ACADEMIC REGULATIONS (R-15)
COURSE STRUCTURE
AND
DETAILED SYLLABI

M.Tech Regular Two Year Degree Programme

(FOR THE BATCHES ADMITTED FROM THE ACADEMIC YEAR 2015-2016)

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)

R.V.S. NAGAR, TIRUPATI ROAD, CHITTOOR- 517 127 (AP)-INDIA

Website: www.svcetedu.org / E-mail: info@svcetedu.org

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.

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CAD/CAM

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

(Affiliated to JNTUA, Ananthapuramu, Approved by AICTE, New Delhi)

R.V.S. NAGAR, CHITTOOR- 517 127 (AP)

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

(AFFILIATED TO JNTUA, ANANTAPUR)

ACADEMIC REGULATIONS

M.TECH REGULAR 2 YEAR DEGREE PROGRAMME

(FOR THE BATCHES ADMITTED FROM THE ACADEMIC YEAR 2015-16)

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

1.0 ELIGIBILITY FOR ADMISSIONS:

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.

2.0 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 Convener through PGECET/GATE score.
b) Category-B seats are to be filled by Management as per the norms stipulated by Government of A.P.

3.0 Specializations:

Sl. No	Department	Specializations
1.	CE	Structural Engg.
2.	EEE	Power Electronics & Electrical Drives
3.	EEE	Electrical Power Systems
4.	ME	CAD/CAM
5.	ME	Machine Design
6.	ECE	VLSI System Design
7.	ECE	Digital Electronics and Communication System
8.	ECE	Embedded systems
9.	CSE	Computer Science & Engg.
10.	CSE	Computer Science
11.	IT	Software Engg.

4.0 COURSE WORK:

4.1. A Candidate after securing admission must pursue the M.Tech course of study for Four Semesters duration.

4.2. Each semester shall have a minimum of 16 instructional weeks.

4.3. 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.

5.0 ATTENDANCE:

5.1. A candidate shall be deemed to have eligibility to write end semester examinations if he has put in at least 75% of attendance on cumulative basis of all subjects/courses in the semester.

5.2. Condonation of shortage of attendance up to 10% i.e., from 65% and above and less than 75% may be given by the college on the recommendation of the Principal.

5.3. Condonation of shortage of attendance shall be granted only on medical grounds and on representation by the candidate with supporting evidence.

5.4. If the candidate does not satisfy the attendance requirement he is detained for want of attendance and shall reregister for that semester. He shall not be promoted to the next semester.

6.0 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.

6.1. 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, based on the average of the marks secured in the two Mid Term-Examinations held, one in the middle of the Semester (first two units) and another immediately after the completion of instruction (last three units) with four questions to be answered out of five in 2 hours, evaluated for 40 marks.

For semester end examination (external paper setting & external evaluation) 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.

6.2. 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 (25marks) and practical test at the end of the semester (15marks).

6.3. Seminar is a continuous assessment process. For Seminar there will be an internal evaluation of 50 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 and two internal experts.

6.4. For comprehensive viva voce there will be an internal evaluation of 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 and two internal experts.

6.5. **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.

6.6. In case the candidate does not secure the minimum academic requirement in any of the subjects (as specified in 6.5) 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.

6.7. Revaluation / Recounting:

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.

6.8 **Supplementary Examination:**

In addition to the regular Semester- End examinations conducted, the College may also schedule and conduct supplementary examinations for all the subjects 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.

7.0 RE-REGISTRATION:

Following are the conditions to avail the benefit of improvement of internal evaluation marks

7.1. The candidate should have completed the course work and obtained examinations results for I& II semesters.

7.2. He should have passed all the subjects for which the Internal evaluation marks secured are more than or equal to 50%.

7.3. Out of the subjects the candidate has failed in the examination due to Internal evaluation marks secured being less than 50%, the candidate shall be given one chance for each Theory subject and for a maximum of **three** Theory subjects for Improvement of Internal evaluation marks.

7.4. The candidate has to re-register for the chosen subjects and fulfill the academic requirements.

7.5. For each subject, the candidate has to pay a fee equivalent to one third of the semester tuition fee and the along with the requisition to the Principal of the college.

7.6. In the event of availing the Improvement of Internal evaluation marks, the internal evaluation marks as well as the End Examinations marks secured in the previous attempt(s) for the reregistered subjects stand cancelled.

