Academic Regulations
Programme Structure
and
Detailed Syllabus

Master of Technology (M.Tech.)
in
Design for Manufacturing

(Two Year Regular Programme)

(Applicable for Batches admitted from 2022)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Bachupally, Kukatpally, Hyderabad- 500 090

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD

Academic Regulations for M.Tech. (Regular) under GR22

(Applicable for Batches Admitted from 2022-23)

Post Graduate Degree Programme in Engineering and Technology (PG)

Gokaraju Rangaraju Institute of Engineering & Technology (GRIET) offers a 2-year (4 Semesters) Master of Technology (M.Tech.) degree programme. The following programmes are offered in GRIET.

S.No	Department	Programme Code	Programme
1	Civil Engineering	20	M.Tech. Structural Engineering
2	Electrical and Electronics Engineering	43	M.Tech. Power Electronics
3	Mechanical Engineering	52	M.Tech. Design for Manufacturing
4	Electronics and Communication Engineering	57	M.Tech. VLSI
5	Computer Science and Engineering	58	M.Tech. Computer Science and Engineering
6	Information Technology	B0	M.Tech. Data Science

GR22 Regulations shall govern the above programmes offered by the Departments with effect from the students admitted to the programmes in 2022-23 academic year is given below

1. **Medium of Instruction:** The medium of instruction (including examinations and reports) is English.

2. **Admission:** Admission into the M.Tech. Programme in any discipline shall be made subject to the eligibility and qualifications prescribed by the University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in GATE, PGCET conducted by the APSCHE for M.Tech. Programmes or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government from time to time.
3. **Programme Pattern:**

   a) Each Academic year of study is divided into two semesters.
   b) Minimum number of instruction days in each semester is 90.

c) The total credits for the Programme are 68.

d) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).

e) A student has a choice of registering for credits from the courses offered in the programme.

f) All the registered credits will be considered for the calculation of final CGPA.

g) Each Semester shall have 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) are taken as 'references' for the present set of Regulations. The terms 'SUBJECT' and 'COURSE' imply the same meaning here and refer to 'Theory Subject', or 'Lab Course', or 'Design/Drawing Subject', or 'Mini Project with Seminar', or 'Dissertation', as the case may be.

h) Course Classification: All courses offered for all undergraduate programmes in M.Tech. degree programmes are broadly classified as follows.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	PC	Professional Core	Includes Core Courses related to the parent discipline/department/ branch of Engineering
2	PE	Professional Elective	Includes Elective Courses related to the parent discipline/ department/ branch of Engineering
3	OE	Open Elective	Elective Courses from other technical and/or emerging subjects
4	Audit	Audit Courses	Mandatory non creditable courses
5	PW	Project Work/Dissertation	Mini Project work, Dissertation Phase-I, II.

4. Award of M.Tech. Degree: A student will be declared eligible for the award of the M.Tech. Degree if he/she fulfills the following academic requirements:

a) A student shall be declared eligible for the award of M.Tech. degree, if he/she pursues the course of study and completes it successfully in not less than two academic years and not more than four academic years.

b) A Student, who fails to fulfill all the academic requirements for the award of the degree within four academic years from the date of admission, shall forfeit his/her seat in M.Tech. programme.

c) The Degree of M.Tech. shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, on the students who are admitted to the programme and fulfilled all the requirements for the award of the degree.

5. Attendance Requirements

a) A student shall be eligible to appear for the semester end examinations if he/she puts in a minimum of 75% of attendance in each course concerned in the semester.

b) Condonation of shortage of attendance up to 10% (65% and above and below 75%) in a semester may be granted. A committee headed by Dean (Academic Affairs) shall be the deciding authority for granting the condonation.

c) Students who have been granted condonation shall pay a fee as decided by the Academic Council.

d) Students whose attendance is less than 65% in any course are detained and are not eligible to take their end examination of that course. They may seek re-registration for that course when offered next with the academic regulations of the batch into which he/she gets re-registered.

e) A student shall put in a minimum required attendance in at least three theory subjects (excluding audit (non-credit course) in first Year I semester for promotion to first Year II Semester.

f) A student shall put in a minimum required attendance in at least three theory subjects (excluding audit (non-credit course) in first Year II semester for promotion to second Year I Semester.

6. Paper Setting, Evaluation of Answer Scripts, Marks and Assessment

a) Paper setting and Evaluation of the Answer Scripts shall be done as per the procedures laid down by the Academic Council of the College from time to time.

b) The following is the division of marks between internal and external evaluations.

S. No	Components	Internal Evaluation	External Evaluation	Total
1	Theory	40	60	100
2	Practical	40	60	100
3	Mini Project	100	--	100
4	Dissertation	50	50	100

c) Continuous Internal Evaluation and Semester End Examinations: The assessment of the student's performance in each course will be based on Continuous Internal Evaluation (CIE) and Semester-End Examination (SEE). The marks for each of the component of assessment are fixed as shown in the following Table.

Assessment Procedure

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Theory	40	Internal Examination & Continuous Evaluation	1) Two mid semester examination shall be conducted for 30 marks each for a duration of 120 minutes. Average of the two mid exams shall be considered **i) Subjective – 20 marks** **ii) Objective – 10 marks** 2) Continuous Evaluation is by conducting Assignments and Quiz exams at the end of each unit **i) Assignment – 5 marks** **ii) Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 5 marks**
		60	Semester end examination	The semester-end examination is for a duration of 3 hours
2	Practical	40	Internal Examination & Continuous Evaluation	One internal lab examination towards the end of course for a duration of 90 minutes with a viva of 5 minutes. **i) Internal Exam-10 marks** **ii) Viva voce – 10 marks** **iii) Continuous Assessment- 10 marks** **iv) G-Lab on Board(G-LOB) (Case study inter threading of all experiments of lab)/ Laboratory Project/Prototype Presentation/App Development - 10 marks**
		60	Semester end examination	The semester-end examination is for a duration of 3 hours. **i) write-up (algorithm/flowchart/procedure) as per the task/experiment/program - 10 marks** **ii) task/experiment/program-15 marks** **iii) evaluation of results -15 marks** **iv) write-up (algorithm/flowchart/procedure) for another task/experiment/program- 10 marks** **v) viva-voce on concerned laboratory course - 10 marks**

d) Project Review Committee: For approval and evaluating mini project, Dissertation-I and Dissertation-II, a Project Review Committee (PRC) will be constituted by the Head of the Department. The composition of PRC is as follows

i) Head of the Department

ii) One senior faculty relevant to the specialization

iii) Coordinator of the specialization.

e) Mini Project: The Mini Project is to be taken up with relevance to Industry and is evaluated for 100 marks. Student shall carryout the mini project in consultation with the mini project supervisor. The Project Review Committee (PRC) along with supervisor will review the progress of the mini project during the internal evaluation for 50 marks. Mini Project Viva Voce will be evaluated by the PRC for another 50 marks before the semester end examinations. The student must secure a minimum of 50% of marks in i) internal evaluation and ii) mini project viva voce, to be declared successful. If he fails to obtain the minimum marks, he/she must reappear for the same as and when scheduled.

Internal Evaluation: Tentative presentation dates and marks distribution of the mini project.

