marks for the internal evaluation components shall be added to the external evaluation marks secured in the Semester-end examinations, to arrive at the total marks for any course in that semester.

13.4 Performance in all the subjects is tabulated program-wise and will be scrutinized by the office of the Controller of Examinations. Total marks obtained in each subject are converted into letter grades. Finally subject-wise marks and grades details, subject-wise and branch-wise pass percentages are calculated through software.

14.0 Results Committee

14.1 Results Committee comprising of Principal, Controller of Examinations, Additional Controller of Examinations (Confidential) and one Senior Professor nominated by the Principal and the University Nominee will oversee the details of marks, grades and pass percentages of all the subjects and branch-wise pass percentages.

14.2 Office of the Controller of Examinations will generate student-wise result sheets and the same will be published through college website.

14.3 Student-wise Grade Sheets are generated and issued to the students.

15.0 Personal Verification / Recounting / Revaluation / Final Valuation

15.1 **Personal Verification of Answer Scripts:**

Candidates appear in a particular semester end examinations may appeal for verification of their answer script(s) for arithmetic correction in totaling of marks and any omission / deletion in evaluation within 7 days from the date of declaration of results at the office of the Controller of Examinations on the prescribed proforma and by paying the prescribed fee per answer script.

It is clarified that personal verification of answer script shall not tantamount to revaluation of answer script. This is only a process of reverification by the candidate. Any mistake / deficiency with regard to arithmetic correction in totaling of marks and any omission / deletion in evaluation if found, the institution will correct the same.

15.2 **Recounting / Revaluation:**
Students shall be permitted for request for recounting/revaluation of the Semester-End examination answer scripts within a stipulated period after payment of prescribed fee. After recounting or revaluation, records are updated with changes if any and the student will be issued a revised grade sheet. If there are no changes, the same will be intimated to the students.

15.3 **Final Valuation:**
Students shall be permitted for request for final valuation of the Semester–End Examination answer scripts within a stipulated period after the publication of the revaluation results by paying the necessary fee. The final valuation shall be carried out by an expert not less than Associate Professor as per the scheme of valuation supplied by the examination branch in the presence of the student, Controller of Examinations and Principal. However students are not permitted to discuss / argue with the examiner. If the increase in marks after final valuation is equal to or more than 15% of the previous valuation marks, the marks obtained after final valuation shall be treated as final. If the variation of marks after final valuation is less than 15% of the previous valuation marks, then the earlier valuation marks shall be treated as the final marks.

16.0 **Supplementary Examinations:** In addition to the regular semester-end examinations conducted, the College may also schedule and conduct supplementary examinations for all the courses of other semesters when feasible for the benefit of students. Such of the candidates writing supplementary examinations may have to write more than one examination per day.

17.0 **Re-Registration for improvement of Internal Marks**

17.1 Following are the conditions for Re-Registration of Theory Courses for improvement of Internal Marks:

17.2 The student should have completed all the course work and obtained examinations results from I to III semesters.

17.3 If the student has failed in the examination due to internal evaluation marks secured being less than 50%, he shall be given one chance for a maximum of 3 theory courses for improvement of internal evaluation marks.

17.4 The candidate has to register for the chosen courses and fulfill the academic requirements (i.e. a student has to attend the classes regularly and appear for the mid-examinations and satisfy the attendance requirements to become eligible for appearing at the semester-end examinations).

17.5 For each course, the candidate has to pay a fee equivalent to one third of the semester tuition fee and the amount is to be remitted in the form of D.D./ Challan in favour of the Principal, Sri Venkateswara College of Engineering & Technology, payable at Chittoor along with the requisition through the concerned Head of the Department.

17.6 A student availing the benefit for Improvement of Internal evaluation marks, the internal evaluation marks as well as the semester-end examinations marks secured in the previous attempt(s) for the re-registered courses stands cancelled.

18.0 **Academic Requirements for completion of Post Graduate Degree Program M.Tech:**
The following academic requirements have to be satisfied in addition to the attendance requirements for completion of Post Graduate Degree Program M.Tech.
For students admitted into Post Graduate Degree Program M.Tech for the Academic Year 2020-21:

18.1 A student shall be deemed to have satisfied the minimum academic requirements for each theory, laboratory course, and Internship and project work, if he secures not less than 40% of marks in the semester-end examination and a minimum of 50% of marks in the sum total of the internal evaluation and Semester-end examination taken together.
A student shall be deemed to have satisfied the minimum academic requirements of mini-project, if he secures not less than a minimum of 50% of marks.

18.2 A student shall register for all the **68** credits and earn all the **68** credits. Grade points obtained in all the 6**8** credits shall be considered for the calculation of the DIVISION based on CGPA.

18.3 A student who fails to earn **68** credits as indicated in the course structure within **four** academic years from the year of their admission shall forfeit his seat in M.Tech Program and his admission stands cancelled.

19.0 Grades, Semester Grade point Average, Cumulative Grade point Average:

19.1 **Grade System:** After all the components and sub-components of any subject (including laboratory subjects) are evaluated, the final total marks obtained will be converted to letter grades on a "10 point scale" described below.

% of Marks obtained	Grade	Grade Points (GP)
90 to 100	A+	10
80 to 89	A	9
70 to 79	B	8
60 to 69	C	7
50 to 59	D	6
Less than 50%in Sum of Internal & External (or) Less than 40% in External	F	0
Not Appeared	N	0

19.2 Computation of SGPA and CGPA

19.2.1 The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$\mathbf{SGPA = \Sigma\ (Ci \times Gi) / \Sigma\ Ci}$$

where, Ci is the number of credits of the i^{th} subject and Gi is the grade point scored by the student in the i^{th} course

19.2.2 The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$$\mathbf{CGPA = \Sigma\ (Ci \times Si) / \Sigma\ Ci}$$

where 'Si' is the SGPA of the ith semester and Ci is the total number of credits in that semester

19.2.3 Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

19.2.4 While computing the SGPA/CGPA, the subjects in which the student is awarded Zero grade points will also be included.

19.2.5 Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

19.2.6 **Letter Grade:** It is an index of the performance of students in a said course. Grades are denoted by letters A+, A, B, C, D, F and N.

19.2.7 As per AICTE regulations, conversion of CGPA into equivalent percentage is as follows:

Equivalent Percentage to SGPA = (SGPA – 0.50) x 10
Equivalent Percentage to CGPA = (CGPA – 0.50) x 10

19.3 **Grade Sheet:** A grade sheet (Marks Memorandum) will be issued to each student Indicating his performance in all subjects registered in that semester indicating the GPA and CGPA. GPA and CGPA will be rounded off to the second place of decimal.

20.0 **Consolidated Grade Sheet:** After successful completion of the entire Program of study, a Consolidated Grade Sheet containing performance of all semesters will be issued as a final record. Duplicate Consolidated Grade Sheet will also be issued, if required, after payment of requisite fee.

21.0 **Award of Degree:** The Degree will be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu on the recommendation of The Principal of SVCET (Autonomous). Student admitted in M.Tech 2Yrs programme shall register for all **68** credits and earn all the **68** credits. Marks obtained in all the **68** credits shall be considered for the award of the class based on CGPA.

21.1 **Eligibility:** A student shall be eligible for the award of M.Tech Degree if he fulfills all the following conditions:

- Registered and successfully completed all the components prescribed in the program of study for which he is admitted.
- Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of study within the stipulated time.
- Obtained CGPA greater than or equal to 6.0 (Minimum requirement for declaring as passed.)

21.2 **Award of Class:** Declaration of Class is based on CGPA.

Cumulative Grade Point Average	Class
≥7.75	First Class with Distinction
≥6.75 and<7.75	First Class
≥6.0 and <6.75	Second Class

22.0 **With Holding of Results:**
If the candidate has not paid dues to the University / College or if any case of in-discipline is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

23.0 **Graduation Day:**
The institute shall have its own annual Graduation Day for the award of Provisional Certificates to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute. The college shall institute prizes and medals to meritorious students and award them annually at the Graduation Day. This will greatly encourage the students to strive for excellence in their academic work.

24.0 **Discipline:**
Every student is required to observe discipline and decorum both inside and outside the institute and not to indulge in any activity which will tend to bring down the honor of the institute. If a student indulges in malpractice in any of the theory / practical examination, continuous assessment examinations he shall be liable for punitive action as prescribed by the Institute from time to time.

25.0 **Grievance Redressal Committee:**
The institute shall form a Grievance Redressal Committee for each course in each department with the Course Teacher and the HOD as the members. This Committee shall solve all grievances related to the course under consideration.

26.0 **Transitory Regulations:**
Students who got detained for want of attendance (**or**) who have not fulfilled academic requirements

(**or**) who have failed after having undergone the Program in earlier regulations (**or**) who have discontinued and wish to continue the Program are eligible for admission into the unfinished semester from the date of commencement of class work with the same (**or**) equivalent courses as and when courses are offered and they will be in the academic regulations into which they are presently readmitted. A student has to satisfy all the eligibility requirements within the maximum stipulated period of **four years** for the award of M.C.A Degree.

27.0 Medium of Instruction:

The Medium of Instruction is **English** for all courses, laboratories, Internal and External examinations, Seminar Presentation and Project Reports.

28.0 Mode of Learning:

Preferably 50% course work for the theory courses in every semester shall be conducted in the blended mode of learning. If the blended learning is carried out in online mode, then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

29.0 General Instructions:

i. The academic regulations should be read as a whole for purpose of any interpretation.

ii. Disciplinary action for Malpractice/improper conduct in examinations is appended.

iii. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

v. The Principal may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Principal.

vi. The above rules and regulations are to be approved / ratified by the College Academic Council as and when any modification is to be done.

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FAILURE TO READ AND UNDERSTAND THE REGULATIONS IS NOT AN EXCUSE

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

Identification of Courses

M. Tech

Each course shall be uniquely identified by an alphanumeric code of width 7 characters as given below.

No. of Digits	Description
First two digits	Year of regulations Ex:20
Next one letter	Type of program: A: B. Tech B: M. Tech C: M.B.A D: M.C.A
Next two letters	Code of program: ST: Structural Engineering, P.E: Power Electronics & Electric Drives, CM: CAD/CAM, VL: VLSI, CS: Computer Science and Engineering, DS: Data Science
Last two digits	Indicate serial numbers: ≥ 01

Ex:
20BST01
20BPE01
20BCM01
20BVL01
20BCS01
20BDS01

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
(AFFILIATED TO JNTUA, ANANTHAPURAMU)
RULES FOR DISCIPLINARY ACTION FOR MALPRACTICE / IMPROPER CONDUCT IN EXAMINATIONS

Sl.No.	Nature of Malpractices / Improper conduct If the candidate	Punishment
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester / year. The Hall Ticket of the candidate is to be cancelled.
3.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester / year.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the

		candidate is subject to the academic regulations in connection with forfeiture of seat.
6.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred and forfeits of seat.
7.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he will be handed over to the police and a case is registered against him.
8.	Refuses to obey the orders of the Chief Superintendent / Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in-charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction or property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate (s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester / year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester / year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or	Cancellation of the performance in that subject.

	writes to the examiner requesting him to award pass marks.	
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Examination committee for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)
R.V.S. NAGAR, CHITTOOR - 517127, A.P.