8.0 EVALUATION OF PROJECT WORK:

Every candidate shall be required to submit thesis or dissertation after taking up a topic approved by the college/ institute.

8.1. Registration of Project work: A candidate is permitted to register for the project work after satisfying the attendance requirement of I& II Semesters.

8.2. An Internal Departmental Committee (I.D.C) consisting of HOD, Supervisor and one internal senior teacher shall monitor the progress of the project work.

8.3. The work on the project shall be initiated in the penultimate semester and continued in the final semester. The duration of the project is for two semesters. The candidate can submit Project thesis with the approval of I.D.C. after 36 weeks from the date of registration at the earliest. Extension of time within the total permissible limit for completing the programme is to be obtained from the Head of the Institution.

8.4. The student must submit status report at least in three different phases during the project work period. These reports must be approved by the I.D.C before submission of the Project Report and award internal assessment marks for 120.

8.5. A candidate shall be allowed to submit the Thesis / Dissertation only after passing in all the prescribed subjects (both theory and practical) and then take viva voce examination of the project. The viva voce examination may be conducted once in two months for all the candidates who have submitted thesis during that period.

8.6. Three copies of the Thesis / Dissertation certified in the prescribed form by the supervisor and HOD shall be presented to the H.OD. One copy is to be forwarded to the Controller Of Examinations and one copy to be sent to the examiner.

8.7. The Dept shall submit a panel of three experts for a maximum of 5 students at a time. However, the Thesis / Dissertation will be adjudicated by one examiner nominated by the Chief Controller Of Examinations.

8.8. If the report of the examiner is favorable viva-voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the thesis / dissertation. The board shall jointly award the marks for 180.

8.9. A candidate shall be deemed to have secured the minimum academic requirement in the project work if he secures a minimum of 50% marks in the end viva-voce examination and a minimum aggregate of 50% of the total marks in the end viva-voce examination and the internal project report 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. If he fails to get the minimum marks at the second viva-voce examination he will not be eligible for the award of the degree, unless the candidate is asked to revise and resubmit. If the candidate fails to secure minimum marks again, the project shall be summarily rejected.

9.0 Grades, Grade point Average, Cumulative Grade point Average:

9.1. 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 Int. and Ext. (or) Less than 40 in Ext.	F	0
Not Appeared	N	0

9.2. GPA: Grade Point Average (GPA) will be calculated as given below on a "10 Point scale" as an Index of the student's performance at the end of each semester:

$$\textbf{GPA} = \frac{\sum(CXGP)}{\sum C}$$

Where C denotes the credits assigned to the subjects undertaken in that semester and GP denotes the grade points earned by the student in the respective subjects

9.3. CGPA: At the end of every semester, a Cumulative Grade Point Average (CGPA) on a 10 Point scale is computed considering all the subjects passed up to that point as an index of overall Performance up to that Point as given below:

$$\textbf{CGPA} = \frac{\sum(CXGP)}{\sum C}$$

Where C denotes the credits assigned to subjects undertaken upto the end of the current semester and GP denotes the grade points earned by the student in the respective courses.

9.4. 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.

9.5 **Transcripts:** After successful completion of the entire Program of study, a transcript containing performance of all semesters will be issued as a final record. Duplicate transcripts will also be issued, if required, after payment of requisite fee.

10.0 Award of Degree: The Degree will be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Anantapur on the recommendation of The Principal of SVCET (Autonomous).

10.1 **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 specialization of study within the stipulated time.
- Obtained CGPA greater than or equal to 6.0 (Minimum requirement for declaring as passed.)

10.2 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

11.0 WITH – HOLDING OF RESULTS: If the candidate has not paid dues to the university 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.

12.0 TRANSITORY REGULATIONS:

Candidates who have discontinued or have been detained for want of attendance or who have failed after having undergone the course in earlier regulations and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to 6.5 and 4.3 sections. Whereas they continue to be in the academic regulations of the batch they join later.

13.0 GENERAL:

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 college 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 college.