S.No	Date	Review	Marks
Internal Marks (50)			
1	First week of the semester	Abstract submission*	10
2	Fourth week of the semester	First Review	10
2	Mid of the semester	Second Review	10
3	Last week of the semester	Last Review	20

Following are the guidelines for the abstract submission

The faculty are requested to check the document submitted in the first review and should contain following:

1. Title of the project and Literature review.
2. Schematic/Block diagram which gives the broad idea of the entire project.
3. Timeline or milestone of the project. It should clearly indicate deliverables/outcomes of the project.
4. Components required with approximate cost.
5. References.
6. Plagiarism check is compulsory for mini project report as per the plagiarism policy of GRIET.

External Evaluation: (50 Marks) The mini project report is presented before PRC along with the supervisor.

Guidelines to award 50 marks:

S. No	Date	Review/ PRC report	Marks
External Evaluation Marks (50)			
1	Last week of the semester	Final Presentation and report Submission	10
2	Project report: Project report should be written as per IEEE guidelines.	Verified by PRC	10

3	Project Deliverables • Hardware prototype • Simulation in any authorized software • Submission of research articles in any Scopus Indexed conference /Journal	Verified by PRC	20
4	Results and Discussion	Verified by PRC	10

f) Dissertation (Phase I & Phase II): Every candidate shall be required to submit a dissertation on a topic approved by the Project Review Committee (PRC).

- The candidate must present in **Dissertation Work Review - I**, in consultation with his/her Dissertation Supervisor, the title, objective and plan of action of his/her Dissertation work to the PRC for approval ***within four weeks*** from the commencement of **Second year First Semester**. Only after obtaining the approval of the PRC can the student initiate the Dissertation work.
- If a candidate wishes to change his/her supervisor or topic of the Dissertation, he/she can do so with the approval of the PRC. However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his/her initial plans of Dissertation proposal. If yes, his/her date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.
- The candidate shall submit his/her Dissertation progress report in two stages at least with a gap of **three** months between them.
- The work on the Dissertation shall be initiated at the beginning of the II year and the duration of the Dissertation is two semesters. A candidate is permitted to submit Dissertation Thesis only after successful completion of all theory and practical courses with the approval of PRC ***not earlier than 40 weeks*** from the date of approval of the Dissertation work. For the approval of PRC, the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.
- **The Dissertation Work Review - II** in II Year I Semester carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate the work for the other 50 marks. The Supervisor and DRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Dissertation Work. A candidate must secure a minimum of 50% of marks to be declared successful in Dissertation Work Review - II. If he/she fails to obtain the minimum required marks, he has to reappear for Dissertation Work Review - II as and when conducted.
- **The Dissertation Work Review - III** in II Year II Sem. carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate it for the other 50 marks. The PRC will examine the overall progress of the Dissertation Work and decide whether the Dissertation is eligible for final submission. A candidate must secure a minimum of 50% of marks to be declared successful in Dissertation Work Review - III. If he/she fails to obtain the required minimum marks, he/she must reappear for Dissertation Work Review - III as and when conducted. For Dissertation Evaluation (Viva Voce) in II Year II Semester there are external marks of 100 and it is evaluated by the external examiner. The candidate must secure a minimum of 50% marks in Dissertation Evaluation (Viva- Voce) examination.
- Dissertation Work Reviews - II and III shall be conducted in Phase I (Regular) and Phase II (Supplementary). Phase II will be conducted only for unsuccessful students in Phase I. The unsuccessful students in Dissertation Work Review - II (Phase II) shall reappear for it at the time of Dissertation Work Review - III (Phase I). These students shall reappear for Dissertation Work Review- III in the next academic year at the time of Dissertation Work Review - II only after completion of Dissertation Work Review - II, and then Dissertation Work Review - III follows. The unsuccessful students in Dissertation Work Review - III (Phase II) shall reappear for Dissertation Work Review – III in the next academic year only at the time of Dissertation Work Review - II (Phase I).

- A student shall present the progress of the dissertation through Dissertation Reviews II and III with at least a gap of three months between the reviews.
- After approval from the DRC, a soft copy of the thesis should be submitted for ANTI-PLAGIARISM Check from the approved agency with a similarity index not more than 24% and the plagiarism report and be included in the final thesis. If the similarity index has more than the required percentage, the student is advised to modify accordingly and resubmit the soft copy of the thesis after one month. The maximum number of re-submissions of thesis after plagiarism check is limited to ***TWO***. The candidate must register for the Dissertation work and work for two semesters. After three attempts, the admission is liable to be cancelled.
- Three copies of the Dissertation Thesis certified by the supervisor shall be submitted to the Institute, after submission of a research paper related to the Dissertation work in a SCOPUS/Web of Science/UGC approved journal. A copy of the submitted research paper shall be attached to thesis.
- The thesis shall be adjudicated by an external examiner selected by the University. For this, the Principal of the Institute shall submit a panel of **three** examiners from among the list of experts in the relevant specialization as submitted by the supervisor concerned and Head of the Department.
- If the report of the external examiner is unsatisfactory, the candidate shall revise and resubmit the Thesis. If the report of the examiner is unsatisfactory again, the thesis shall be summarily rejected. Subsequent actions for such dissertations may be considered, only on the specific recommendations of the external examiner and /or Dissertation Review Committee. No further correspondence in this matter will be entertained if there is no specific recommendation for resubmission.
- If the report of the examiner is satisfactory, the Head of the Department shall coordinate and decide for the conduct of Dissertation Viva-Voce examination. The Dissertation Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Thesis. The candidate must secure a minimum of 50% of marks in Dissertation Evaluation (Viva-Voce) examination.
- If he/she fails to fulfill the requirements of minimum 50% of marks, he/she will reappear for the Dissertation Viva-Voce examination ***only after three months***. In the reappeared examination also, if he/she fails to fulfill the requirements, he/she will not be eligible for the award of the degree, unless he/she is asked to revise and resubmit his/her Dissertation Work by the board within a specified time period (within ***four*** years from the date of commencement of his/her first year first semester).

7. Recounting of Marks in the End Examination Answer Books: A student can request for re-counting of his/her answer book on payment of a prescribed fee.

8. **Re-evaluation of the End Examination Answer Books:** A student can request for re-evaluation of his/her answer book on payment of a prescribed fee.

9. **Supplementary Examinations:** A student who has failed in an end semester examination can appear for a supplementary examination, as per the schedule announced by the College/Institute.

10. Malpractices in Examinations: Disciplinary action shall be taken in case of malpractice during Mid/ End-examinations as per the rules framed by the Academic Council.

11. **Academic Requirements:**

a) A student shall be deemed to have secured the minimum academic requirement in a subject if he / she secures a minimum of 40% of marks (i.e.,16 marks out of 40 marks) in CIE, 40% of marks (i.e.,24 marks out of 60 marks) in SEE and a minimum aggregate of 50%(i.e.,50 marks out of 100 marks) of the total marks in the Semester-end examination (SEE) and Internal Evaluation (CIE) taken together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 40% (16 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 40% of CIE marks (16 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

b) A student shall be promoted to the next semester only when he/she satisfies the requirements of all the previous semesters.

c) In order to qualify for the award of M.Tech. Degree, the student shall complete the academic requirements of passing in all the Courses as per the course structure including Seminars and Project if any.

d) In case a student does not secure the minimum academic requirement in any course, he/she has to reappear for the Semester-end Examination in the course, or re-register for the same course when next offered or re-register for any other specified course, as may be required. However, one more additional chance may be provided for each student, for improving the internal marks provided the internal marks secured by a student are less than 50% and he/she failed finally in the course concerned. In the event of taking another chance for re-registration, the internal marks obtained in the previous attempt are nullified. In case of re-registration, the student has to pay the re-registration fee for each course, as specified by the Dean Admissions of College.

e) Grade Points: A 10- point grading system with corresponding letter grades and percentage of marks, as given below, is followed:

Letter Grade	Grade Points	Percentage of marks
O (Outstanding)	10	Marks >= 90
A+ (Excellent)	9	Marks >= 80 and Marks < 90
A (Very Good)	8	Marks >= 70 and Marks < 80
B+ (Good)	7	Marks >= 60 and Marks < 70
B (Above Average)	6	Marks >= 50 and Marks < 60
F (Fail)	0	Marks < 50
Ab (Absent)	0	

Earning of Credit:

A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range O-B. Letter grade 'F' in any Course implies failure of the student in that course and no credits earned.