COURSE STRUCTURE AND SCHEME OF EXAMINATION FOR M.TECH-CAD/CAM

M.TECH, I-SEMESTER

S.NO	SUBJECT CODE	SUBJECT	PERIODS			CREDITS	SCHEME OF EXAMINATION (MAXIMUM MARKS)		
			L	T	P		CIE	SEE	TOTAL
1	20BCM01	FINITE ELEMENT METHODS	3	0	0	3	40	60	100
2	20BCM02	COMPUTER INTEGRATED MANUFACTURING	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE – I									
3	20BCM03	AUTOMATED AND COMPUTER INTEGRATED MANUFACTURING SYSTEMS	3	0	0	3	40	60	100
	20BCM04	ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS							
	20BCM05	DESIGN FOR MANUFACTURING							
PROFESSIONAL ELECTIVE – II									
4	20BCM06	COMPUTATIONAL FLUID DYNAMICS	3	0	0	3	40	60	100
	20BCM07	COMPUTATIONAL METHODS							
	20BCM08	HYDRAULICS AND PNEUMATICS							
5	20BMB21	RESEARCH METHODOLOGY	2	0	0	2	40	60	100
6	20BCM09	MODELLING LAB	0	0	4	2	40	60	100
7	20BCM10	FINITE ELEMENT ANALYSIS LAB - 1	0	0	4	2	40	60	100
8	20BCM11	AUDIT COURSE: HUMAN VALUES AND PROFESSIONAL ETHICS	2	0	0	-	-	-	-
TOTAL			**16**	**0**	**8**	**18**	**280**	**420**	**700**

M.TECH, II-SEMESTER

S.NO	SUBJECT CODE	SUBJECT	PERIODS			CREDITS	SCHEME OF EXAMINATION (MAXIMUM MARKS)		
			L	T	P		CIE	SEE	TOTAL
1	20BCM12	OPTIMIZATION THEORY & PRACTICE	3	0	0	3	40	60	100
2	20BCM13	ADDITIVE MANUFACTURING	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE – III									
3	20BCM14	MECHATRONICS	3	0	0	3	40	60	100
	20BCM15	ADVANCED VIBRATION ENGINEERING							
	20BCM16	VEHICLE AERODYNAMICS							
PROFESSIONAL ELECTIVE – IV									
4	20BCM17	NON- DESTRUCTIVE EVALUATION	3	0	0	3	40	60	100
	20BCM18	QUALITY ENGINEERING							
	20BCM19	MECHANICS & MANUFACTURING OF COMPOSITES							
5	20BCM20	MINI PROJECT	0	0	4	2	100	00	100
6	20BCM21	FINITE ELEMENT ANALYSIS LAB - II	0	0	4	2	40	60	100
7	20BCM22	CAM LAB	0	0	4	2	40	60	100
8	20BCM23	AUDIT COURSE: INTELLECTUAL PROPERTY RIGHTS	2	0	0	-	-	-	-
TOTAL			**14**	**0**	**12**	**18**	**340**	**360**	**700**

M.TECH, III-SEMESTERS

S.NO	SUBJECT CODE	SUBJECT	PERIODS			CREDITS	SCHEME OF EXAMINATION (MAXIMUM MARKS)		
			L	T	P		CIE	SEE	TOTAL
PROFESSIONAL ELECTIVE – V									
1	20BCM24	GEOMETRIC MODELLING	3	0	0	3	40	60	100
	20BCM25	ADVANCES MANUFACTURING TECHNOLOGY							
	20BCM26	METAL FORMING PROCESSES							
PROFESSIONAL ELECTIVE – VI									
2	20BCM27	ROBOTICS	3	0	0	3	40	60	100
	20BCM28	CNC TECHNOLOGY & PROGRAMMING							
	20BCM29	MICRO & SMART SYSTEMS							
3	20BCM30	DISSERTATION PHASE-I	-	-	20	10	40	60	100
TOTAL			**6**	**0**	**20**	**16**	**120**	**180**	**300**

M.TECH,IV-SEMESTERS

S.NO	SUBJECT CODE	SUBJECT	PERIODS			CREDITS	SCHEME OF EXAMINATION (MAXIMUM MARKS)		
			L	T	P		CIE	SEE	TOTAL
1	20BCM31	DISSERTATION PHASE-II	-	-	32	16	120	180	300
TOTAL						**16**	**120**	**180**	**300**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

M.Tech - I Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM01) FINITE ELEMENT METHODS

Objectives:

1. Gain a fundamental understanding of the finite element method for solving boundary value problems.
2. To gain the knowledge on fundamental concepts of the theory of the finite element method.
3. To understand the importance of numerical methods and how it will helpful to solve engineering problems.
4. To enrich with the knowledge of finite element method (MODELLING, analysis, and interpretation of results) to realistic engineering problems.

UNIT – I

FORMULATION TECHNIQUES: Methodology, Engineering problems and governing differential equations, finite elements. Variational methods-potential energy method, Rayleigh Ritz method, Galerkin and weighted residual methods, calculus of variations, Essential and natural boundary conditions.

UNIT – II

ONE-DIMENSIONAL FINITE ELEMENT METHODS: Bar elements, temperature effects. Element matrices, assembling of global stiffness matrix, shape functions. Application of boundary conditions, Elimination and penalty approaches, and solution for displacements, reaction stresses, and temperature effects, Quadratic Element, and problems on 2-noded 1-D bar Element, 3-noded 1-D bar element.

UNIT – III

TRUSSES, BEAMS & FRAMES: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses, temperature effects. Beams: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses. Plane Frames.

UNIT – IV

TWO DIMENSIONAL PROBLEMS:CST, LST, four-noded six-noded, rectangular elements, Lagrange basis for triangles and rectangles, serendipity interpolation functions. Axisymmetric Problems: Axisymmetric formulations, Element matrices, boundary conditions.

UNIT – V

FINITE ELEMENTS IN HEAT TRANSFER & STRUCTURAL DYNAMICS:1D, 2D Heat Transfer problems, Dynamic equations, Eigen value problems, and their solution methods, simple problems.

Outcomes:

After completion of the course, the student will be able to:

1. Apply the concepts of minimum potential energy principles to solve structural mechanics problems.
2. Develop element matrix equation by different methods.
3. Use FEM software's for the practical problems.
4. Find better alternative economic design with good features.

Text Books:

1. R. Chandraputla, D. Ashok & Belegundu, Introduction to Finite Elements in Engineering, Prentice Hall, Fourth Edition,2018.
2. J.N. Reddy, Finite Element Method in Heat transfer and fluid dynamics, CRC press, Third edition,2016
3. S S Rao, Finite Element Method, Fourth Edition,2015.
4. C.S. Krishna Murthy, Finite Element Analysis, Tata McGraw Hill,1994.

References:

1. O.C. Zienckiwicz& R. L. Taylor, Finite Element Method, Tata McGraw Hill,1983.
2. J. N. Oden, Finite Element of Nonlinear Continua, Tata McGraw Hill, New York, 1971.
3. K. J. Bathe, Finite Element Procedures, Prentice Hall,1996.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
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M.Tech - I Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM02) COMPUTER INTEGRATED MANUFACTURING

Objectives:

1. To enrich with the knowledge of automation strategies for effective manufacturing.
2. To provide knowledge of NC machines and programming.
3. Toimpartknowledgeofflexiblemanufacturingsystemsandgroupingconcepts.
4. To understand advanced materials management concepts such as MRP and JIT.

UNIT – I

FUNDAMENTAL CONCEPTS: Manufacturing and Automation, Automation Strategies, Economic analysis in production, fundamentals of CAD / CAM, product cycle and role of CAD/CAM, Automation and CAD/CAM, Scope of Computer Integrated Manufacturing, Automated flow lines, Transfer mechanisms-types and their suitability, Line balancing of automated lines- methods of line balancing.

UNIT – II

NUMERICAL CONTROL MACHINES: Introduction- basic components of an NC system- the NC procedure- NC coordinate system, NC motion control system- application of numerical control- Economics of Numerical control.

NC PART PROGRAMMING: Introduction - The punched tape - Tape code format - manual part programming. NC programming with manual data input. Computer Numerical Control (CNC), Direct Numerical Control(DNC).

UNIT – III

GROUP TECHNOLOGY: Part families, parts classification and coding, Opitz coding, production flow analysis, Composite part concept, Machine cell design, benefits of GT.
FLEXIBLE MANUFACTURING SYSTEMS: Components of FMS, FMS Work stations, Material Handling Systems, Computer Control system, FMS layout configurations and benefits ofFMS.

Unit – IV

COMPUTER AIDED PLANNING SYSTEMS: Approaches to Computer aided Process Planning (CAPP) - Generative and Retrieval CAPP systems, benefits of CAPP over manual planning systems.

MRP/JIT/ERP: Mechanism of MRP, benefits, Inputs to MRP, Lot sizing decisions, MRP II, Capacity Planning, Just in Time manufacturing and applications, Enterprise Resource Planning.

UNIT – V

CONTROL AND MONITORING IN MANUFACTURING: Adaptive control machining systems. Adaptive control optimization system, adaptive control constraint system, applications to machining processes, computer process monitoring, hierarchical structure of computers in manufacturing, and computer process control.

Outcomes:

After completion of the course the student will be able to:

1. Select appropriate automation strategy for improving manufacturing efficiency
2. Develop NC part programs and use NC machines effectively.
3. Performgroupingofmachinesandcomponentstoimproveutilizationofprocesslayouts.
4. Recommend appropriate materials management strategy of a manufacturing unit.

Text Books:

1. M.P. Groover, Automation, Production systems and Computer Integrated Manufacturing Systems,PHI Publishers, Fourth Edition,2016
2. M.P. Grooves & E.W. Zimmers Jr., CAD/CAM, Prentice Hall,2013

References:

1. K.Lalit Narayan, K.Mallikarjuna Rao &MMM.Sarcar, Computer Aided Design and Manufacturing, Printice Hall India Publishers,2008.
2. Radhakrishnan& Subramanian, CAD/CAM/CIM, New Age Publishers, 2nd Edition, 2000.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

M.Tech - I Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM03) AUTOMATED AND COMPUTER INTEGRATED MANUFACTURING SYSTEMS (ELECTIVE-I)

Objectives:

1. Understand principles and models of CIM.
2. Study the effectiveness of storage and transportation in automated systems.
3. To investigate principles of automated assembly system variants.
4. Educate the process control strategies applicable to automated systems.

UNIT - I

INTRODUCTION: Evolution of CIM, CIM wheel and cycle, Major elements of CIM system, Production concepts and mathematical models, Simple problems in production models, CIM hardware and software.

IMPLEMENTATION OF CIM: Computers in CIM, Computer networks for manufacturing, The future automated factory, Management of CIM, Impact of CIM on personnel, CIM current status.

UNIT - II

AUTOMATED PRODUCTION LINE: Comparison of manual and automated production lines, Criteria for designing manual and automated production lines, automated production line- system configurations, work part transfer mechanisms, Part delivery at workstations, applications of automated lines, analysis of transfer lines.

UNIT - III

AUTOMATED GUIDED VEHICLE SYSTEM: Types of vehicles and AGVs applications, Vehicle guidance technology, Vehicle management and safety.

AUTOMATED STORAGE & RETRIEVAL SYSTEMS: Storage system configuration and performance, storage location strategies – Conventional storage methods and equipments, Automated storage/Retrieval system and Carousel storage system

UNIT - IV

AUTOMATED ASSEMBLYSYSTEMS: Overview of generic material handling equipments, Consideration in material handling system design, The 10 principles of Material handling. Conveyor systems, Types of conveyors, Operations and features, basics of automated assembly systems, planning for single and mixed model systems, quantitative analysis of assembly systems.

UNIT - V

PROCESS CONTROL: linear feedback control systems, Sequence control and PLC, Computer process interface, Interface hardware, Computer process monitoring, Direct digital control and Supervisory computer control. Overview of Automatic identification methods, Bar code technology, Other Automatic data capture technologies.

Outcomes:

After completion of the course the student will be able to:

1. Solve problems of the production system involving automated elements.
2. Choice appropriate storage and transportation requirements of automated systems.
3. Design an assembly system involving single or multiproduct.
4. Apply appropriate process control strategy to an automated system.