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Sri Venkateswara College of Engineering and Technology
(Autonomous)
R.V.S. Nagar, Chittoor

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:15
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, PS: Electrical Power Systems, CM: CAD/CAM, MD: Machine Design, VL: VLSI, DE: DECS, EM: Embedded Systems, CS: Computer Science and Engineering, CO: Computer Science, SE: Software Engineering,
Last two digits	Indicate serial numbers: ≥ 01

Ex:

15BST01

15BPE01

15BPS01

15BCM01

15BMD01

15BVL01

15BDE01

15BEM01

15BCS01

15BCO01

15BSE01

SRI VENKATESWARA COLLEGE OF ENGINNERING & TECHNOLOGY

(AUTONOMOUS)

(AFFILIATED TO JNTUA, ANANTAPUR)

RULES FOR DISCIPLINARY ACTION FOR MALPRACTICE / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices / Improper conduct	**Punishment**
	If the candidate	
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 writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
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 FOR M.TECH IN CAD/CAM
M.TECH I-YEAR I-SEMESTER

S.NO	SUBJECT CODE	SUBJECT	PERIODS			CREDITS	SCHEME OF EXAMINATION (MAXIMUM MARKS)		
			L	T	P		INTERNAL	EXTERNAL	TOTAL
1	15BCM01	FINITE ELEMENT METHODS	3	1	-	4	40	60	100
2	15BCM02	COMPUTER INTEGRATED MANUFACTURING	3	1	-	4	40	60	100
3	15BCM03	GEOMETRIC MODELING	3	1	-	4	40	60	100
4	15BCM04	ADVANCES IN MANUFACTURING TECHNOLOGY	3	1	-	4	40	60	100
		ELECTIVE – I							
5	15BCM05	COMPUTATIONAL METHODS	3	1	-	4	40	60	100
	15BCM06	MICRO & SMART SYSTEMS							
	15BCM07	DESIGN FOR MANUFACTURING							
		ELECTIVE – II							
6	15BCM08	QUALITY ENGINEERING	3	1	-	4	40	60	100
	15BCM09	AUTOMATED AND COMPUTER INTEGRATED MANUFACTURING SYSTEMS							
	15BCM10	HYDRAULICS AND PNEUMATICS							
7	15BCM11	MODELING LAB	-	-	3	2	40	60	100
8	15BCM12	FEA LAB-I	-	-	3	2	40	60	100
9	15BCM13	SEMINAR-I	-	-	-	2	50	-	50
TOTAL			**18**	**6**	**6**	**30**	**370**	**480**	**850**

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(AUTONOMOUS)
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COURSE STRUCTURE FOR M.TECH IN CAD/CAM
M.TECH I-YEAR II-SEMESTER

S. NO	SUBJECT CODE	SUBJECT	PERIODS			CREDITS	SCHEME OF EXAMINATION (MAXIMUM MARKS)		
			L	T	P		INTERNAL	EXTERNAL	TOTAL
1	15BCM15	OPTIMIZATION THEORY & PRACTICE	3	1	-	4	40	60	100
2	15BCS30	ADVANCED COMPUTER GRAPHICS	3	1	-	4	40	60	100
3	15BCM16	ROBOTICS	3	1	-	4	40	60	100
4	15BCM17	CNC TECHNOLOGY & PROGRAMMING	3	1	-	4	40	60	100
		ELECTIVE – III							
5	15BCM18	MECHATRONICS	3	1	-	4	40	60	100
	15BCM19	NON-DESTRUCTIVE EVALUATION							
	15BCM20	METAL FORMING PROCESSES							
		ELECTIVE – IV							
6	15BCM21	RAPID PROTOTYPING	3	1	-	4	40	60	100
	15BCM22	ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS							
	15BCM23	MECHANICS & MANUFACTURING OF COMPOSITES							
7	15BCM24	FEA LAB-II	-	-	3	2	40	60	100
8	15BCM25	CAM LAB	-	-	3	2	40	60	100
9	15BCM26	SEMINAR-II	-	-	-	2	50	-	50
10	15BCM27	COMPREHENSIVE VIVA	-	-	-	2	100	-	100
TOTAL			**18**	**6**	**6**	**32**	**470**	**480**	**950**

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(AUTONOMOUS)
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COURSE STRUCTURE FOR M.TECH IN CAD/CAM
M.TECH II-YEAR III & IV-SEMESTERS

S.NO	SUBJECT CODE	SUBJECT	PERIODS			CREDITS	SCHEME OF EXAMINATION (MAXIMUM MARKS)		
			L	T	P		INTERNAL	EXTERNAL	TOTAL
1	15BCM28	PROJECT WORK	-	-	-	**14**	**120**	**180**	**300**

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

I M.Tech - I Sem (CAD/CAM)

L	T	P	C
3	1	0	4

(15BCM01) FINITE ELEMENT METHODS
(Common to CAD/CAM & Machine Design)

Objectives:

1. *Gain a fundamental understanding of the finite element method for solving boundary value problems.*
2. *To understand the 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 understand the application of the finite element method (modeling, analysis, and interpretation of results) to realistic engineering 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.*

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.