Computation of SGPA and CGPA:

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i) $\mathbf{S_k}$ the SGPA of k^{th} semester (1 to 4) is the ratio of sum of the product of the number of credits and grade points to the total credits of all courses registered by a student, i.e.,

$$SGPA\ (S_k) = \sum_{i=1}^{n} (C_i * G_i) / \sum_{i=1}^{n} C_i$$

Where $\mathbf{C_i}$ is the number of credits of the i^{th} course and $\mathbf{G_i}$ is the grade point scored by the student in the i^{th} course and **n** is the number of courses registered in that semester.

ii) The CGPA is calculated in the same manner taking into account all the courses m, registered by a student over all the semesters of a programme, i.e., upto and inclusive of $\mathbf{S_k}$, where $k \geq 2$.

$$CGPA = \sum_{i=1}^{m} (C_i * G_i) / \sum_{i=1}^{m} C_i$$

iii) The SGPA and CGPA shall be rounded off to 2 decimal points.

12. **Award of Class:** After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of M.Tech. Degree by JNTUH, he/she shall be placed in one of the following four classes:

S. No	Class Awarded	CGPA Secured

1	First Class with Distinction	CGPA ≥ 7.75
2	First Class	CGPA ≥ 6.75 and CGPA < 7.75
3	Second Class	CGPA ≥ 6.00 and CGPA < 6.75

Equivalence of grade to marks

Marks % = (CGPA -0.75)*100

13. **Withholding of Results:** If the student has not paid dues to the Institute/ University, or if any case of indiscipline is pending against him, the result of the student (for that Semester) may be withheld and he will not be allowed to go into the next Semester. The award or issue of the Degree may also be withheld in such cases.

14. **Re-Admission/Re-Registration (Re-Admission for Discontinued Student)**

- A student, who has discontinued the M. Tech. degree programme due to any reason whatsoever, may be considered for 'readmission' into the same degree programme (with the same specialization) with the academic regulations of the batch into which he gets readmitted, with prior permission from the authorities concerned.
- If a student is detained in a subject (s) due to shortage of attendance in any semester, he/she may be permitted to re-register for the same subject(s) in the same category (core or elective group) or equivalent subject, if the same subject is not available, as suggested by the Board of Studies of that department, as and when offered in the subsequent semester(s), with the academic regulations of the batch into which he/she seeks re-registration, with prior permission from the authorities concerned
- A candidate shall be given only one-time chance to re-register and attend the classes for a maximum of two subjects in a semester, if the internal marks secured by a candidate are less than 40% and failed in those subjects but fulfilled the attendance requirement. A candidate must re-register for failed subjects within four weeks of commencement of the class work, in the next academic year and secure the required minimum attendance. In the event of the student taking this chance, his Continuous Internal Evaluation (internal) marks and Semester End Examination marks obtained in the previous attempt stand cancelled.

15. **Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/Universities:** Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/Universities shall be considered only on case-to-case basis by the Academic Council of the Institute.

16. **Transitory Regulations:** Students who have discontinued or have been detained for want of attendance, or who have failed after having undergone the PG degree Programme, may be considered eligible for readmission to the same or equivalent subjects as and when they are offered.

17. **General Rules**

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

b) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

c) In case of any error in the above rules and regulations, the decision of the Academic Council is final.

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

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MECHANICAL ENGINEERING

M. Tech (DFM) – GR22 Course Structure

I M.Tech (DFM) - I Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	ME	PC	GR22D5048	Advanced Computer Aided Design	3	0	0	3	3	0	0	3	40	60	100
2	ME	PC	GR22D5049	Design and Analysis of Machine Tools	3	0	0	3	3	0	0	3	40	60	100
3	ME	PE-I	GR22D5050	1. Materials Technology	3	0	0	3	3	0	0	3	40	60	100
			GR22D5051	2.Advanced Composite Technologies											
			GR22D5052	3.Smart Materials and Structures											
4	ME	PE-II	GR22D5053	1. Finite Element Applications in Manufacturing	3	0	0	3	3	0	0	3	40	60	100
			GR22D5054	2. MEMS and Micro Systems: Design and Manufacturing											
			GR22D5055	3. Computer Aided Inspection and Non Destructive Testing.											
5	ME	PC	GR22D5056	Computer Aided Design Lab	0	0	2	2	0	0	4	4	40	60	100
6	ME	PC	GR22D5057	Design and Analysis of Machine Tools Lab	0	0	2	2	0	0	4	4	40	60	100
7	ENG	PC	GR22D5011	Research Methodology and IPR	2	0	0	2	2	0	0	2	40	60	100
				Total	**14**	**0**	**4**	**18**	**14**	**0**	**8**	**22**	**280**	**420**	**700**
8		AC		Audit Course I	0	0	0	0	2	0	0	2	40	60	100

I M.Tech (DFM) - II Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	ME	PC	GR22D5058	Computer Aided Manufacturing	3	0	0	3	3	0	0	3	40	60	100
2	ME	PC	GR22D5059	Advanced Manufacturing Processes	3	0	0	3	3	0	0	3	40	60	100
3	ME	PE-III	GR22D5060	1. Additive Manufacturing	3	0	0	3	3	0	0	3	40	60	100
			GR22D5061	2. Hydraulics and Pneumatics Systems.											
			GR22D5062	3. Flexible Manufacturing Systems											
4	ME	PE-IV	GR22D5063	1. Automation in Manufacturing	3	0	0	3	3	0	0	3	40	60	100
			GR22D5064	2. Design for Sustainable Manufacturing and Assembly											
			GR22D5065	3.Intelligent Manufacturing Systems											
5	ME	PC	GR22D5066	Computer Aided Manufacturing Lab	0	0	2	2	0	0	4	4	40	60	100
6	ME	PC	GR22D5067	Advanced Manufacturing Processes Lab	0	0	2	2	0	0	4	4	40	60	100
7	ME	PW	GR22D5144	Mini Project	0	0	2	2	0	0	4	4	50	50	100
				Total	**12**	**0**	**6**	**18**	**12**	**0**	**12**	**24**	**280**	**420**	**700**
8	ME	Audit		Audit course – 2	0	0	0	0	2	0	0	2	40	60	100

II M.Tech (DFM) - I Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	ME	PE-V	GR22D5068	1. Advanced Metal Forming	3	0	0	3	3	0	0	3	40	60	100
			GR22D5069	2. Mechatronics and Robotics											
			GR22D5070	3. Optimization Techniques											
2	ME	OE	GR22D5147	1. Cost Management of Engineering Projects	3	0	0	3	3	0	0	3	40	60	100
			GR22D5148	2. Industrial Safety											
			GR22D5149	3. Operations Research											
			GR22D5150	4. Artificial Neural Networks and Fuzzy Systems											
			GR22D5151	5. Cyber Security											
			GR22D5152	6.Internet of Things Architecture and Design Principles											
3	ME	PW	GR22D5145	Dissertation Phase – I	0	0	10	10	0	0	20	20	100		100
				Total	**6**	**0**	**10**	**16**	**6**	**0**	**20**	**26**	**180**	**120**	**300**