Text Books:

1. M.P. Groover, Automation, Production systems and Computer Integrated Manufacturing Systems,PHI Publishers, Fourth Edition,2016
2. P. Radhakrishnan,S. Subramanian& V. Raju, CAD/CAM/CIM, New Age International Publishers, Third Edition,2008.

References:

1. James A.Retrg & Herry W. Kraebber, Computer Integrated Manufacturing, Pearson Education, Asia,2001.
2. N.Viswanathan&Y.Narahari, Performance MODELLING and Automated Manufacturing Systems, Prentice Hall of India Pvt. Ltd.,2000.
3. S.Kant Vajpayee, Computer Integrated Manufacturing, Prentice Hall of India, New Delhi,2007.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

M.Tech – I Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM04) ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS (ELECTIVE – I)

Objectives:

1. To learn fundamental concepts of AI.
2. To acquire knowledge based techniques.
3. To learn the logics used in AI applications.
4. To Learn expert systems and their advantages.

UNIT - I

ARTIFICIAL INTELLIGENCE: Introduction, definition, underlying assumption, Importance of AI, Ai & related fields State representations, Defining a problem , production system and its characteristics, search and control strategies- Introduction preliminary concepts, Uniformed or Blind search, Informed search, searching And –Or Graphs, Heuristic search techniques- Generate and test, hill climbing , best first search, problem reduction, Constraint satisfaction, Means-Ends Analysis. , examples of search problems

UNIT - II

KNOWLEDGE ACQUISITION AND REPRESENTATION ISSUES: Types of learning, General learning model, and performance measures. Representation and Mapping, Approaches to KR, Issues in KR, KR using rules, Procedural Vs Declarative Knowledge, Logic Programming, Forward Vs Backward reasoning, matching. Symbolic reasoning under uncertainty: introduction to Non monotonic reasoning and its logics.

UNIT - III

USE OF PREDICATE LOGIC: Representing simple facts in logic, Instance and Isa Relationships, Syntax and semantics for Propositional Logic and FOPL, and properties of Wffs, conversion to casual form, Resolutions , natural deduction. Introduction to Machine learning: Perceptions, checker playing examples, learning, Automata, Genetic Algorithms, Intelligent Editors.

UNIT - IV

STATISTICAL AND PROBABILISTIC REASONING: Probability and Bayer's theorem, Certainty factors and Rules based on systems. Basyesian networks, Dempster- Shafer Theory, Fuzzy Logic.

UNIT - V

EXPERT SYSTEMS AND TYPICAL EXPERT SYSTEMS: Introduction, structure and uses, Representing and using domain Knowledge, Expert system shells. Pattern recognition: introduction. Recognition, classification process, learning classification patterns, recognizing and understanding speech.

TYPICAL EXPERT SYSTEMS: MYCIN, Variants of MYCIN, prospector dendral, Pruff etc.

Outcomes:

After completion of the course students will able

1. To Understand search pattern and hunt for answers.
2. Use acquired knowledge in decision making.
3. To apply knowledge to manipulate the environment.
4. To use computer system with the decision-making capabilities of a human expert.

Text Books:

1. Elaine Rich & Kevin Knight, Artificial Intelligence, Tata McGraw Hill, Third Edition, 2019.
2. Dan W. Patterson, Artificial Intelligence and Expert Systems, Prentice Hall,1990.
3. Joseph C. Giarratano & Gary D.Riley, Expert systems, Thomson Course Technology, 2005.

Reference:

1. Nils J.Nillson, Principal of Artificial Intelligence, Springer,1982.
2. Patrice Hennry Wilston, Artificial Intelligence, Pearson Education, Inc. and Darling Kindersley publishing, Inc., 1992.

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M.Tech – I Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM05) DESIGN FOR MANUFACTURING
(ELECTIVE-I)

Objectives:

1. To obtain the knowledge about design philosophy, steps in designing for economical production.
2. To acquire the knowledge of material selection, interrelationship with manufacturing processes and methods.
3. To learn the effective utilization of materials and machines in casting, welding, forging and extrusion.
4. To understand the behaviour and design considerations of plastic materials.

UNIT - I

INTRODUCTION: Design philosophy - Steps in design process - General design rules for manufacturability - Basic principles of designing for economical production - Creativity in design

MATERIALS: Selection of materials for design - Factors determining process selection - Material selection interrelationship with process selection - Material selection methods

UNIT - II

WEAR MEASURING TECHNIQUES: Reasons for failure of cutting tools and forms of wear - Mechanisms of wear - Design for machining.

METAL CASTING: Comparisons of casting processes - Design of gating system - General design considerations for casting - Use of solidification simulation in casting design - Product design rules for sand casting.

UNIT - III

METAL JOINING: Principles of sound welding design - Design of welds subjected to combinedstresses-Estimationofweldingcosts-Stagesofweldinspectionandtesting.

FORGING: Design factors for forging - Closed die forging design - Parting lines of dies - Forging die design - General forging design recommendations.

UNIT - IV

EXTRUSION & SHEET METAL WORK: Direct extrusion process - Impact extrusion - Extrusion of tubing - Sheet metal characteristics - Bending and punching sheet metal plate - Deep drawing - Keeler Goodman forging limit diagram - Design of brazed joint

UNIT - V

PLASTICS: Viscoelastic and creep behaviour in plastics - Design guidelines for plastic components - Design considerations for injection moulding - Mechanisms of plastic deformation - Critical resolved shear stress for slip

Outcomes:

After completion of this course, the student will be able to:

1. Create a new design or modify the existing one based on principles of design.
2. Select a suitable material for a particular process effectively and economically.
3. Frame the optimal design for improved productivity.
4. Familiar with the design guidelines of the plastic components.

Text Books:

1. O.P. Khanna, Material science and metallurgy, Dhanapthrai& Sons, 2nd Edition, 2014.
2. John Cobert, Design for manufacture, Adisson Wesley,1995.
3. Boothroyd, Design for Manufacture, 2nd edition, CRC Press.

References:

1. ASM Hand book, Volume-XX, 1stEdition, ASM International Publishers,1997.
2. Dieter, Mechanical metallurgy, Tata McGraw Hill, Newyork,1972.
3. Kalpakjian, Serope, Schmid &R. Steven, Manufacturing engineering and technology, 4th edition, Printice Hall,2000.

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(AUTONOMOUS)

M.Tech - I Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM06) COMPUTATIONAL FLUID DYNAMICS (ELECTIVE-II)

Objectives:

1. To gain the basic mathematical representation of the governing equations of fluid flow and heat transfer.
2. To understand the fundamental concepts and problems solving techniques of FDM, FVM and different discretization techniques
3. To enable students to apply the grid generation techniques
4. Expose students to the computational complicities on various turbulence models.

UNIT –I

Governing Equations of Fluid flow and Heat Transfer: MODELLING of flow, control volume concept, substantial derivative, physical meaning of the divergence of velocity. Continuity equation, momentum equation, energy equation and its conservation form. Equations for viscous flow (Navier Stokes equations), Equations for inviscid flow (Euler equation)- Reynolds Transport Theorem, Exact Solution of Simplified Navier Stokes Equation – Parallel Flow, Blassius Solution for determining boundary layer over a flat plate

UNIT –II

Classification of Physical behavior and FDM: Elliptical, parabolic and hyperbolic equations. Finite difference discretization (FDM), Forward, backward and central difference, Order of accuracy, different types of errors and boundary conditions

Finite Volume Method (FVM) for Diffusion Problems: FVM for 1D and 2D steady state diffusion, Solution of discretized equations- TDMA scheme for 2D flow.

UNIT-III

FVM for Convection-Diffusion Problems: FVM for 1D steady state convection-diffusion, Central differencing scheme, Conservativeness, Boundedness, Transportiveness, Upward differencing scheme, Hybrid differencing scheme for 2D convection-diffusion, Power-law scheme, QUICK scheme.

FVM for Unsteady Flows: 1D unsteady heat conduction (Explicit, Crank-Nicolson, fully implicit schemes), Implicit methods for 2D problems, Discretization of transient convection diffusion problems

UNIT-IV

Solution Algorithm for Pressure-velocity Coupling in Steady Flows: Concept of staggered grid, SIMPLE, SIMPLER, SIMPLEC, PISO algorithm.

UNIT-V

Turbulence MODELLING: Basic equations of Turbulence: Derivation of turbulence using non-dimensional analysis, Reynolds averaging, Reynolds averaged N-S equations, Eddy viscosity hypothesis, Reynolds Stress Transport Equations. First order closures: k-ε two equation models, SST k-ω model. Large Eddy Simulations

Outcomes:

After completion of the course the student will be able to:

1. Analyze the governing equations of fluid flow and heat transfer
2. Explain the physical behavior of Finite difference discretization
3. Solve fluid flow fields using FVM for diffusion and diffusion-convection and unsteady flow cases problems.
4. Interpret the Solution Algorithm for Pressure-velocity Coupling in Steady Flows

Text Books:

1. H.K Versteeg and W Malalasekera (2010), An Introduction to Computational Fluid Dynamics, Prentice Hall, Second Edition, 2007

References:

1. S.V. Patankar Hemisphere (2004), Numerical Fluid Flow & Heat transfer,CRC press.
2. D.A.Anderson, J.C.Tannehill and R.H.Fletcher (2007), Computational Fluid Flow and Heat Transfer, Butterworth-Heincmann, NewYork.
3. Muralidhar, K., and Sundararajan, T. (2014), "Computational Fluid Flow and Heat Transfer", Narosa Publishing House, NewDelhi.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
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M.Tech – I Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM07) COMPUTATIONAL METHODS
(ELECTIVE – II)

Objectives:

1. To gain the knowledge for applying different numerical method to solve engineering problems.
2. To frame the boundary conditions using methods like shooting, Rayleigh ritz.
3. To solve parabolic, hyperbolic, partial differential equations using computer programs effectively.
4. To obtain the relation between inputs and outputs by curve fitting

UNIT - I

INTRODUCTION TO NUMERICAL METHODS APPLIED TO ENGINEERING PROBLEMS:

Examples - Solving sets of equations - Matrix notation - Determinants and inversion - Iterative methods - Relaxation methods - System of non-linear equations - Computer programs **NUMERICAL INTEGRATION:** Newton-Cotes integration formulas - Simpson's rules - Gaussian quadrature – Adaptive integration

UNIT - II

OPTIMIZATION: One dimensional unconstrained optimization – Multi-dimensional unconstrained optimization - Direct methods and gradient search methods - Constrained optimization

BOUNDARY VALUE PROBLEMS AND CHARACTERISTIC VALUE PROBLEMS:

Shooting method

- Solution through a set of equations - Derivative boundary conditions - Rayleigh-Ritz method - Characteristic value problems

UNIT - III

NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS: Laplace's equations, Representations as a difference equation, Iterative methods for Laplace's equations, Poisson equation, Examples, Derivative boundary conditions, Irregular and non– rectangular grids, Matrix patterns, Sparseness, ADI method - Finite element method

UNIT - IV

PARABOLIC PARTIAL DIFFERENTIAL EQUATIONS: Explicit method, Crank-Nickelson method, Derivative boundary condition, Stability and convergence criteria, Finite element for heat flow, Computerprograms

HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS: Solving wave equation by finite differences, Stability of numerical method, Method of characteristics, Wave equation in two space dimensions, Computerprograms

UNIT - V

CURVE FITTING AND APPROXIMATION OF FUNCTIONS: Least square approximation, Fitting of non-linear curves by least squares, Regression analysis, Multiple linear regression, Non-linear regression, Computer programs

Outcomes:

After completion of this course, the student will be able to:

1. Solve equations, matrices effectively for engineering problems.
2. Effectively use constrained and unconstrained, multi dimensional optimizations.
3. Frame and solve equations for different derivative boundary conditions.
4. Develop the regression models for mechanical problems.