Text Books:

1. R. Chandraputla, D. Ashok & Belegundu, Introduction to Finite Elements in Engineering, Prentice Hall, 2011.
2. J.N. Reddy, Finite Element Method in Heat transfer and fluid dynamics, CRC press, 1994.
3. 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.

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I M.Tech - I Sem (CAD/CAM)	**L**	**T**	**P**	**C**
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(15BCM02) 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. *To impart knowledge of flexible manufacturing systems and grouping concepts.*
4. *To understand advanced materials management concepts such as MRP and JIT.*

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. *Perform grouping of machines and components to improve utilization of process layouts.*
4. *Recommend appropriate materials management strategy of a manufacturing unit.*

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 of FMS.

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.

Text Books:

1. M.P. Groover, Automation, Production systems and Computer Integrated Manufacturing Systems,PHI Publishers, 2010
2. M.P. Grooves & E.W. Zimmers Jr., CAD/CAM, Prentice Hall, 1995

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.

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I M.Tech - I Sem (CAD/CAM)

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(15BCM03)GEOMETRIC MODELING
(Common to CAD/CAM & Machine Design)

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 thepolygons.*
4. *To be familiar with different computer animation sequence and techniques*

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 modeling concept in to various applications*
4. *Create the animation for real time applications.*

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-SPLINE 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 MODELING CONCEPTS: Wire frames, Boundary representation, half space modelling, spatial cell, cell decomposition, classification problem.

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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(15BCM04)ADVANCES IN MANUFACTURING TECHNOLOGY

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.*

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.*

UNIT – I

WELDING PROCESSES: Fusion- oxy fuel gas welding, Thermit welding, 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 MODERNMACHINING 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. 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

UNIT – IV

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

RAPID PROTOTYPING: Working principle, methods-Sterio lithography, Laser sintering, Fused deposition method, applications and limitations.

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.

Text Books:

1. Serope Kalpakjain& Steven R. Schmid, Manufacturing Engineering and Technology, Pearson Publisher, 2010.
2. M.P. Groover, Fundamentals of Modern Manufacturing, John Wiley & Sons Publishers, 2011.
3. P.N. Rao, Manufacturing Technology Foundry, Forming and Welding, Volume-I, Tata McGraw Hill Publications, 2011.

References:

1. AmitabhaGhosh&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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(15BCM05) COMPUTATIONAL METHODS
(ELECTIVE-I)
(Common to CAD/CAM & Machine Design)

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*

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.*

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, Computer programs

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

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

Text Books:

1. Steven C. Chapra& Raymond P. Canale, Numerical Methods for Engineers, 6th Edition, Tata McGraw hill, 2009
2. Curtis F. Gerald&Partick O. Wheatly, Applied numerical analysis, Addison-wesley, 4th Edition, 1989

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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(15BCM06)MICRO & SMART SYSTEMS
(ELECTIVE-I)
(Common to CAD/CAM & Machine Design)

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.*

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.*

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

MODELING OF SOLIDS IN MICROSYSTEMS: Bar, beam, energy methods for elastic bodies, heterogeneous layered beams, bimorph effect, residual stress and stress gradients, Poisson effect and the anticlastic curvature of beams, torsion of beams and shear stresses, dealing with large displacements, In-plane stresses.

MODELLING OF COUPLED ELECTROMECHANICAL SYSTEMS: electrostatics, Coupled Electro-mechanics: 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.

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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(15BCM07) DESIGN FOR MANUFACTURING
(ELECTIVE-I)
(Common to CAD/CAM & Machine Design)

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 understand the effective utilization of materials and machines in casting, welding, forging and extrusion.*
4. *To understand the behaviour and design considerations of plastic materials.*

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.*

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 combined stresses - Estimation of welding costs - Stages of weld inspection and testing.

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

Text Books:

1. John Cobert, Design for manufacture, Adisson Wesley, 1995.
2. Boothroyd, Design for Manufacture, 2nd edition, CRC Press.
3. O.P. Khanna, Material science and metallurgy, Dhanapthrai & Sons, 5th edition, 1987.