OPEN ELECTIVE				
S.NO	**BOS**	**Group**	**Course Code**	**Course**
1	CE	OE	GR22D5147	1. Cost Management of Engineering Projects
2	EEE	OE	GR22D5148	2. Industrial Safety
3	ME	OE	GR22D5149	3. Operations Research
4	ECE	OE	GR22D5150	4. Artificial Neural Networks and Fuzzy Systems
5	CS	OE	GR22D5151	5. Cyber Security
6	IT	OE	GR22D5152	6.Internet of Things Architecture and Design Principles

II M.Tech (DFM) - II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	ME	PW	GR22D5146	Dissertation Phase – II	0	0	16	16	0	0	32	32	100	100	200
				Total	**0**	**0**	**16**	**16**	**0**	**0**	**32**	**32**	**100**	**100**	**200**

Audit Courses I & II

S.No	Course Code	Course
1	GR22D5153	English for Research Paper Writing
2	GR22D5154	Disaster Management
3	GR22D5155	Sanskrit for Technical Knowledge
4	GR22D5156	Value Education
5	GR22D5157	Indian Constitution
6	GR22D5158	Pedagogy Studies
7	GR22D5159	Stress Management by Yoga
8	GR22D5160	Personality Development through Life Enlightenment Skills

I YEAR
I SEMESTER

GOKARAJURANGARAJUINSTITUTE OF ENGINEERINGANDTECHNOLOGY

ADVANCED COMPUTER AIDED DESIGN

Course Code: GR22D5048 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Objectives:

1. Impart knowledge of Computer Aided Design tools in design of machine components.
2. Create Wire-frame, Surface and Solid models for Engineering Components using the CAD system.
3. Gain the knowledge of special surfaces and solid model representation techniques to create models of complex products.
4. Inculcate collaborative engineering principles in industry or organization.
5. Implement Finite Element Methods in analysis of the Engineering components.

Course Outcomes:

1. Illustrate the basic principles of Computer Aided Design tools used in Engineering.
2. Develop synthetic curves like Hermitte cubic curve, Bezier curve, B-Spline and NURBS to create wire- frame models of engineering products.
3. Apply analytical surfaces like plane surface, surface of revolution, tabulated cylinder and synthetic surfaces to create surfaces of engineering products.
4. Create the solid model of the object using Boundary representation, Constructive solid geometry, Sweep representation methods. And able to recognize the CAD/CAM exchange formats.
5. Analyze a CAD model using Finite Element Method (FEM) and apply collaborative Engineering Principles.

UNIT I

CAD Tools: Definition of CAD, Design process, Applications of CAD to design process. Product cycle, Types of productions, CAD system hardware configuration. CAD input and output devices. CAD software: CAD software configuration, CAD software functions, 2D Transformations: Scaling, Rotation and Translation.

UNIT II

Geometric Modeling-Wireframe Modeling: Parametric and non-parametric representation of curves. Continuity of curves, Parametric representation of Analytical curves such as Line, Circle, Conics etc., and Problems, Parametric representation of synthetic curves like Hermitte cubic curves, Bezier curves B-Splines, NURBS – properties and problems.

UNIT III

Geometric Modeling-Surface Modeling: Parametric representation of surface entities- Analytical surfaces. Parametric Representation of Synthetic Surfaces- Plane surface, Ruled surface, Tabulated Cylinder and Surface of revolution. Hermitte bi-cubic surface, Bezier surface,

B-Spline surface. Special surfaces like: COON surface, Blending surface, Sculptured surface. Surface manipulation-Displaying, Segmentation, Trimming and Intersection.

UNIT IV

Geometric Modeling-Solid modeling: Solid Representation, Boundary Representation (B-rep), Constructive Solid Geometry (CSG). Sweep representation. Difference between Feature-based and Parametric based modeling, Description of features such as Extrude, Sweep, Loft, Hole, Extrude-cut etc.

CAD/CAM Exchange: Evaluation of data-exchange format, IGES data representations and structure, STEP Architecture, implementation, ACIS & DXF.

UNIT V

Design Applications: Mass property calculations, Finite Element Modeling and Analysis, Steps used in FEM process. Pre and Post processing in FEA, Types of Structural and Thermal analysis.

Collaborative Engineering: Collaborative Design, Principles, Approaches, Tools, Design Systems.

Text Books:

1. CAD/CAM Theory and Practice/ lbrahim Zeid/McGraw Hill International.
2. CAD/CAM by E. Zimmers, M. Groover, Pearson publisher.

Reference Books:

1. CAD/CAM/P.N.Rao/TMH.
2. CAD/CAM/CIM Radhakrishnan, New Age Publisher.

GOKARAJURANGARAJUINSTITUTE OF ENGINEERINGANDTECHNOLOGY

DESIGN AND ANALYSIS OF MACHINE TOOLS

Course Code: GR22D5049 **L/T/P/C: 3/0/0/3**
I Year I Semester

Course Objectives:

1. Know cutting tool material and tool nomenclature
2. Know the tool wear mechanisms
3. Know the advanced machining techniques
4. Know the terminology related to die design and punch
5. Know the location and clamping design

Course Outcomes

1. Learn the importance of selecting the proper cutting tool material and cutting tool angles required to machine a work piece.
2. Analyse various tool wear mechanisms and temperatures generated in machining process
3. Select modern machining processes for machining a given material and required part accuracies.
4. Design of die and punch for blanking, piercing, drawing and bending operations.
5. Design a location and clamping system for a given component.

UNIT I

Metal Cutting: Tool Materials, Introduction desirable properties of tool materials, Types of Cutting Tool Materials, Indexable inserts, Coated tools, Orthogonal and Oblique cutting, Classifications of cutting tools, Chip formation, Types of chips, Cutting tool geometry, various methods of tool nomenclature and their relationships. Theoretical Determination of shear angle and cutting forces Shear plane theory – Merchant's models, Lee and Shaffer's model. Velocity relationships, Work done in cutting. Analysis of cutting forces using Merchant Circle diagram.

UNIT II

Tool Life and Tool Wear: Theories of tool wear-adhesion, abrasive and diffusion wear mechanisms, forms of wear, Taylor's tool life equation, Tool life criteria and machinability index. Problems on tool life

Cutting Temperature: Sources of heat in metal cutting, influence of metal conditions. Temperature distribution, zones, Use of tool work thermocouple for determination of temperature. Temperature distribution in Metal Cutting.

UNIT III

Material Removal Mechanism of Advanced Machining Processes Mechanical energy based machining processes: Abrasive jet machining, Ultrasonic machining, Water jet machining, Abrasive water jet machining. Thermo-electric energy based machining processes: Laser beam machining, Electron beam machining, Electric discharge machining

UNIT IV

Press Tool Design: Introduction, press operations, Press working equipment – Classification, Press working Terminology, Types of dies – Simple dies, Inverted dies, Compound dies, Combination dies, Progressive dies, Transfer dies. Principle of metal cutting, strip layout, clearance, angular clearance, cutting forces, method of reducing cutting forces, die block, die block thickness, Strippers, Stoppers, Stock stop, Stock guide, Knock outs, Pilots. Blanking & Piercing die design-single & progressive dies.