Text Books:

1. Steven C. Chapra &Raymond P. Canale, Numerical Methods for Engineers, Seventh Edition, Tata McGraw hill,2016
2. Curtis F. Gerald & Partick O. Wheatly, Applied numerical analysis, Addison-wesley,7th Edition, 2006

References:

1. Ward Cheney & David Kincaid, Numerical mathematics and computing, Brooks/Cole publishing company 1999,4thEdition.
2. S. Rajasekaran, Numerical Methods in Science and Engineering,A Practical Approach, Wheeler Publishing,2005
3. P. Kandasamy, K. Thilagavathy& K. Gunavathy, Numerical methods, S. Chand & Co., New Delhi,2007.

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(AUTONOMOUS)

M.Tech - I Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM08) HYDRAULICS AND PNEUMATICS (ELECTIVE-II)

Objectives:

1. To study the principles and applications of Hydraulic and Pneumatic systems.
2. To learn hydraulic and pneumatic power and its control.
3. To use hydraulic and pneumatic actuators in industry.
4. To utilize automation in hydraulics and pneumatics.

UNIT – I

INTRODUCTION TO FLUID POWER : Fluids**-** Classification of fluids - properties of fluids - Fluid power system – Hydraulic power& its applications - Hydraulic ISO symbols - Pneumatic Power and its applications - Hydraulic & Pneumatic comparison

UNIT - II

FLUID POWER AND CONTROL ELEMENTS: Positive displacement Pumps - Gear, Vane, Piston and other special types of pumps – Control valves - Pressure Control valve, relief valve, Pressure reducing valve, Counter balance valve, sequence valve, Flow Control -Meter in Meter out, Bleed off, Pressure and Temperature compensated flow control valve - Direction Control - Spool valve, Check valve, Open centre, closed centre, Tandem centre, Cartridge valves,

UNIT – III

FLUID POWER ACTUATORS: Linear (S/T, D/T, Cushion) and rotary - Accessories in hydraulic systems – Accumulator, Pressure switches etc.- Hydraulic power packs - Servo valves - Torque motor - Electro-hydraulic Servo valves - Types and principles of operations - Maintenance of hydraulic systems and working fluid.

UNIT - IV

PNEUMATIC SYSTEMS: Air Compressor Reciprocating and rotary, Air Filter, Lubricators and Regulators, Air control valve, Quick Exhaust valves, Pneumatic actuators, Air Cylinders and Air motors, Servo system, PLC Automation, Pneumatic safety circuits

UNIT – V:

TROUBLESHOOTING: Selection fault finding and maintenance of hydraulic components - Electro pneumatic circuits. – Installation fault finding and maintenance of pneumatic components

Outcomes:

After completion of the course students will able:

1. To apply Hydraulic and Pneumatic systems in industry.
2. To control hydraulic and pneumatic systems.
3. To utilize hydraulic and pneumatic actuators in industry.
4. To apply automation in hydraulics and pneumatics.

Text Books:

1. H.E. Merritt, Hydraulic Control Systems, Wiley, Second Edition,2019.
2. Esposito, Fluid Power, Peaerson Education, Seventh Edition,2009.
3. Andrew Parr, Hydraulics & Pneumatics, Jaico Publishing House,1999.

References:

1. Antony espossito, Fluid Power with Applications, Prantice Hall,1980.
2. Harry L. Stewart, Pneumatics & Hydraulics, D.B. Taraporevala sons & co Pvt. Ltd, Bombay.
3. J.H.Pippenger& T.G. Hicks, Industrial Hydraulics, Tata McGraw Hill International Editions.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

M.Tech – I Sem

L	T	P	C
2	0	0	2

(20BMB21) RESEARCH METHODOLOGY

OBJECTIVES:

1. To introduce the students to concepts, objectives, and process of research.
2. To enable the students to formulate research problems and develop a coherent research design.
3. To introduce the students to instruments of data collection, tools for data analysis, and help them draw meaningful interpretations.
4. To enable the students to prepare research reports.

Unit-I:
Research: Meaning, Objective, Motivation in Research, Types of Research, Research Approaches, Research Process; Validity and Reliability in Research; Research Design: Features of Good Design, Types of Research Design, and Basic Principles of Experimental Design.

Unit-II:
Sampling Design: Meaning, Steps in Sampling Design, Characteristics of a Good Sample Design, Random Samples and Random Sampling Design; Measurement and Scaling Techniques: Errors in Measurement, Tests of Sound Measurement, Scaling and Scale Construction techniques, Forecasting Techniques, Time Series Analysis, Interpolation and Extrapolation.

Unit-III:
Methods of Data Collection: Primary Data, Questionnaire and Interviews, Collection of Secondary Data, Cases and Schedules. Professional Attitude and Goals, Concept of Research Excellence, Ethics in Science and Engineering, Frauds in Science and Research.

Unit-VI:
Correlation and Regression Analysis, Method of Least Squares, Regression Vs. Correlation, Correlation Vs. Determination, Types of Correlation and Their Specific Applications; Statistical Interference: Tests of Hypothesis, Parametric Vs. Non-Parametric Tests, Procedure for Testing Hypothesis, Use Statistical Techniques for Testing Hypothesis, Sampling Distribution, Sampling T Chi-Square Test, Analysis of Variance and Covariance, Multivariable Analysis

Unit V:
Interpretation of Data and Report Writing, Layout of a Research Paper, Techniques of Interpretation, Making Scientific Presentation at Conferences and Popular Lectures to Semi Technical Audience, Participating in Public Debates on Scientific Issues.

Outcomes*:*

After completion of the course, the students will be able to:

1. Explain the concepts, objectives, and process of research (Understanding).
2. Formulate the research problem and develop a sufficiently coherent research design (Creating).
3. Identify the measuring and scaling procedure used in research (Applying).
4. Use statistical tools for descriptive and inferential analysis (Applying).
5. Outline the key elements of report writing (Remembering).

Text Books:

1. Garg, C. K. (2019). Research Methodology: Methods and Techniques (4 ed.). New Delhi: New Age International Publisher.
2. Bhattacharyya, D. K. (2006). Research Methodology (2 ed.). New Delhi: ExcelBooks.
3. O. R. Krishnaswamy and D.Obul Reddy,(2009),Research Methodology and Statistical Analysis, Himalaya Publication, (2^{nd}Edition)

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
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	L	T	P	C
M.Tech – I Sem (CAD/CAM)	**0**	**0**	**4**	**2**

(20BCM09)MODELLING LAB

Objectives:

1. To understand the computer aided drafting software such as SOLID WORKS and CATIA.
2. Use understand various features in software.
3. To model the 3Dimages.
4. To understand the assembly and drafting techniques using software assistance.

Outcomes:

After completion of this course, the student will be able to:

1. Use Solid Works and Catia software toolbars and menus, draw and modify tools.
2. Model the 3D mechanical components with dimensioning.
3. Model the parts such as springs, automobile wheel etc.
4. Assembling and detailing of a given mechanical component using software assistance.

List of experiments:

1. **SOLIDWORKS**
   A. 2D Drawing of machine elements
   B. 3D drawing of machine elements
   C. 3D assembly drawing of machine elements
   D. Detail Drawing of machine elements

2. **CATIA**
   A. Sketcher
   B. Part design
   C. Assembly drawing of machine element
   D. Sheet metal design

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(AUTONOMOUS)

M.Tech-I Sem (CAD/CAM)	**L**	**T**	**P**	**C**
	0	**0**	**4**	**2**

(20BCM10) FINITE ELEMENT ANALYSIS LAB – I

Objectives:

1. Understand the general steps of finite element methods.
2. Understand the basic finite element formulation techniques.
3. Understand the simply finite element packages to solve linear problems.
4. Understand the general-purpose F.E. packages to model and analyze real structures.

List of experiments:

1. Analysis of cantilever beam using ANSYS Workbench
2. Two dimensional truss using ANSYS Workbench
3. 3D Plane stress rectangular block with hole using ANSYS Workbench
4. Buckling analysis on linear materials using ANSYS Apdl
5. Analysis of bracket using ANSYS Apdl
6. Creation and analysis of solid model – I Using ANSYS Apdl
7. Creation and analysis of solid model – II Using ANSYS Apdl
8. Application of distributed loads Using ANSYS Apdl
9. Non–linear analysis of a cantilever beam Using ANSYS Apdl
10. Buckling analysis on linear materials Using ANSYS Apdl

Outcomes:

After completion of the course, the student will be able to:

1. Derive equations in finite element methods for 1D, 2D and 3Dproblems.
2. Formulate and solve basic problems in heat transfer, solid mechanics and fluid mechanics.
3. Demonstrate a knowledge and understanding of Fundamentals of the finite element method as an approximation method for analysis of a variety of engineering problems.
4. Analyze a real component using a finite element package. This includes:
   a. Geometric modelLing of component
   b. Applying boundary conditions
   c. Solving for stresses and strains
   d. Making Design changes as suggested by the analysis.

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(AUTONOMOUS)

M.Tech I semester (CAD/CAM)

L	T	P	C
2	0	0	0

(20BCM11) HUMAN VALUES AND PROFESSIONAL ETHICS
(Audit Course)

Unit I:

HUMAN VALUES: Morals, Values and Ethics - Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty - Courage- Co Operation – Commitment – Empathy –Self Confidence Character – Spirituality.

Unit II:

ENGINEERING ETHICS: Senses of Engineering Ethics- Variety of moral issues – Types of inquiry – Moral dilemmas – Moral autonomy – Kohlberg's theory- Gilligan's theory- Consensus and controversy – Models of professional roles- Theories about right action- Self interest Customs and religion –Uses of Ethical theories – Valuing time –Co operation – Commitment.

Unit III:

ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering As Social Experimentation – Framing the problem – Determining the facts – Codes of Ethics – Clarifying Concepts – Application issues – Common Ground - General Principles – Utilitarian thinking respect for persons.

UNIT IV:

ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK: Safety and risk – Assessment of safety and risk – Risk benefit analysis and reducing risk Safety and the Engineer- Designing for the safety- Intellectual Property rights (IPR).

UINIT V:

GLOBAL ISSUES: Globalization – Cross culture issues- Environmental Ethics – Computer Ethics – Computers as the instrument of Unethical behavior – Computers as the object of Unethical acts – Autonomous Computers- Computer codes of Ethics – Weapons Development Ethics.

Text Books:

1. "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt.Ltd-2009.
2. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger – Tata McGrawHill– 2003.

Reference Books:

1. “Professional Ethics and Morals” by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.
2. “Professional Ethics and Human Values” by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran , Laxmi Publications.

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(AUTONOMOUS)

M.Tech-IISem(CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM12) OPTIMIZATION THEORY & PRACTICE

Objectives:

1. To enrich with the knowledge for solving problems using linear programming.
2. Tomasterdifferentoptimizationtechniquesusingclassicalandnumericaltechniques.
3. To equip with the concepts of genetic algorithms, neural networks, and Petrinets to solve some practical problems.
4. To provide a base for SQC techniques, experimental design, Taguchi concepts, and orthogonal experimentation.

UNIT - I

LINEAR PROGRAMMING: Review of fundamentals, Two-phase simplex method, Big-M method, duality, Relationship between primal and dual, Applications.

ASSIGNMENT MODELS: Hungarian algorithm, Degeneracy, Applications of Transportation & Assignment models, Balanced and Unbalanced problems, Variations of assignment problems, Travelling salesman problem, Asymmetric and symmetric problems, Case studies.