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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I M.Tech - I Sem (CAD/CAM)

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(15BCM08)QUALITY ENGINEERING
(ELECTIVE-II)

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 bench marking.*

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.*

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 TECHNINIQUES– 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.

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. SenthilArasu, Total quality management, SciTech Publications, 1999.
2. V. Narayana &N.S.Sreenivasan, Quality Management – Concepts and Tasks, New Age International 1996.
3. A.V.Feigenbaum,Total Quality Management, Tata McGraw Hill, 1991.

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I M.Tech - I Sem (CAD/CAM)	**L**	**T**	**P**	**C**
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(15BCM09) AUTOMATED AND COMPUTER INTEGRATED MANUFACTURING SYSTEMS (ELECTIVE-II)

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.*

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 multi product.*
4. *Apply appropriate process control strategy to an automated system.*

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.

Text Books:

1. M.P. Groover, Automation, Production system and Computer integrated Manufacturing, Prentice Hall of India Pvt. Ltd., 2008.
2. P. Radhakrishnan,S. Subramanian& V. Raju, CAD/CAM/CIM, New Age International Publishers, 2000.

References:

1. James A.Retrg&Herry W. Kraebber, Computer Integrated Manufacturing, Pearson Education, Asia, 2001.
2. N.Viswanathan&Y.Narahari, Performance Modeling 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.

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(15BCM10) HYDRAULICS AND PNEUMATICS (ELECTIVE-II)

Objectives:

The main objectives of this course are:

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.*

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.*

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, $\frac{3}{2}$, $\frac{4}{3}$ & $\frac{5}{3}$ Valves, 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

Text Books:

1. H.E. Merritt, Hydraulic Control Systems, Wiley, New York.
2. Esposito, Fluid Power, Peaerson Education.
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.

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I M.Tech - I Sem (CAD/CAM)

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(15BCM11)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 3D images.*
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 tool bars 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. **SOLID WORKS**
   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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I M.Tech-I Sem (CAD/CAM)

L	T	P	C
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(15BCM12) FEA LAB – I
(Common to CAD/CAM & Machine Design)

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.*

Outcomes:

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

1. *Derive equations in finite element methods for 1D, 2D and 3D problems.*
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 modeling of component*
    b. *Applying boundary conditions*
    c. *Solving for stresses and strains*
    d. *Making Design changes as suggested by the analysis.*

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

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(AUTONOMOUS)

I M.Tech - II Sem(CAD/CAM)

L	T	P	C
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(15BCM15) OPTIMIZATION THEORY & PRACTICE
(Common to CAD/CAM & Machine Design)

Objectives:

1. *To enrich with the knowledge for solving problems using linear programming.*
2. *To master different optimization techniques using classical and numerical techniques.*
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.*

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.*

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 of GA.

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 modeling of discrete-event systems, Classification of Petrinets, Methods of analysis of Petrinets, Modelling and simulation of real life situations, Conflict resolving, Applications and Limitations of Petrinets.

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 experiments.

TextBooks:

1. S.S. Rao, Engineering Optimisation, Theory and Practice, New age publishers, 2013.
2. D.C. Montgomery, Design and Analysis of Experiments, 5th edition, John Wiley and Sons, New York, 2001.

References:

1. J.L. Peterson, Petrinet theory and modeling 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.

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(15BCS30) ADVANCED COMPUTER GRAPHICS

Objectives:

The objective of this course is to make students to:

1. *Understand the basic principles and problems of Computer graphics*
2. *Understand algorithms underlying computer graphics, including line drawing algorithms, circle/ellipse drawing algorithms.*
3. *Learn how to use 2D, 3D geometric transformations, viewing in 3D.*
4. *Learn how to use a standard graphics API(application programming interface)to Create, read, and manipulate interactively structured two –and three-dimensional models.*

Outcomes:

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

1. *Understand how visual information is modeled and represented digitally*
2. *Understand how visual information is computed and manipulated in 2D and 3D.*
3. *Develop an understanding of computer graphics in API.*
4. *Understand how to use and develop computer animation functions*

UNIT - I

INTRODUCTION TO COMPUTER GRAPHICS: Raster scan display, random scan display**,** Color CRT, Direct view storage tubes, flat panel display, three dimensional viewing device, Graphics software.

UNIT - II

OUTPUT PRIMITIVES: Points and lines, line drawing algorithms – DDA, Bresenham's, mid-point circle and ellipse algorithms, Filled area primitives - Scan line polygon fill algorithm, inside-outside tests, boundary-fill and flood-fill algorithms.