UNIT V

Design of Jigs and fixtures:

Work holding devices: Basic principle of six-point location, Locating methods and devices, Principle of clamping and Types of clamps.

Design of jigs: Type of Drill bushes, Classification of drill jigs, Design of drill jigs.

Design of fixtures: Design of milling fixtures, Design of turning fixtures.

Text Books:

1. A.Bhattacharya- Metal Cutting Theory and Practice, New Central Book Agency (P)Ltd.
2. Donaldson.C, G.H.Lecain and V.C.Goold “Tool Design” Tata McGraw Hill Publishing company ltd, New Delhi,2010.

GOKARAJURANGARAJUINSTITUTE OF ENGINEERINGANDTECHNOLOGY

MATERIALS TECHNOLOGY
(Professional Elective I)

Course Code: GR22D5050 **L/T/P/C:3/0/0/3**
I Year I Semester

Course Objectives:

1. Introduce elastic and plastic behavior of metals and polymers.
2. Impart the knowledge on strengthening mechanisms of metals and polymers.
3. Analyze the fracture behavior analysis of ductile and brittle materials.
4. Gain the skill of identifying the relationship between materials selection and processing for various applications-Case studies.
5. Develop the knowledge on composites, super alloys, adhesives, coatings and application of these in aero, auto, Marine, Machinery and Nuclear.

Course Outcomes:

1. Apply core concepts and Analyze materials for design, construction and the importance of lifelong learning.
2. Study the fiber and dispersion strengthening mechanisms in materials
3. Examine the theories of fracture for brittle and ductile materials.
4. Select the best material for particular engineering applications
5. Describe the scope of modern metal composites.

UNIT I

Elastic And Plastic Behavior: Elasticity in metals and polymers, mechanism of plastic deformation, role of dislocations, yield stress, shear strength of perfect and real crystals, strengthening mechanism, work hardening, solid solution ,grain boundary strengthening.

UNIT II

Poly phase, mixture, precipitation, particle, fiber and dispersion strengthening, effect of temperature, strain and strain rate on plastic, behavior, super plasticity, deformation of non-crystalline material

UNIT III

Fracture Behavior: Griffith's Theory, stress intensity, factor and fracture toughness, Toughening Mechanisms, Ductile and Brittle transition in steel, High Temperature Fracture, Creep, Larson, Miller parameter, Deformation and Fracture mechanism maps. Fatigue, Low and High cycle fatigue test, Crack Initiation and Propagation mechanism and Paris Law, Effect of surface and metallurgical parameters on Fatigue analysis, Sources of failure, procedure of failure analysis.

UNIT IV

Material Selection: Motivation for selection, cost basis and service requirements, selection for mechanical properties, strength, toughness, fatigue and creep. Selection for Surface durability, Corrosion and Wear resistance, Relationship between Materials Selection and Processing, Case studies in Materials Selection with relevance to Aero, auto, Marine, Machinery and Nuclear applications.

UNIT V

Modern Metallic Materials: Dual Phase Steels, Micro alloyed, High Strength, Low alloy (HSLA) Steel, Transformation induced plasticity (TRIP)Steel, Maraging Steel, Inter metallic, Ni and Ti Aluminides, Smart Materials, Shape Memory alloys, Metallic Glass Quasi Crystal and Nano Crystalline Materials. Fibres, Foames, Adhesives and coatings, advanced structural ceramics: WC, Tic, Tac, Al2O3, Si3N4, CBN, Diamond Properties, processing and applications.

Text Books

1. Mechanical Metallurgy George E Dieter, McGraw-Hill
2. Materials Science and Engineering: An Introduction, William D. Callister, John Wiley & Sons

Reference Books:

1. Selection and use of engineering materials Charles J A, Butter worth, Heirmaker
2. Material selection in Mechanical Design by Micheal F Asby, Butter worth, Heirmaker

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED COMPOSITE TECHNOLOGIES
(Professional Elective I)

Course Code: GR22D5051 **L/T/P/C:3/0/0/3**
I Year I Semester

Course Objectives:

1. Understand composite material and their reinforcements
2. Select constituent materials to develop appropriate composites
3. Analyze interfaces of composites for predicting their mechanical properties.
4. Develop metal matrix, ceramic matrix and polymer matrix composites with calculated values of constituents
5. Analyze the performance of composites

Course Outcomes:

1. Understand composite material and their reinforcements
2. Select constituent materials to develop appropriate composites
3. Analyze interfaces of composites for predicting their mechanical properties.
4. Develop metal matrix, ceramic matrix and polymer matrix composites with calculated values of constituents
5. Analyze the performance of composites

UNIT I

Fundamental concepts: Overview of the course, history and basic concept of composites, Types and constituents, reinforcement and matrices, interface and mechanism of strengthening. Definition and Classification of Composites, particulate and dispersion hardened composites, continuous and discontinuous fibre reinforced composites MMC, PMC, CMC.

UNIT II

Metal Matrix Composites Processing: Liquid state processes, solid state processes andin situ processes.Interface: Role, reactions, bonding mechanisms and bond strength. Properties and applications: Strength, stiffness, creep, fatigue and fracture; thermal, damping and tribological properties.

UNIT III

Polymer Matrix Composites Processing: Hand layup and spray technique, filament winding, pultrusion, resin transfer molding, bag and injection molding, sheet molding compound. Matrix resins-thermoplastics and thermosetting matrix resins. Reinforcing fibers- Natural fibers (cellulose, jute, coir etc.), carbon fiber, glass fiber, Kevlar fiber, etc. Particulate fillers-importance of particle shape and size. Coupling agents-surface treatment of fillers and fibers,

significance of interface in composites. Short and continuous fibre reinforced composites, critical fibre length, and anisotropic behavior.

UNIT IV

Ceramic Matrix Composites Processing: Cold pressing & sintering, hot pressing reaction bonding processes, infiltration, in-situ chemical reaction, Sol-Gel and polymer pyrolysis, self-propagating high temperature synthesis. Carbon- carbon composites, Interfaces

UNIT V

Rule of mixtures. Stress, strain transformations. Nanocomposites: introduction to Nanocomposites, advantages disadvantages Test methods: Quality assessment, physical and mechanical property characterization.

Text Books:

1. Composite Materials Science and Engineering, Chawla, Springer
2. An introduction to composite materials, Hull, Cambridge

Reference Books:

1. ASM Handbook Composites, Steven L. Donaldson, Volume 21, 2001.
2. Composite Materials, Science and Engineering, Krishan K. Chawla, Springer, 2001.
3. Process Modelling in Composites Manufacturing,Suresh G. Advani, E. Murat Sozer, 2nd Ed. CRC Press, 2009

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SMART MATERIALS & STRUCTURES
(Professional Elective - I)

Course Code: GR22D5052 **L/T/P/C:3/0/0/3**
I Year I Semester

Course Objectives:

1. To make students aware on soft materials and its structures.
2. To introduce students to various classes of stimuli responsive materials.
3. To signify the huge potential/crucial role of smart material systems in the future technology development for various applications.
4. To introduce the various characterization techniques for soft materials.
5. To underpin the significance of soft materials through various case studies.