UNIT – II

CLASSICAL OPTIMISATION TECHNIQUES: Single variable optimization with and without constraints, Multivariable optimization without constraints, Multivariable optimization with constraints- Method of Lagrange multipliers, Kuhn-Tucker conditions.

NUMERICAL METHODS FOR OPTIMISATION: Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Types of penalty methods for handling constraints.

UNIT –III

GENETIC ALGORITHM (GA): Differences and similarities between conventional and evolutionary algorithms, Working principle, Reproduction, Crossover, Mutation, Termination criteria, Different reproduction and crossover operators, GA for constrained optimization, Draw backs ofGA.

NEURAL NETS: Organisation of the brain, Biological and artificial neuron models, Characteristics of ANN, McCulloch-Pitts model, Types of neuron activation function, ANN connectivity, Learning strategies, Learning rules.

UNIT- IV

PETRINETS: Basic concepts of Petrinets and their use in MODELLING of discrete-event systems, Classification of Petrinets, Methods of analysis of Petrinets, Modelling and simulation of real life situations, Conflict resolving, Applications and Limitations ofPetrinets.

PROCESS CONTROL: Process capability studies, Statistical quality control tools, Seven tools, Industrial applications, Six sigma sustainability, Case studies.

UNIT -V

DESIGN OF EXPERIMENTS: Analysis of Variance, Full and fractional design of experiments, Orthogonal experimentation, Taguchi method of Robust Design- two steps of optimization, types of quality loss functions-LTB, STB, NTB, P-Diagram, Selection of quality characteristics. Analysis of means, Analysis and verification of sexperiments.

Outcomes:

After completion of the course the student will be able to:

1. Select an appropriate model and solve using LP.
2. Solve real life problems involving single or multi variables.
3. Compare and adopt the solutions obtained by modelling using genetic algorithms, neural networks, and Petrinets.
4. Design the experimentation and use appropriate SQC technique and control quality.

Text Books:

1. S.S. Rao, Engineering Optimisation, Theory and Practice, New age publishers,Third Enlarged Edition,2013.
2. D.C. Montgomery, Design and Analysis of Experiments, 10^{th} edition, John Wiley and Sons, New York,2019.

References:

1. J.L. Peterson, Petrinet theory and MODELLING of systems, Prentice Hall,1983.
2. D.E. Goldberg, Genetic Algorithms in Search, Optimisation and Machine Learning, Addision Wesley publishers,1989
3. Jasbir S. Arora, Optimal Design, Tata McGraw Hill Publishers,1989.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

M.Tech – II Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM13) ADDITIVE MANUFACTURING

Objectives:

1. To enrich with the knowledge of basic principles additive manufacturing(AM)
2. Understand importance of design, fabrication and material science for additive manufacturing.
3. Learn the process modelling for additive manufacturing.
4. Learn the Rapid Tooling utilizing Rapid Prototyping

UNIT - I

Basics and Principles: Basics and Principles of Additive Manufacturing (AM), Additive Manufacturing Processes, Extrusion, Beam Deposition, Jetting, Sheet Lamination, Direct-Write, Photo-polymerization, Sintering, Powder Bed Fusion

UNIT - II

Design/Fabrication Processes: Data Sources, Software Tools, File Formats, Model Repair and Validation, Pre- & Post-processing, Reverse engineering: digitizing, laser scanning, CT-scanning, point cloud manipulation, data segmentation, surface reconstruction, model further processing.

Materials Science for AM: Materials Science for Additive Manufacturing- Polymer and Photo-polymerization, Process& Material Selection, Direct Digital Manufacturing and AM; parts and their uses. Process Monitoring and Control for AM-Defects, Geometry, Composition, Temperature, Phase Transformation.

UNIT - III

Design for Additive Manufacturing: Design for Additive Manufacturing, Multiple Materials, Hybrids, Functionally Graded Materials, Composite Materials, current and future directions; Process MODELLING of AM process- Design optimization through finite-element MODELLING of AM- Simulation of phase transformations- heating, melting, forming, solidification and finishing and rheological studies of various AM materials.

UNIT - IV

Rapid Tooling: An Automotive Perspective to Rapid Tooling utilizing Rapid Prototyping and Manufacturing, Precision Strati form Machining, CAD/LAM- integration of CAD with CAM laser cutting, Profile Edge Lamination, Slice Control Machining, Subsequent Casting Operations, Rubber Mold Casting, Plaster/Sand Molding, Spin Casting, prototyping methodology for automotive product development.

UNIT - V

Nickel Vapor Deposition : Nickel Ceramic Composite (NCC) Tooling from RP & Models, NCC Tools Based On Stereo lithography Models, Integration of Tool Forming With RP&M, Compression Tooling Nickel Vapor Deposition Technology-Need for NVD, NVD applications, properties of NVD nickel, comparison between NVD and Electroformed nickel tooling, comparison between NVD and Conventional tooling

Applications and Future Directions of AM: Applications of AM: Aerospace, Automotive, Biomedical Applications of AM, Product Development, Commercialization, Trends and Future Directions in Additive Manufacturing

Outcomes:

At the end of the course the student will be able to:

1. Demonstrate the advanced concepts in additive manufacturing (AM) of materials and explain their operating principles, capabilities, and limitations
2. Design the fabrication process of AM materials and the material science aspects of AM
3. Apply the Design for Additive Manufacturing
4. Evaluate the Rapid prototyping process and Future Directions of AM

Text Books:

1. 1.Ian Gibson, David Rosen, Brent Stucker,(2015), Additive Manufacturing Technologies, Springer-Verlag US2010.

Reference Books:

1. Dongdong Gu, (2014), Laser Additive Manufacturing of High-Performance Materials, Springer Publicatin.
2. Andreas Gebhardt, (2011), Understanding Additive Manufacturing, HanserPublishers
3. Hopkinson, Hague, Dickens, (2005), Rapid Manufacturing: An Industrial Revolution for the Digital Age.Wiley

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

M.Tech - II Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM14) MECHATRONICS
(Elective-III)

Objectives:

1. To know about different control systems in Mechatronics systems.
2. To get the knowledge of signal conditioning process.
3. To understand microcontrollers and PLCs working technology.
4. To motivate the students towards automation and machine vision technologies.

UNIT-I

MECHATRONICS SYSTEMS : Measurement & control systems - Sensors and transducers – types - displacement, position, proximity, velocity, motion , force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature and light sensors, Open loop & closed loop control, Feedback control & Feed forward control, Fundamental concepts of adaptive and fuzzy Logic control, Sequential Logic control, Microprocessor based controllers,

UNIT-II

HYDRAULIC AND PNEUMATIC ACTUATING SYSTEMS: Fluid systems, Hydraulic and pneumatic systems, Components, Control valves, Electro-pneumatic, Electro-hydraulic, Servo Systems, Mechanical actuating systems and Electrical actuating systems.

UNIT-III

DIGITAL ELECTRONICS AND SYSTEMS: Digital logic control, Programmable logic controllers, Internal relays, shift registers, Timers and counters, PLCs versus computers, Intelligent Machine Vs Automatic machine, Application of PLCs for control

MODELLING AND SIMULATION OF MIXED SYSTEMS: Introduction, Electronics and Mechanics, Model Transformation, Domain-Independent Description Forms, Simulator Coupling

UNIT-IV

MICROPROCESSOR: Architecture, memory segmentation, addressing modes, assembly language programs, pin diagram of 8086 - minimum mode and maximum mode of operation, Interfacing memory (static RAM and ROM) – 8255 PPI

UNIT-V

MICROCONTROLLERS: Architecture – Registers – I/O ports and memory organization - addressing modes – Instrumentation set, simple assembly language programming examples using 8051

Outcomes:

After completion of the course students will able:

1. To use automation process with different control systems.
2. To use the knowledge of signal conditioning process in Mechatronics.
3. To utilize microcontrollers and PLCs in automation.
4. To apply machine vision technology in automation.

Text Books:

1. K.P. Ramachandran & G. K .Vijaya Raghavan, Mechatronics Integrated Mechanical Electronics Systems, WILEY India Edition,2008.
2. W. Bolton, Mechatronics – Electronic Control Systems in Mechanical and Electrical Engg. 4thEdition, Pearson,2012.
3. R.P. Jain, Modern digital electronics, Tata McGraw Hill,2003.
4. Pelz, G. and Waddington, R., 2004. Mechatronic systems. J.Wiley.

References:

1. A.K. Ray and K.M. Bhurchandi, Advanced microprocessor and peripherals, 2ndedition, TMH,2000.
2. Mikell P. Groover, Mitchell Weiss, Roger N. Nagel & Nicholas G.Odrey, Industrial Robotics, Tata McGraw Hill,1996
3. Newton C Braga, Mechatronics Source Book, Thomson Publications,Chennai.
4. M.D. Singh & J.G. Joshi, Mechatronics, Printice Hall India,2006.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

M.Tech – II Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM15) ADVANCED VIBRATION ENGINEERING
(ELECTIVE-III)

Objectives:

1. To gain the knowledge on basic concepts involve in vibrations
2. To learn the concepts of Mechanical vibrations single, two and multi degree freedom systems
3. To understand the numerical techniques for analysis of complex structures
4. To gain the knowledge on experimental techniques such as modal testing to identify natural frequencies and mode shapes.

UNIT- I

Introduction to Vibrations: Free and Forced Vibration analysis of single degree of freedom- Undamped and viscously damped vibrations-Measurement of damping-Response to Periodic, Harmonic and Non-periodic Excitations

UNIT-II

Two degree of freedom system: Free and Forced vibration analysis-Coordinate transformation and linear superposition- Vibration Absorption and Vibration Isolation

Multi degree of freedom system: Stiffness and Flexibility matrix- Eigen Value formulation- Lagrange's method-Principle of Orthogonality- Modal matrix and modal analysis of multi DOF

UNIT-III

Approximate numerical methods: Rayleigh's Method, Matrix inversion method, Stodola's method, Holzer's method, Transfer Matrix method

Vibrations of Continuous systems: Vibration analysis of strings- Vibration of bar-Vibration of beams by Euler's equation-Effect of rotary inertia and shear deformation effects-Effect of axial force

UNIT-IV

Experimental methods: Vibration exciters and measuring instruments- Free and forced vibration tests- Signal analysis-Industrial case studies

Random Vibration: Probability density function- Stationary and ergodic process- Auto-correlation function- Power spectral density-Narrow band and wideband random processes- Response of single and Multi-DOF systems.

UNIT-V

Non-linear vibration: Fundamental concepts in stability and equilibrium points-Perturbation technique- Duffing equation, Phenomena of Jump, vibration analysis of a simple pendulum with non-linear behavior Contemporary Discussion.

Outcomes:

After completion of the course, the student will be able to:

1. Apply concepts of Mechanical vibrations single, two and multi degree freedom systems and in continuous, Non-linear and Random Vibration concepts.
2. Demonstrate the classical vibration theories, relating to discrete and continuous systems with applications.
3. Use and apply various numerical techniques for analysis of complex structures Perform various experimental techniques such as modal testing to identify natural frequencies and mode shapes.
4. Analyze various measurements of vibration techniques in structures and employ suitable control techniques

Text Books:

1. S. S. Rao, "Mechanical Vibrations" Pearson India, 6th Edition2016.
2. Kelly SG "Mechanical Vibrations" CL Engineering 1st Edition,2011

References:

1. Dukkipati RV, "Advanced Mechanical Vibrations", Narosa Publications,2008.
2. Benson H. Tongue, "Principles of Vibrations", Oxford University Press, Delhi,2012.
3. W.T. Thomson, M.D. Dahleh, "Theory of Vibrations with applications",PearsonNew International 5th Edition,2013.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

M.Tech - II Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM16) VEHICLE AERODYNAMICS (ELECTIVE-III)

Objectives:

1. To provide the students with sufficient background to understand the aerodynamics of road vehicles.
2. Enable the students to understand the dynamics of the road vehicles influenced by wing forces
3. Enable the students to understand the stability, safety and comfort of road vehicles.
4. To study about experimental aerodynamics and on-field testing.