UNIT - III

2-D GEOMETRICAL TRANSFORMS: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

2-D VIEWING: The viewing pipeline,, window to view- port coordinate transformation, viewing functions, Cohen-Sutherland line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNIT - IV

THREE DIMENSIONAL CONCEPTS: 3-D Display method, 3-D object representation: Polygon surfaces, Curved lines and surfaces, quadric surfaces.

3-D GEOMETRIC TRANSFORMATIONS: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

UNIT - V

SHADING ALGORITHMS: Constant intensity algorithm, Phong's shading algorithm, gourand shading algorithm, Comparison of shading algorithms

Text Books:

1. Donald Hearn & M.Pauline Baker, Computer Graphics C version, Pearson Education.
2. Foley, VanDam, Feiner& Hughes, Computer Graphics Principles & practice, second edition in C, Pearson Education.

References:

1. Steven Harrington, Computer Graphics, Tata McGraw Hill.
2. Zhigandxiang& Roy Plastock, Computer Graphics,2nd Edition, Tata McGraw Hill.

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(15BCM16) ROBOTICS

Objectives:

The main objectives of this course are:

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.*

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.*

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 rigid body.

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-H representation.

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.

Text Books:

1. Saeed B. Niku, Introduction to Robotics- Analysis, Systems Applications, Printice Hall India Publishers.
2. M.P. Groover,Mitchell Weiss, Roger N. Nagel & NicholasG.Odrey, Industrial Robotics, Tata McGraw Hill, 1996.
3. RachidManseur, Robot Modeling and Kinematics, Firewall media Publishers,New Delhi, 2007.
4. AshitraGhosh, 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 text book, Harper & Row Publishers, 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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(15BCM17)CNC TECHNOLOGY & PROGRAMMING

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.*

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.*

UNIT – I

INTRODUCTION TO CNC MACHINE TOOLS: Evolution of Computerized control in 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, control commands, Macro subroutines, Part programming preparation for typical examples.

UNIT – V

ECONOMICS AND MAINTENANCE OF 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.

Text Books:

1. RadhaKrishnanan, Computer Numerical Control Machines, New Central Book Agency.
2. Hans B.Keif& T. Frederick Waters, Computer Numerical Control Machines, Tata McGraw Hill.

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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(15BCM18) MECHATRONICS
(Elective-III)

Objectives:

The main objectives of this course are:

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.*

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.*

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

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

Text Books:

1. K.P.Ramachandran& G.K.VijayaRaghavan, Mechatronics Integrated Mechanical Electronics Systems, WILEY India Edition, 2008.
2. W. Bolton, Mechatronics – Electronic Control Systems in Mechanical and Electrical Engg. 4th Edition, Pearson, 2012.
3. R.P.Jain, Modern digital electronics, Tata McGraw Hill, 2003.

References:

1. A.K. Ray and K.M. Bhurchandi, Advanced microprocessor and peripherals, 2nd edition, TMH, 2000.
2. Mikell P. Groover,Mitchell Weiss, Roger N. Nagel & NicholasG.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.

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L	T	P	C
3	1	0	4

(15BCM19) NON-DESTRUCTIVE EVALUATION
(ELECTIVE-III)
(Common to CAD/CAM & Machine Design)

Objectives:

1. *To study the X-Ray and Gamma-ray radiography.*
2. *To understand the 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.*

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 fibercontent and effect radiation on film.*
4. *Identify the defects in pressure vessels, piping, castings and welded constructions using non destructive tests.*

UNIT - I

NON-DESTRUCTIVE TESTING: Introduction to various non-destructive methods - Comparison of destructive and non destructive 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 Intergranular 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

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.

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L	T	P	C
3	1	0	4

(15BCM20)METAL FORMING PROCESSES (ELECTIVE-III)

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.*

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.*

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 line method.

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.

Text Books:

1. G.E.Dieter, Mechanical Metallurgy,2nd Edition, Tata McGraw Hill Co., 2004.
2. T.Altan, Metal forming – Fundamentals and applications, American Society of Metals, Metals park, 2003.
3. KalpakJian, Manufacturing Technology, 4th Edition, Pearson Education, India, 2002.

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-Ik Oh& H. L. Gegel,Metal forming, fundamentals and Applications, American Society of Metals, Metals Park, Ohio, 1983.