Course Outcomes:

1. Students will get introduced to smart materials and its behavior.
2. The course would also enable the students to appreciate the huge role of smart materials in the design of next generation materials.
3. The vast potential of smart materials will encourage students to explore them in detail and to design them for specific applications
4. Students will be familiar with various signal conditioning techniques to obtain accurate output.
5. Students will develop a fundamental understanding of the various classes of smart materials that are relevant for technological applications in different sectors including materials industry and consumer products.

UNIT I

Overview of Smart Materials, Structures and Products Technologies.

UNIT II

Smart materials (Physical Properties) Piezoelectric Materials, Elecrostrictive Materials, Magnetostrictive Materials, Magneto electric Materials. Magnetorheological Fluids, Electroheological Fluids, Shape Memory Materials, Fiber-Optic Sensors.

UNIT III

Smart Sensor, Actuator and Transducer Technologies: Smart Sensors: Accelerometers; Force Sensors; Load Cells; Torque Sensors; Pressure Sensors; Microphones; Impact Hammers; MEMS Sensors; Sensor Arrays Smart Actuators; Displacement Actuators; Force Actuators; Power Actuators: Vibration Dampers; Shakers; Fluidic Pumps; Motors ; smart Transducers: Ultrasonic Transducers; Sonic Transducers.

UNIT IV

Measurement, Signal Processing, Drive and Control Techniques: Quasi -static and Dynamic Measurement Methods; Signal conditioning devices; Constant voltage, Constant-current and Pulse drive methods; Calibration methods; Structural dynamics and Identification techniques; Passive, Semi -active and Active control; Feedback and feed forward/control strategies

UNIT V

Design, Analysis, Manufacturing and Applications of Engineering Smart Structures and Products: Case studies incorporating design, analysis, manufacturing and application issues involved in integrating smart materials and devices with signal processing and control capabilities to engineering smart structures and products; Emphasis on structures, automation and precision manufacturing equipment, automotives, consumer products, sporting products, computer and telecommunications products, as well as medical and dental tools equipment.

Text Books:

1. Smart Materials and Structures/ M. V. Gandhi and_B.So Thompson/ Chapman & Hall, London; New York, 1992 (ISBN 0412370107).
2. Smart Structures and Materials/ B.Cui Shaw/Artech House, Boston, 1996 (ISBN:0890066817)

Reference Books:

1. Smart Structures; Analysis and Design/ A.V. Srinivasan/ Cambridge University Press, Cambridge; New York, 2001 (ISBN: 0521650267).
2. Electro ceramics: Materials, Properties/ A.J. Moulson and J.M-Herbert/ Wiley/ 2nd Edition, (ISBN: 0471497479).
3. Piezoelectric Sensories: Force, Strain, Pressure, Acceleration and Acoustic Emission Sensors. Materials and Amplifiers/ G. Gautschi/ Springer, Berlin; New York,2002 (ISBN:3540422595) Piezoelectric Actuators and wtrasonic Motors/ K.Uchino/ Kluwer Academic Publishers, Boston, 1997 (ISBN: 0792398114)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FINITE ELEMENT APPLICATIONS IN MANUFACTURING
(Professional Elective II)

Course Code: GR22D5053 **L/T/P/C:3/0/0/3**
I Year I Semester

Course Objectives:

1. Gain a fundamental understanding of the finite element method for solving boundary value problems.
2. Analyze important concepts of variational form, minimum potential energy principles, and method of weighted residuals.
3. Derive one dimensional problems such as truss, beam, and frame members, two-dimensional problems such as plain stress and plain strain elasticity problems, torsion problem.
4. Introduce the finite element analysis of static and dynamic problems and heat transfer problems and manufacturing processes.
5. Analyzing skills in applying basic laws in mechanics and integration by parts to develop element equations and steps used in solving the problem by finite element method.

Course Outcomes:

1. Obtain an understanding of the fundamental theory of the FEA method
2. Apply the concepts of minimum potential energy principles to formulate one dimensional elements and solve structural and heat transfer problems
3. Formulate 2D and higher order elements and solve two dimensional and axisymmetric problems
4. Able to create a FE code to solve 1-D structural problems
5. Apply the finite element techniques in manufacturing processes.

UNIT I

Introduction: Fundamentals–Initial, boundary and Eigen value problems–weighted residual, Galerkin and Raleigh Ritz methods-Integration by parts–Basics of variational formulation – Polynomial and Nodal approximation.

UNIT II

One Dimensional Analysis: Steps in FEM–Discretization. Interpolation, derivation of elements characteristic matrix, shape function, assembly and imposition of boundary conditions-solution and post processing– One dimensional analysis in solid mechanics and heat transfer.

UNIT III

Shape Functions and Higher Order Formulations: Shape functions for one and two dimensional elements-Three nodded triangular and four nodded quadrilateral element Global and natural co- ordinates, Basics of two dimensional, plane stress, plane strain and axisymmetric analysis.

UNIT IV

Computer Implementation: Pre-Processing, mesh generation, elements connecting, boundary conditions, input of material–Solution and post processing–Development of ANSYS-APDL code for one dimensional Beam and Truss problems.

UNIT V

Analysis of Production Processes: FE analysis of metal cutting, Basic concepts of plasticity and fracture–Solid and flow formulation–small incremental deformation formulation–Fracture criteria–FE analysis of metal cutting, chip separation criteria, incorporation of strain rate dependency.

Text Books:

1. Rao, S.S., Finite Element method in engineering, Pergamm onpress,1989.
2. Bathe, K.J., Finite Element procedures in Engineering Analysis,1990.

Reference Books:

1. Logan D.L., A First Course in the Finite Element Method, Cengage Learning, 2016
2. Kobayashi, S,Soo-ik-Oh and Altan, T,Metal Forming and the Finite Element Methods, Oxford University Press,1989.
3. Lewis R.W.Morgan, K,Thomas, H.R. and Seetharaman, K.N. The Finite Element Method in Heat Transfer Analysis, JohnWiley,1994.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MEMS AND MICRO SYSTEMS: DESIGN AND MANUFACTURING
(Professional Elective II)

Course Code: GR22D5054 **L/T/P/C:3/0/0/3**
I Year I Semester

Course Objectives:

1. To gain fundamental understanding of standard micro fabrication techniques and issues surrounding them.
2. To know major classes, components and applications of MEMS.
3. To demonstrate fundamental principles behind the operation of devices/systems.
4. To apply knowledge of micro fabrication techniques and applications
5. To the design and manufacturing of an MEMS device or a micro system.

Course Outcomes:

1. Understand the operational theory of common MEMS sensors and MEMS.
2. Identify the situations where MEMS sensors and actuators would be ideal for applications to various products..
3. Apply the scaling-law to determine if MEMS devices would perform better than existing non-microscale devices.
4. Analyze the engineering science and physics of MEMS devices at the micro-scale including: Electrostatics, thermodynamics, piezoresistive, magnetism, micro fluidics and optics..
5. Understand the fabrication methods used to build/construct MEMS

UNIT I

OVERVIEW AND WORKING PRICIPLES OF MEMS AND MICROSYSTEMS :Overview and working principles of mems and microsystems: MEMS and microsystems, evolution of micro fabrication, microsystems and microelectronics, microsystems and miniaturization, applications of MEMS in industries, micro sensors, micro actuation, MEMS with micro actuators micro accelerometers, micro fluidics.

UNIT II

ENGINEERING SCIENCE FOR MICROSYSTEMS DESIGN AND FABRICATION: Engineering science for microsystems design and fabrication: Atomic structure of matter, ions and ionization, molecular theory of mater and intermolecular force, doping of semiconductors, diffusion Process, plasma physics, electrochemistry, quantum physics.