UNIT - I

Introduction to Road Vehicle Aerodynamics: Basic principles of road vehicle aerodynamics; evolution of road vehicles; borrowed shapes; streamlining era; parametric studies; one-volume bodies; bathtub bodies; commercial vehicles; motorcycles; shape and detail optimization; futuristic trends; performance analysis of cars and light Trucks.

UNIT - II

Motion dynamics: vehicle equation of motion; aerodynamic drag; tire rolling resistance; climbing resistance; effective mass; traction diagram; acceleration capability and vehicle elasticity; fuel consumption and economy; gear-ratio re-matching; EPA driving cycles – urban, highway, combined; low fuel consumption strategies.

UNIT -III

Directional Stability, Safety and Comfort: Flow field around a vehicle; interior and exterior flows; attached, separated and oscillating flows; aerodynamic forces and moments; cornering and side wind behaviors; stability index; passing maneuvers; spoiler design; safety and aesthetics; water and dirt accumulation; visibility impairment; ventilation, air flow and odor removal. Engine and interior cooling; radiators; HVAC systems.

UNIT -IV

Race Car, High performance and Commercial Vehicle: Race cars: Front wings, Rear wings, Weight distribution, Over steer and Under steer, Center of gravity effects, Split streaming.

Commercial vehicle aerodynamics: Truck Aerodynamics, Improvements in design, Different styles of trailers, Effect of gap between truck and trailer, fairings

UNIT- V

Measurement and Testing Techniques: Wind tunnel and on-road testing techniques; classification and design of wind tunnels; instrumentation and data acquisition; wind tunnel components and corrections; road testing methods; cross-wind and engine cooling tests; soiling, water and dirt accumulation, visibility measurements on road; wind noise models, analysis and measurement.

Outcomes:

After completion of the course the student will be able sto:

1. Demonstrate the aerodynamics of road vehicles
2. Apply principles of motion dynamics in real time vehicles.
3. Analyze the Stability, Safety and Comfort techniques for vehicles on-road
4. Demonstrate the measurement and Testing Techniques for high performance of road vehicles.

Text Books:

1. Theory and Applications of Aerodynamics for Ground Vehicles- T. YomiObidi. Published by SAE, 2014, ISBN 978-0-7680-2111-0.

Reference Books:

1. Competition Car Aerodynamics, A Practical Hand Book, 3rd Edition, Simon McBeath, Willem Toet, Published by Veloce Publishing, 2015 ISBN978-1845847760.
2. Aerodynamics of Road Vehicles, W.H.Hucho, Published by SAE International, 2015
3. Low Speed Wind Tunnel Testing, 3rd Edition, Jewel B. Barlow, William H. Rae Jr., Alan Pope, Wiley India Pvt Ltd,2010.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

M.Tech - II Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM17) NON-DESTRUCTIVE EVALUATION
(ELECTIVE-IV)

Objectives:

1. To study the X-Ray and Gamma-ray radiography.
2. To gain the knowledge of different ultrasonic tests and their uses.
3. To understand Principle of thermography and radiography
4. To apply the non destructive tests to pressure vessels, piping, castings and welded constructions.

UNIT - I

NON-DESTRUCTIVE TESTING: Introduction to various non-destructive methods - Comparison of destructive and nondestructive tests - Visual inspection - Optical aids used for visual inspection - Applications

LIQUID PENETRANT TESTING: Physical principles - Procedure for penetrant testing - Penetrant testing materials - Penetrant testing methods - Water washable, Post–emulsification methods - Applications

UNIT - II

EDDY CURRENT TESTING: Principles - Instrumentation for ECT – Absolute - Differential probes - Techniques – High sensitivity techniques - Multi frequency - Phased array ECT - Applications

UNIT - III

ACOUSTIC EMISSION & LEAK TESTING: Principle of AET – Instrumentation - Applications - Testing of metal pressure vessels - Fatigue crack detection in aerospace structures - Measurement of leakage - Leak testing methods

MAGNETIC PARTICLE TESTING: Principle of MPT - Procedure used for testing a component Equipment used for MPT - Magnetizing techniques -Applications

UNIT - IV

ULTRASONIC TESTING: Principle - Ultrasonic transducers - Ultrasonic Flaw detection Equipment - Modes of display - A-Scan, B-Scan, C-Scan – Applications - Inspection Methods Normal Incident Pulse-Echo Inspection - Normal Incident Through-transmission testing, Angle Beam Pulse-Echo testing - Applications of Normal Beam Inspection in detecting fatigue cracks - Inclusions, Slag, Porosity and Inter granular cracks

UNIT – V

THERMOGRAPHY: Principle of Thermography - Infrared Radiometry - Active Thermography measurements - Applications – Imaging entrapped water under an epoxy coating - Detection of carbon fiber contaminants

RADIOGRAPHY : Principle of Radiography - Effect of radiation on film - Radiographic imaging - Inspection techniques – Single wall single image, double wall penetration, multiwall penetration technique - Real time radiography

Outcomes:

After completion of this course, the student will be able to:

1. Critically analyse industrial problems and suggest appropriate NDT method.
2. Make an effective evaluation of ultrasonic tests like transmission and pulse echo methods, A, B, C, F and P-scan modes.
3. Detect carbon fiber content and effect radiation on film.
4. Identify the defects in pressure vessels, piping, castings and welded constructions using non destructive tests.

Text Books:

1. Baldev Raj, T. Jeyakumar& M. Thavasimuthu, Practical Non Destructive Testing, Narosa publishing house, New Delhi,2002.
2. J.Krautkramer, Ultra Sonic Testing of Materials, 1st Edition, Springer – Verlag Publication, New York,1996.

References:

1. Peter J. Shull, Non Destructive Evaluation - Theory, Techniques and Application, Marcel Dekker, Inc., New York, 2002.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

M.Tech - II Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM18) QUALITY ENGINEERING
(ELECTIVE-IV)

Objectives:

1. To understand the basic principles of the total quality management.
2. To obtain the knowledge of systematic procedure for maintaining the records of the organization and environmental issues.
3. To identify the causes of defects those are formed in the production system.
4. To obtain the knowledge of benchmarking.

UNIT –I

QUALITY VALUE AND ENGINEERING: Definition of TQM, approaches, elements, principles, pillars, models. Crosby's 14 steps to quality improvement.

QUALITY ASSURANCE SYSTEMS: Definition, objection, major elements, manual, management principles, forms, quality planning, FMEA.

UNIT –II

ISO9000, Series of standards, Benefits of ISO9000, ISO9001 Requirements, Documentation, Registration. ISO14000, Series of standards, Concept of ISO14001, Requirements of ISO14001, Benefits of EMS.

UNIT-III

STATISTICAL PROCESS CONTROL: Process capability, old and new seven tools of quality, Control charts for variables, Control Charts for attributes, problems on control charts, setting of product tolerances.

UNIT-IV

QUALITY IMPROVEMENT TECHNIQUES– definition, types, merits, models, phases. Business process reengineering-definition, 6 R's of Business process, Quality circles.

UNIT-V

DESIGN OF EXPERIMENTS: Introduction, task aids and responsibilities for DOE process steps, DOE process steps description. Analysis of variance (ANOVA): one way ANOVA, two way ANOVA, critique of F-test, ANOVA for four level factors, multiple level factors.

TAGUCHI METHODS– 5s principles, quadratic loss function, analysis, robust design.8-point approach. Computer aided quality control.

Outcomes:

After completion of the course the student will be able to:

1. Acquires the knowledge of basic principles of TQM.
2. Maintain the records of the organization and environmental issues.
3. Identify the various causes for the defects in the production system.
4. Promotes the idea to reduce the wastage during production.

Text Books:

1. AmitivaMitra, Fundamentals of Quality control and improvement,Willey Publications, 2000.
2. Dale H. Besterfiled, Total quality management, Pearson Education, Inc,2003.
3. K.C. Arora, Total quality management, S.K. Kataria& Sons,2005.

References:

1. Senthil Arasu, Total quality management, SciTech Publications,1999.
2. V. Narayana & N.S. Sreenivasan, Quality Management – Concepts and Tasks, New Age International1996.
3. A.V.Feigenbaum,Total Quality Management, Tata McGraw Hill,1991.

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M.Tech – II Sem (CAD/CAM)

L	P	T	C
3	0	0	3

(20BCM19) MECHANICS AND MANUFACTURING OF COMPOSITES
(ELECTIVE-IV)

Objectives:

1. To gain the knowledge on fundamentals of composite material strength and its mechanical behavior
2. To understand the variety of composite materials, metals and alloys from the point of view of their industrial applications.
3. To know manufacturing methods of composites for economic production.
4. To understand methods of analysis to help effective product design.

UNIT - I

INTRODUCTION TO COMPOSITE MATERIALS: Definition – Need – General characteristics - Natural and manmade composites – Applications - Aircrafts, missiles, space, automobile, electrical and electronics, marine, recreational and sports equipment - Future potential of composites Types and classification of composites-advantages-disadvantages over metals.

REINFORCEMENTS: Fibers – glass, silica, carbon, Kevlar, silicon boride, boron carbide and aramid - Fibers matrices – Polymer, graphite, ceramic and metal matrices – Characteristics of fibers and matrices – Fiber – Polymer - Laminated and particulate composites - Prepegs and sandwich construction

UNIT – II

MANUFACTURING: Layup and curing - Open and closed mould processing - Hand layup techniques - Bag moulding and filament winding – Pultrusion – Pulforming – Autoclave – RTM – Thermoforming - Injection moulding – Cutting - Machining and joining.

UNIT – III

MACRO MECHANICAL ANALYSIS OF A LAMINA: Hooke's law for different types of materials - Hooke's law for a 2D unidirectional lamina - Plane stress assumption - Reduction of Hooke's law in 3D to 2D - Relationship of compliance and stiffness matrix to engineering – Elastic constants of a lamina - Hooke's law for a 2D angle lamina - Engineering constants of an angle lamina - Invariant form of stiffness and compliance matrices for an angle lamina, Failure Criteria of Lamina.

UNIT - IV

MICRO MECHANICAL ANALYSIS OF A LAMINA: Introduction - Volume and mass fractions - Density - Void content - Evaluation of the four elastic moduli - Strength of materials approach - Semi-empirical models - Elasticity approach - Elastic moduli of lamina with transversely isotropic fibers - Ultimate strengths of unidirectional lamina - Coefficients of thermal expansion.

UNIT – V

ANALYSIS OF LAMINATED COMPOSITE PLATES: Introduction - Laminate code – Stress- strain relations for a laminate - In-plane engineering constants of a laminate – Flexural engineering constant of a laminate - Hydrothermal stresses and strains

FAILURE, ANALYSIS, AND DESIGN OF LAMINATES: Introduction - Special cases of laminates - Failure criterion for a laminate - Design of a laminated composite - Other mechanical design issues - Sandwich composites - Long-term environmental effects – Inter laminar stresses - Impact resistance - Fracture resistance - Fatigue resistance

Outcomes:

After completion of the course, the student will be able to:

1. Replace the components made by metals based on composite material strength and behavior
2. Select the appropriate composite material based on the functional requirements of a product.
3. Compare production operations and choose the right method based on economy and environmental degradation.
4. Perform failure analysis and design a product for effective performance.