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(15BCM21) RAPID PROTOTYPING
(ELECTIVE-IV)

Objectives:

1. *To make the students to understand various types of Rapid prototyping techniques.*
2. *To impart the knowledge on SGC and LOM.*
3. *To know the various software for Rapid prototyping.*
4. *To gain knowledge on Rapid manufacturing process optimization.*

Outcomes:

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

1. *Select appropriate method of Rapid prototyping to suit their applications.*
2. *Understand the different principle of SGC and LOM*
3. *Identify the suitable software for the particular rapid prototyping.*
4. *Construct the optimisation model to prepare the rapid manufacturing process.*

UNIT-I

INTRODUCTION: Need for the compression in product development, History of RP system, Survey of applications, Growth of RP industry and classification of RP system.

STEREO LITHOGRAPHY : Principle, Process parameter, Process details, Data preparation, Data files and machine details, Applications.

SELECTIVE LASER SINTERING (SLS): Principle, Process parameter, Applications.

UNIT -II

FUSION DEPOSITION MODELING (FDM): Principle, process parameter, Path generation, Applications.

SOLID GROUND CURING (SGC): Principle of operation, Machine details, Applications.

LAMINATED OBJECT MANUFACTURING (LOM): Principle of Operation, LOM materials, Process details, Applications.

UNIT –III

CONCEPT MODELLERS: Principle- ThermoJet printer, Sanders model maker, 3D printer, GenisysXs 3D printer, JP system 5, Objet Quadra system.

LASER ENGINEERING NET SHAPING (LENS): Principle, Process parameter, Applications.

UNIT –IV

RAPID TOOLING: INDIRECT RAPID TOOLING: Silicon rubber tooling, Aluminum filled epoxy tooling, Spray metal tooling, Sand Casting, 3D keltool process.

DIRECT RAPID TOOLING: Direct AIM, Copper polyamide, Rapid Tool, DMLS, SandForm tooling, Laminate Object Manufactured (LOM) tooling,

SOFTWARE FOR RP:STL files, Overview of Solid view, magics, imics, magic communication, etc. Internet based software, Collaboration tools.

UNIT-V

RAPID MANUFACTURING PROCESS OPTIMIZATION: Factors influencing accuracy- Data preparation error, Part building error, Part finishing errors. Selection of Part build orientation.

ALLIED PROCESS: Vacuum casting, surface digitizing, Surface generation from point cloud, Surface modification- Data transfer to solid models.

Text Books:

1. D.T. Pham& S.S. Dimov, Rapid Manufacturing,Verlog London, 2001.
2. Seropekalpakjain& Steven R. Schmid, Manufacturing Engineering and Technology, Pearson Publisher, 2009.

Reference:

1. Paul F.Jacobs, stereo lithography and other RP & M Technologies, SME, NY 1996
2. Lament wood, Rapid automated, Indus Press New York.
3. Chua Chee Kai, Rapid Prototyping: Principles and Applications, 2nd Edition, 2003.

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(15BCM22) ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS (ELECTIVE – IV)

Objectives:

The main objectives of this course are

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.*

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.*

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.

Text Books:

1. Elaine Rich & Kevin Knight, Artificial Intelligence, Tata McGraw Hill, 1991.
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 HennryWilston, Artificial Intelligence, Pearson Education, Inc. and Darling Kindersley publishing, Inc., 1992.

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(15BCM23) MECHANICS AND MANUFACTURING OF COMPOSITES (ELECTIVE-IV) (Common to CAD/CAM & Machine Design)

Objectives:

1. *To understand the 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.*

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.*

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 matals.
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 - Interlaminar stresses - Impact resistance - Fracture resistance - Fatigue resistance

Text Books:

1. Autar K. Kaw, Mechanics of composite materials, CRC Press, New York.
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, Kogakusha Ltd.
2. Michael W. Hyer, Stress analysis of fiber Reinforced Composite Materials, Tata McGraw Hill International.
3. Vasiliev&Morozov, Advanced Mechanics of Composite Materials, Elsevier, Second Edition.

SRI VENKATEWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

I M.Tech-II Sem (CAD/CAM)	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

(15BCM24) FEA LAB – II
(Common to CAD/CAM & Machine Design)

Objectives:

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.*

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.*

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.

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I M.Tech-II Sem (CAD/CAM)

L	T	P	C
0	0	3	2

(15BCM25) 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.*

Outcomes:

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

1. *Apply the basic concepts in NC technology for turning and milling applications.*
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.*

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