UNIT III

ENGINEERING SCIENCE FOR MICROSYSTEMS DESIGN AND FABRICATION: Engineering mechanics for microsystems design: Static Bending of thin Plates, mechanical vibration. Thermo mechanics fracture mechanics, thin-film mechanics, and overview of finite element stress analysis

UNIT IV

THERMO FLUID ENGINEERING AND MICROSYSTEMS DESIGN : Thermo fluid engineering and microsystems design: Overview of basics of fluid mechanics in macro and meso scales, basic equations in continuum fluid dynamics, laminar fluid flow in circular conduits, computational fluid dynamics, incompressible fluid flow in micro conduits, fluid flow in sub micrometer and nano scale, overview of heat conduction in solids, heat conduction in multilayered thin films and in solids in sub micrometer scale, design considerations, process design mechanical design, mechanical design using finite element method, design of a silicon die for a micro pressure sensor.

UNIT V

MATERIALS FOR MEMS, MICROSYSTEMS AND THEIR FABRICATION : Materials for mems and microsystems and their fabrication: Substrates and Wafers, Active substrate materials, Silicon as a substrate material, Silicon Compounds, Silicon Piezoresistors, Gallium Arsenide, Quartz, Piezoelectric Crystals and Polymers, Photolithography, Ion implantation, Diffusion and oxidation, chemical and physical vapor deposition, Etching, Bulk micro manufacturing, Surface Micromachining, The LIGA Process

TEXT BOOKS:

1. Tai-Ran Hsu, "MEMs & Microsystems: Design & Manufacture", Tata McGraw Hill, 1st Edition, 2002.
2. M. Maluf, "An Introduction to Microelectromechanical Systems Engineering", Artech House, 1 st Edition, 2000.

REFERENCE BOOKS:

1. Trimmer, W.S.N, "Micro robots and Micromechanical Systems Sensors & Actuators", 19th Edition, 1989 5 | P a g e
2. Madou, M, "Fundamentals of Microfabrication", CRC Press, 1st Edition, 1997.
3. Hsu, T.R, "The Finite Element Method in Thermo mechanics", Alien & Unwin, London, 1 stEdition,1986.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTER AIDED INSPECTION AND NON DESTRUCTIVE TESTING
(Professional Elective II)

Course Code: GR22D5055 **L/T/P/C:3/0/0/3**
I Year I Semester

Course Objectives:

1. Provide knowledge on computer aided metrology and measuring machines.
2. To introduce the concepts on dye penetrant testing methods and its importance.
3. To expose the importance of Magnetic Particle Inspection and Acoustic Emission.
4. To impart knowledge on radiography inspection in testing of materials.
5. To proficient with advancement of ultrasonic inspection and its importance.

Course Outcomes:

1. To illustrate the exact method of measuring a component with high accuracy and precision.
2. To explain about dye penetrant testing process, its features and its Importance.
3. To describe about Magnetic Particle Inspection and Acoustic Emission process.
4. To examine the components by radiography inspection and identify the defects.
5. Familiar with ultrasonic inspection method in identifying the defects with high accuracy.

UNIT I

Computer Aided Metrology And Measuring Machines - Metrological concepts – Abbes principle – need for high precision measurements – problems associated with high precision measurements - Computer aided metrology and inspection – principles and interfacing, software metrology, laser metrology, application of lasers in precision measurements – laser interferometer, laser scanners, contact and non-contact type optical and non-optical inspection methods, In process inspection. Use of microprocessors and computers in metrology and inspection, Coordinate Measuring Machine (CMM), Image Shearing Microscope

UNIT II

Liquid Penetrant Inspection and Shearography - Introduction – Principles of penetrant inspection - Characteristics of Liquid penetrants, - Water-washable System – Post-emulsification system – Solvent removable system – Surface preparation and cleaning – Penetrant application – Development Developers – Advantages and limitations - Applications. Shearography-principles constructions - applications.

UNIT III

Magnetic Particle Inspection And Acoustic Emission - Introduction – Magnetisation – Magnetisation methods – Continuous and residual methods – Sensitivities – Demagnetisation –

Magnetic particles - Applications, Advantages and Limitations Principles of acoustic emission techniques, instrumentation, applications, advantages and limitations.

UNIT IV

Radiography Inspection - Introduction – Uses of radiography – Limitations of radiography – Principles of radiography – Radiation sources – X-Ray production, X-ray Spectra, Properties of Xrays and γ Rays – Attenuation of radiation – Radiographic equivalence – Shadow formation, enlargement and distortion – Radiographic film and paper - Exposure curves and charts, Contrasts – Radiographic screens – Viewing and interpretation of radiographs – Operational characteristics of X-ray, Equipment, Applications, Advantages, limitations etc.

UNIT V

Ultrasonic Inspection - Introduction – Nature of Sound - Production of Ultrasonic waves, Different types of waves, General characteristics of waves, Pulse echo method, Sound attenuation – Display systems – Probe types and construction – Type of Display – Inspection techniques - Identification of defects – Sensitivity and Calibration - Applications, Advantages and limitations.

Text Books:

1. Baldev Raj, Jayakumar .T and Thavasimuthu M., 'Practical Nondestructive Testing', Narosa Publishing House, 2002
2. "American Society of Metals", Metals Hand book, Vol. 11, 10th edition, 1998

Reference Books:

1. Jain R.K., "Engineering Metrology", Khanna Publishers, 1997
2. "Progress in Acoustic Emission", Proceedings of 10th International Acoustic Emission symposium, Japanese society for NDT,1990
3. Barry Hull and Vernon John, "Non Destructive Testing", Macmillan, 1988
4. Gayler and Shotbolt, "Metrology for Engineers", ELBS, 1980

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTER AIDED DESIGN LAB

Course Code: GR22D5056 **L/T/P/C: 0/0/4/2**
I Year I Semester

Course Objectives:

1. Provide knowledge to Model 3D parts using CAD software.
2. Apply CAD software in creating assembly of machine components.
3. Confer about Importance of parametric curves to model complex machine parts.
4. Provides knowledge about different layouts of drawings, orthographic projections and introduce various file formats.
5. Develop simulation techniques to solve structural and heat transfer problems

Course Outcomes:

1. Create machine components and generate drawings.
2. Create engineering assemblies using appropriate assembly constraints and generate drawings.
3. Model complex machine components and surface models.
4. Simulate and analyze structural problems.
5. Simulate and analyze heat transfer problems.

Introduction to CAD Software:

Part Modeling:
To create 3D Part models using features such as Extrude, Revolve, fillets, chamfer, Sweep, Loft, Hole, Extrude-cut, etc.