Text Books:

1. Autar K. Kaw, Mechanics of composite materials, CRC Press, NewYork.
2. L.R. Calcote, Analysis of Laminated Composite Structures, Van NostrandRainfold, New York,1969.
3. B.D. Agarwal & L.J. Broutman, Analysis and performance of fibre Composites, Wiley Inter science, New York,1980.

References:

1. R.M. Joness, Mechanics of Composite Materials, Tata McGraw Hill, KogakushaLtd.
2. Michael W. Hyer, Stress analysis of fiber Reinforced Composite Materials, Tata McGraw HillInternational.
3. Vasiliev&Morozov, Advanced Mechanics of Composite Materials, Elsevier, Second Edition.

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M.Tech – II Sem (CAD/CAM)

L	P	T	C
0	0	4	2

(20BCM20) MINI PROJECT

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M.Tech-II Sem (CAD/CAM)

L	T	P	C
0	0	4	2

(20BCM21) FINITE ELEMENT ANALYSIS LAB – II

Objectivses:

1. To understand the Finite Element method using Analysis Software.
2. To understand the Steady state Thermal Analysis of different shapes.
3. To understand the Transient state of Thermal Analysis.
4. To understand the Heat flux, energy equations.

LIST OF EXPERIMENTS:

FE Analysis using Ansys Package for different structures that can be
Discredited with 1-D, 2-D & 3-D elements to perform the following analysis:

1. Introduction of Thermal Analysis, with steady & unsteady states.
2. Thermal analysis of temperature distribution in a 2-D fin cooled electronic components.
3. Temperature distribution in a 3-D fin cooled electronic component.
4. Heat flux analysis of a composite slab.
5. Heat flux analysis of a cylindrical rod.
6. Transient heat transfer analysis of a rectangular slab.
7. Heat flux analysis of a spear.
8. CFD Analysis of circular tube
9. Coupled structural/Thermal analysis.
10. Experiment to view the X-Sectional results using paths to post process results.

Outcomes:

After completion of the course, the student will be able to:

1. Understand the concept of FEM.
2. Apply the FEM technology for Structural, Thermal & Fluid flow Analysis.
3. Make familiar of the use of CAE Software.
4. Make familiar of the use of Mass, moment, energy conservation of fluid flow.

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	L	T	P	C
M.Tech-II Sem (CAD/CAM)	**0**	**0**	**4**	**2**

(20BCM22) CAM LAB

Objectives:

1. To impart CNC part programming skills for turning and milling applications.
2. To give a good exposure of CAM software in order to perform Simulation and to generate CL data.
3. To understand G&M Codes for different applications.
4. To understand Grooving and slotting operations through CNC Codes.

LIST OF EXPERIMENTS:

CAM

CNC LATHE

1. Introduction of G & M Codes
2. Facing Cycle
3. Turning Cycle
4. Drilling Cycle
5. Grooving Cycle
6. Taper Turning Cycle
7. Step Turning Cycle

CNC Milling

1. Linear & circular interpolation
2. Mirroring
3. Circular pocketing
4. Rotation
5. Rectangular pocketing

Outcomes:

After completion of the course, the student will be able to:

1. ApplythebasicconceptsinNCtechnologyforturningandmillingapplications.
2. Make familiar of the use of CAE and CAM Software.
3. Concepts of CNC Lathe & milling operations.
4. Concepts of different stages of motions (Linear, Circular) in CNC Machines.

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M.Tech-II Sem (CAD/CAM)

L	T	P	C
2	0	0	0

(20BCM23) INTELLECTUAL PROPERTY RIGHTS
(Audit Course)

Objectives:

1. Understanding, defining and differentiating different types of intellectual properties (IPs) and their roles in contributing to organizational competitiveness.
2. Understanding the Framework of Strategic Management of Intellectual Property(IP).
3. Appreciating and appraising different IP management (IPM) approaches and describing how pioneering firms initiate, implement and manage IPM programs,
4. Explaining how to derive value from IP and leverage its value in new product and service development
5. Exposing to the Legal management of IP and understanding of real life practice of IPM.

UNIT – I

Introduction To Intellectual Property: Introduction, Types Of Intellectual Property, International Organizations, Agencies And Treaties, Importance Of Intellectual Property Rights.

UNIT – II

Trade Marks : Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.

UNIT – III

Law Of Copy Rights : Fundamental Of Copy Right Law, Originality Of Material, Rights Of Reproduction, Rights To Perform The Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice Of Copy Right, International Copy Right Law.

Law Of Patents : Foundation Of Patent Law, Patent Searching Process, Ownership Rights And Transfer

UNIT – IV

Trade Secrets : Trade Secrete Law, Determination Of Trade Secrete Status, Liability For Misappropriations Of Trade Secrets, Protection For Submission, Trade Secrete Litigation.
Unfair Competition : Misappropriation Right Of Publicity, False Advertising.

UNIT – V

New Development Of Intellectual Property: New Developments In Trade Mark Law ; Copy Right Law, Patent Law, Intellectual Property Audits.

International Overview On Intellectual Property, International – Trade Mark Law, Copy Right Law, International Patent Law, International Development In Trade Secrets Law

Outcomes:

After completion of the course, the student will be able to:

1. Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.
2. Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
3. Be familiar with the processes of Intellectual Property Management (IPM) and various approaches for IPM and conducting IP and IPM auditing and explain how IP can be managed as a strategic resource and suggest IPM strategy.
4. Be able to demonstrate a capacity to identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing;

TEXT BOOKS& REFERENCES:

1. Intellectual Property Right, Deborah. E. Bouchoux, CengageLearing.
2. Intellectual Property Right – Nleashmy The Knowledge Economy, Prabuddha Ganguli, Tate Mc Graw Hill Publishing CompanyLtd.,

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M.Tech - III Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM24)GEOMETRIC MODELLING
(ELECTIVE-V)

Objectives:

1. To understand the graphic system and their fundamental to apply in various needs.
2. To recognize the 2D viewing and geometrical transformations.
3. To know how the software perform clipping of the object & fill the polygons.
4. To be familiar with different computer animation sequence and techniques

UNIT – I

INTRODUCTION: Definition, Explicit and implicit equations, parametric equations.

CUBIC SPLINES : Algebraic and geometric form of cubic spline, tangent vectors, parametric space of a curve, blending functions, four point form, reparametrization, truncating and subdividing of curves. Graphic construction and interpretation, composite pc curves.

UNIT – II

BEZIER CURVES: Bernstein basis, equations of Bezier curves, properties, derivatives.

UNIT – III

B S PLINE CURVES:B-Spline basis equations, knot vectors, properties, and derivatives.

UNIT – IV

SURFACES: Bicubic surfaces, Coon's surfaces, Bezier surfaces, B-Spline surfaces, surfaces of revolutions, Sweep surfaces, ruled surfaces, tabulated cylinder, bilinear surfaces, Gaussian curvature.

UNIT – V

SOLIDS: Tricubic solid, Algebraic and geometric form.

SOLID MODELLING CONCEPTS: Wire frames, Boundary representation, half space modelling, spatial cell, cell decomposition, classification problem.

Outcomes:

After completion of the course, the student will be able to:

1. Know the distinction between the 2D and 3D geometrical transformations
2. Grasp the various visible surface detection basics and methods
3. Comprehend the solid MODELLING concept in to various applications
4. Create the animation for real time applications.

Text Books:

1. Micheal E. Mortenson, Geometric Modelling, Tata McGraw Hill Publishers,1997.
2. Rogers&J. Alan Adams, Elements of Computer Graphics, Tata McGraw Hill,2002.

References:

1. Ibrahim Zeid, Mastering CAD/CAM, Tata McGraw Hill, 2007.
2. K. Lalit Narayan, K. Mallikarjuna Rao & MMM. Sarcar, Computer Aided Design and Manufacturing, PRINTICE HALL INDIA Publishers,2008.

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M.Tech - III Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM25)ADVANCES IN MANUFACTURING TECHNOLOGY (ELECTIVE-V)

Objectives:

1. To know the types of welding methods, what factors to be consider while design of welds and different weld testing methods.
2. To identify the different types of modern machining methods.
3. To know how the product is manufacture in rapid prototyping method.
4. To know what are different surface processing techniques are available to improve the surface quality of the manufactured components.

UNIT – I

ADVANCED WELDING PROCESSES: Electron beam welding, laser beam welding, Solid state welding process-ultrasonic welding, friction welding, diffusion welding, Automation in Welding, Design aspects of welds-the weld joint, weld quality, weld ability.

NON-DESTRUCTIVE TESTING: different methods working principles-visual inspection, liquid penetrant testing, ultrasonic, magnetic particle testing, applications and limitations.

UNIT – II

MECHANICAL MODERN MACHINING METHODS: Abrasive jet machining **-** Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent developments. Ultrasonic machining: Elements of the process, machining parameters, effect of parameters on surface finish and metal removal rate, mechanics of metal removal process parameters, economic considerations, applications and limitations.

UNIT –III

ELECTRICAL MODERNMACHINING METHODS: Wire EDM Process: General Principle and applications of Wire EDM, Mechanics of metal removal, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy.

Electron Beam Machining: Generation and control of electron beam for machining, theory of electron beam machining, principle, advantages, limitations, comparison of thermal and non-thermal processes.

UNIT – IV

PLASMA ARC MACHINING: Principle, machining parameters, effect of machining parameters on surface finish and metal removal rate, applications, limitations Laser Beam Machining: Principle, effect of machining parameters on surface finish, applications, and limitations

ELECTRO-CHEMICAL PROCESSES: Fundamentals of electro chemical machining, metal removal rate in ECM, Tool design, Surface finish and accuracy economics aspects of ECM.

UNIT – V

SURFACE PROCESSING OPERATIONS: Conversion Coatings, Physical Vapor Deposition, Chemical Vapor Deposition, Organic Coatings, Porcelain Enameling and other Ceramic coatings, Thermal and Mechanical Coating Processes, painting, surface texturing, cleaning surfaces.

NANO TECHNOLOGY: Nano milling processes, wet milling, dry milling, nano materials, fabrication of nano tubes, advantages of nano tubes, mechanical properties.

Outcomes:

After completion of the course the student will be able to:

1. Identify suitable welding methods to weld modern metals, how can achieve the efficient weld joints.
2. Understand the mechanism of metal removal and machining operation of different modern machining methods.
3. Know the different methods of Rapid Prototyping and model creation.
4. Know the how to improve the surface characteristics and quality of the components.

Text Books:

1. Serope Kalpakjain & Steven R. Schmid, Manufacturing Engineering and Technology, Pearson Publisher, Seventh Edition,2013.
2. M.P. Groover, Fundamentals of Modern Manufacturing, John Wiley & Sons Publishers, Seventh Edition,2019.
3. P.N. Rao, Manufacturing Technology Foundry, Forming and Welding, Volume-I, Tata McGraw Hill Publications,2011.

References:

1. Amitabha Ghosh & Asok Kumar Mallik, Manufacturing Science, East-West Press Pvt Ltd, Second edition,2010.
2. Poole & Owens, Introduction to Nanotechnology, Wiley Publishers,2009.
3. R.K.Jain, Advanced machining process, Alied Publications,2011.

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L	T	P	C
3	0	0	3

(20BCM26)METAL FORMING PROCESSES
(ELECTIVE-V)

Objectives:

1. To study about various type of metal forming processes.
2. To understand the different types of plastic deformation and forming processes.
3. To impart knowledge of Powder Metallurgy techniques.
4. To study about the influence of the Residual Stress distribution in sheet metal forming process.

UNIT - I

INTRODUCTION: Theory of plastic deformation – Yield criteria – Tresca and Von- mises – Distortion energy – Stress-strain relation.

MOHR'S CIRCLE REPRESENTATION OF A STATE OF STRESS– cylindrical and spherical co- ordinate system – upper and lower bound solution methods, Slab analysis – Slip linemethod.

UNIT - II

STUDY OF PLASTIC DEFORMATION: Forging, Rolling, Extrusion, rod/wire drawing and tube drawing – Effect of friction. **Classification of forming process**- Temperature in metal working- Forging defects- Hydrostatic pressure.

UNIT -III

FORMABILITY STUDIES– Conventional processes – H E R F techniques – Super plastic forming techniques – Hydro forming – Stretch forming – Water hammer forming – Principles and process parameters – Advantage, Limitations and application.

UNIT- IV

OVERVIEW OF POWDER METALLURGY TECHNIQUE– Advantages– applications – powder rolling – Tooling, process parameters and applications. - Orbital forging – Isothermal forging. Hot and cold isostatic pressing – High speed extrusion – Rubber pad forming – Fine blanking – LASER beam forming.

UNIT-V

RESIDUAL STRESS- Residual stress in homogeneous deformation in rolling of sheet- resulting distribution of longitudinal residual stress over thickness of sheet – CAD - production of seamless pipe and tubing.

Outcomes:

After completion of the course the student will be able to:

1. Understand the Concept of various metal forming processes.
2. Select appropriate method of plastic deformation and forming processes to suit their applications.
3. Known the importance of Powder Metallurgy techniques.
4. Understand the residual stresses acting on the sheet metal in the metal forming processes.

Text Books:

1. G.E.Dieter, Mechanical Metallurgy,3Rd Edition, Tata McGraw Hill Co.,2017.
2. T.Altan, Metal forming – Fundamentals and applications, American Society of Metals, Metals park,2003.
3. KalpakJian, Manufacturing Technology, SI Edition, Pearson Education, India,2018.

References:

1. ASM Hand book, Forming and Forging, 9th Edition, Volume-XIV,2003.
2. Shiro Kobayashi,Soo-Ik-oh & T. Altan, Metal forming and Finite Element Method, Oxford University Press,2001.
3. TaylanAltan, Soo-IkOh&H. L. Gegel,Metal forming, fundamentals and Applications, American Society of Metals, Metals Park, Ohio,1983.

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M.Tech – III Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM27) ROBOTICS
(ELECTIVE VI)

Objectives:

1. To study the fundamentals of robotics.
2. To learn motions used in robotics.
3. To learn actuators and sensors used in robots.
4. To learn programming applied to robotics.

UNIT - I

FUNDAMENTALS OF ROBOTICS: Introduction, definition of robot, classification of robots, History of robotics, robot components, degree of freedom, robot joints, robot coordinates, reference frames, programming modes, robot characteristics, robot work space, robot languages, advantages and disadvantages of robots, Robot as a mechanisms, matrix representation - representation of a point in a space, representation of a vector in space, representation of a frame in a reference frame, representation of rigidbody.

UNIT - II

ROBOT KINEMATICS: Homogeneous transformation matrices, representation of a pure translation, pure rotation about an axis, representation of combined transformations, transformations relative to the rotating, inverse of transformation matrices, forward and inverse kinematics of robots, forward and inverse kinematic equations for position and orientation, Denavit-Hartenberg (D-H) representation of forward kinematic equations of robots, The inverse kinematic solution and programming of robots, Degeneracy and Dexterity, simple problems with D-Hrepresentation.

UNIT - III

DIFFERENTIAL MOTIONS AND VELOCITIES: Introduction, differential relationship, Jacobian differential motions of a frame-translations, rotation, rotating about a general axis, differential transformation of a frame, Differential changes between frames, Calculation of jacobian, relation between jacobian and the differential operator, Inverse jacobian, basics of trajectory planning, path Vs trajectory, joint space trajectory planning
– third order polynomial trajectory planning.

UNIT – IV

ROBOT DYNAMICS AND APPLICATIONS: Lead through programming, robot programming as a path in space, motion interpolation WAIT, SIGNAL and DELAY, Branching capabilities and limitations, ROBOT LANGUAGES: Textual robot languages, generations, Robot language structures, elements in functions, Applications – Material transfer, Machine loading/unloading, processing operations, assembly and inspections.

UNIT – V

ROBOT ACTUATORS AND FEEDBACK COMPONENTS: Hydraulic actuators, Pneumatic actuators, electric actuators & stepper motors, Position sensors, potentiometers, resolvers, encoders, velocity sensors, tactile sensors, proximity sensors.

Outcomes:

After completion of the course students will able:

1. To gain knowledge of robotics basics.
2. To control robotic motions as per required.
3. To utilize actuators and sensors in robotic applications.
4. To apply programs in robotic operations.

Text Books:

1. Saeed B. Niku, Introduction to Robotics- Analysis, Systems Applications, Printice Hall India Publishers,2001.
2. M.P. Groover, Mitchell Weiss, Roger N. Nagel & Nicholas G.Odrey, Industrial Robotics, Tata McGraw Hill, Second Edition,2008.
3. Rachid Manseur, Robot MODELLING and Kinematics, Firewall media Publishers, New Delhi,2007.
4. Ashitra Ghosh, Robotics- Fundamental concepts & Analysis, Oxford University Press, Second Edition,2008

References:

1. H. Asada & J.J.E. Slotine, Robot Analyses and control, Jhon Willey & Sons,2011.
2. Robert J.Schilling, Fundamentals of Robotics: Analysis and control, Prentice Hall, 1990.
3. Mohsen shahinpoor, A robot Engineering textbook,Harper&RowPublishers,1987.
4. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, Robotics- control, sensing, vision and Intelligence, Tata McGraw Hill,1987

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M.Tech-III Sem (CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM28) CNC TECHNOLOGY & PROGRAMMING (ELECTIVE VI)

Objectives:

1. To study about working principle and parts of CNC machine.
2. To study about control systems and their interface with CNC machines.
3. To learn the programming languages like APT.
4. To select suitable CNC machines for a particular application.

UNIT – I

INTRODUCTION TO CNC MACHINE TOOLS: Evolution of Computerized controlling manufacturing, Components, Working principle of CNC, DNC and Machining centres.

CONSTRUCTIONAL FEATURES OF CNC MACHINE TOOLS: Introduction, Spindle drives, Transmission belting, axes feed drives, Slide ways, Ball screws.

UNIT – II

ACCESSORIES: Work tables, Spindles, Spindle heads, Beds and Columns, Tooling – Automatic Tool changer(ATC).

FEEDBACK DEVICES: Introduction, Digital incremental displacement measuring systems, Incremental rotary encoders, Moire fringes, Digital absolute measuring system.

UNIT – III

ELECTRO-MAGNETIC ANALOGUE POSITION TRANSDUCERS:\Principle, advantages, characteristics, Synchros, Synchro-Resolvers, Inductors, Laser interferometer.

CONTROL SYSTEMS AND INTERFACE: Open and closed loop systems, Micro processor based CNC systems, block diagram of typical CNC system, description of hard ware and soft interpolation systems, Standard and optional features of CNC control systems.

UNIT – IV

APT PROGRAMMING:APT language structure, APT geometry, Definition of point, time, vector, circle, plane, patterns and matrices. APT motion commands: setup commands, point-to point motion commands, continuous path motion commands, post processor commands, controlcommands,Macrosubroutines,Partprogrammingpreparationfortypicalexamples.

UNIT – V

ECONOMICS AND MAINTENANCEOF CNC MACHINE TOOLS: Introduction, factors influencing selection of CNC machines, Cost of operation of CNC machines, Maintenance features of CNC machines, Preventive maintenance, Documentation, Spare parts, Training in Maintenance.

Outcomes:

After completion of the course the student will be able to:

1. Understand the working principle of CNC, DNC Machines.
2. Understand the feedback devices like open and close loop systems.
3. Use programming languages like APT.
4. Select, operate & maintain CNC Machine tools.

Text Books:

1. Radha Krishnanan, Computer Numerical Control Machines, New Central Book Agency, 2013.
2. Hans B.Keif& T. Frederick Waters, Computer Numerical Control Machines, Tata McGrawHill.

References:

1. B.S. Aditahn and Pabla, CNC Machines, New Age International,2007.
2. Smith& T. Graham, CNC Machining technology,Springer –Verlag.
3. G.E. Thyer, Computer Numerical Control of Machine tools, Newnes,1991.

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M.Tech – III Sem(CAD/CAM)

L	T	P	C
3	0	0	3

(20BCM29) MICRO & SMART SYSTEMS (ELECTIVE-VI)

Objectives:

1. To understand the basic concepts involve in this technology for device architecture and interface engineering at atomic.
2. To understand general introduction to different types of conventional and novel nano electronic devices for different applications.
3. To understand the underlying physical processes governing the operation of Microscopic devices.
4. To understand how simulation can facilitate learning of fabrication process and device designing.

UNIT- I

INTRODUCTION: Miniaturization, Microsystems versus MEMS, micro fabrication, smart materials, structures and systems, integrated Microsystems, applications of smart materials and Microsystems.

UNIT-II

MICRO SENSORS, ACTUATORS, SYSTEMS AND SMART MATERIALS: Silicon capacitive accelerometer, piezo resistive pressure sensor, conductometric gas sensor, an electrostatic combo-drive, a magnetic micro relay, portable blood analyzer, piezoelectric inkjet print head, micro mirror array for video projection, smart materials and systems.

UNIT-III

MICRO MACHINING TECHNOLOGIES: Silicon as a material for micro machining, thin film deposition, lithography, etching, silicon micromachining, specialized materials for Microsystems, advanced processes for micro fabrication.

UNIT-IV

MODELLING OF SOLIDS IN MICROSYSTEMS: Bar, beam, energy methods for elastic bodies, heterogeneous layered beams, bimorph effect, residual stress and stress gradients,
Poissoneffectandtheanticlasticcurvatureofbeams,torsionofbeamsandshearstresses,dealing with large displacements, In-plane stresses.

MODELLING OF COUPLED ELECTROMECHANICAL SYSTEMS: electrostatics, Coupled Electromechanics: statics, stability and pull-in phenomenon, dynamics. Squeezed film effects in electro mechanics.

UNIT-V

INTEGRATION OF MICRO AND SMART SYSTEMS: Integration of Microsystems and microelectronics, Microsystems packaging, case studies of integrated Microsystems, case study of a smart-structure in vibration control.

SCALING EFFECTS IN MICROSYSTEMS: scaling in mechanical domain, electrostatic domain, magnetic domain, diffusion, effects in the optical domain, biochemical phenomena.

Outcomes:

After completion of the course the student will be able to:

1. Exposes to various structure specific synthesis methods; their advantages etc.
2. Know Top-down to Bottom up approach techniques.
3. Optimize the methods for specific material application.
4. Develop fabrication methods with improve accuracy.

Text Books:

1. Nitaigour Premchand Mahalik, "MEMS", TMH,2007.
2. G.K. Ananthasuresh, K.J. Vinoy, S. Gopalakrishnan, K.N. Bhat, V.K. Aatre, "Micro and Smart Systems", Wiley India,2010.
3. Tai, Ran Hsu, "MEMS and Microsystems Design and Manufacture", TMH,2002.

References:

1. Campbell, "The Science and Engineering of Microelectronic Fabrication", 2nd edition, Oxford,2001.
2. Nadim Maluf, "An Introduction to Micro electromechanical Systems Engineering", Artech House,2000.
3. James J. Allen Micro Electro Mechanical System Design CRC Press, Taylor & Francis Group,2005.

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M.Tech – III Sem (CAD/CAM)

L	T	P	C
0	0	20	10

(20BCM30) DISSERTATION PHASE-I

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M.Tech – IV Sem (CAD/CAM)

L	T	P	C
0	0	32	16

(20BCM31) DISSERTATION PHASE-II