Assembly of Parts:
To create an Assembly of parts by applying constraints (relations/ Mates)
Modeling of complex Parts and surfaces:
To create complex 3D parts and surfaces using parametric curves

Drafting:
To create layout, orthographic views, detailing
Exercises in Modeling, Assembly, and Drafting

Task 1: Creating Parts related to Shock Assembly

Task 2: Creating Parts related to Quick Acting Hold-Down Clamp

Task 3: Assembly of Shock Assembly

Task 4: Assembly Quick Acting Hold-Down Clamp

Task 5: Part and Assembly Drawings of Shock Assembly

Task 6: Part and Assembly Drawings of Quick Acting Hold-Down Clamp

Task 7: Exercise related to Advanced Feature Options- Loft, Sweep, parametric curves

Task 8: Exercise related to Surface modeling

Finite Element Analysis:

Task 9: Structural analysis: Truss and Beam problems, ANSYS-APDL coding

Task 10: Structural analysis: 2D problems-Symmetric and axisymmetric conditions

Task 11: Model analysis of Beam

Task 12: Thermal analysis of a Composite Slab

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN AND ANALYSIS OF MACHINE TOOLS LAB

Course Code: GR22D5057 **L/T/P/C:0/0/4/2**
I Year I Semester

Course Objectives:

1. Know the terminology related to machining
2. Know the forces generated in turning
3. Know the various mechanisms of tool wear
4. Know the parameter which effect surface roughness
5. Analyze and evaluate the data

Course Outcome

1. Acquire knowledge on various machining processes in turning. Estimate the chip reduction coefficient and shear angle.
2. Analyze cutting forces in turning process.
3. Estimate tool life of a single point cutting tool.
4. Evaluate the effect of the process parameters on surface roughness.
5. Gain knowledge in simulation techniques. Analyze experimental data to derive valid conclusions.

Task 1 Estimation of various cutting forces in orthogonal turning using Lathe tool dynamometer on ferrous materials

Task 2 Estimation of various cutting forces in orthogonal turning using Lathe tool dynamometer on Non- ferrous materials

Task 3 Estimation of Specific cutting energy in turning Process carried on Precision lathe.

Task 4 Estimation of chip reduction coefficient and shear angle in orthogonal turning.

Task 5 Estimation of Material Removal Rate in turning process

Task 6 Estimation of tool life of a single point cutting tool using Tool makers Microscope for ferrous materials.

Task 7 Estimation of tool life of a single point cutting tool using Tool makers Microscope for non- ferrous Materials.

Task 8 Evaluation of the effect of process parameters by measuring surface roughness using surf test

Task 9 Simulation of oblique turning process

Task 10 Simulation of orthogonal turning process

Task 11 Study on the effect of various parameters and various angles in single point cutting tool.

Task 12 Study on conversions of angles between ASA and ORS systems.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

RESEARCH METHODOLOGY AND IPR

Course Code: GR22D5011 **L/T/P/C:2/0/0/2**
I Year I Semester

Course Objectives:

1. To familiarize students with the different aspects of research.
2. To provide an idea of good scientific writing and proper presentation skills.
3. To provide an understanding of philosophical questions behind scientific research.
4. To provide a brief background on the historical legacy of science.
5. To provide an insight of the nature of Intellectual Property and new developments in IPR.

Course Outcomes:

1. Understand research problem formulation.
2. Analyze research related information and follow research ethics
3. Understand that today's world is controlled by Computer, Information Technology, but tomorrow's world will be ruled by ideas, concepts, and creativity.
4. Understand that when IPR would take such an important place in the growth of individuals & nations, it is needless to emphasise the need for information about Intellectual Property Rights to be promoted among students in general & engineering.
5. Understand the nature of Intellectual Property and IPR in International scenarios.

UNIT I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

UNIT II

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations, Effective literature studies approaches, analysis Plagiarism, Research ethics.

UNIT III

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

Reference Books:

1. RanjitKumar, 2 ndEdition , "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd , 2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.
5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in the New Technological Age", 2016. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008.

I YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTER AIDED MANUFACTURING

Course Code: GR22D5058 **L/T/P/C:3/0/0/3**
I Year II Semester

Course Objectives:

1. Apply CNC and APT programming knowledge in Manufacturing of machine members.
2. Understand the working and constructional features of CNC Machine tools, DNC, and Adaptive control system.
3. Understand the concept of post processors of CNC machines and its functions
4. Understand hardware of microcontrollers and PLC system.
5. Create the process plans of machine members and to analyze the quality of product using advanced inspection and testing instruments.

Course Outcomes:

1. Apply knowledge of CNC and APT programming in manufacturing of machine members of automobile industry, machine tools, aerospace etc.
2. Apply the knowledge of CNC machine tools and its features in efficient use of the machine.
3. Understand the working principle of post processors, its hardware and its functions.
4. Understand basic principles of micro controllers, its hardware, programming, PLC hardware and its application to CNC machines.
5. Create process plans using the software for machine components. Analyze the machine components using advanced inspection and testing instruments for controlling the quality and understand the knowledge of expert systems like Artificial Intelligence.

UNIT I

Computer Aided Programming: General information, CNC programming and examples of CNC programming. APT Programming, Examples APT programming (2D machining only). Introduction to CAD/ CAM software, Automatic Tool Path generation.

UNIT II

Tooling for CNC Machines: Interchangeable tooling system, preset and qualified tools, coolant fed tooling system. Modular fixturing, quick change tooling system and automatic head changers. Introduction of DNCSystems and types of DNC systems, advantages and disadvantages of DNC system. Adaptive control with optimization. Adaptive control with constraints, Adaptive control of machining processes like turning, grinding.

UNIT III

Post Processors for CNC: Introduction to Post Processors, The necessity of a Post Processor, the general structure of a Post Processor, the functions of a Post Processor, DAPP based Post Processor. Communication channels and major variables in the DAPP based Post Processor. The creation of a DAPP based Post Processor.

UNIT IV

Micro Controllers: Introduction. Hardware components, I/O pins, external memory, counters, timers and serial data I/O interrupts. Selection of Micro Controllers Embedded controllers. Applications and programming of Micro Controllers.

Programming Logic Controllers (PLC's): Introduction, Hardware Components of PLC System, basic structure, principle of operations, programming mnemonics timers, Internal relays and counters Applications of PLC's in CNC Machines.

UNIT V

Computer Aided Process Planning (CAPP): Types of CAAP Systems and benefits.
Computer Aided Quality Control (CAQC): Computer Aided Inspection (CAI)-Coordinate Measuring Machine (CMM), Non-Optical and Optical Inspection Methods. Computer Aided Testing.

Artificial Intelligence and Expert systems: Artificial Neural Networks, Artificial Intelligence in CAD. Experts systems and its structures.

Text Books:

1. Computer Control of Manufacturing Systems / Yoram Koren / McGraw Hill.
2. CAD/CAM by E. Zimmers, M. Groover, Pearson publisher.

Reference Books:

1. Computer Aided Design Manufacturing, K. Lalit Narayan, K. Mallikarjuna Rao and MMM Sarcar PHI.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED MANUFACTURING PROCESSES

Course Code: GR22D5059 **L/T/P/C:3/0/0/3**
I Year II Semester

Course Objectives:

1. Provide the concepts of surface treatments and coatings based on the application of manufacturing processes for materials
2. Impart knowledge of advanced casting techniques.
3. Apply various welding and casting principles in design analysis, aerospace, automotive and other fields
4. Analyze the forming components using high energy rate forming process
5. Explain fundamentals of additive manufacturing technologies.

Course Outcomes:

1. Provide the concepts of surface treatments and coatings based on the application ofmanufacturing processes for materials
2. Impart knowledge of advanced casting techniques.
3. Apply various welding and casting principles in design analysis, aerospace, automotive and other fields
4. Analyze the forming components using high energy rate forming process
5. Explain fundamentals of additive manufacturing technologies.

UNIT I

Surface treatment: Scope, Cleaners, Methods of cleaning, Surface coating types, Electro forming, thermal spraying, Ion implantation, diffusion coating, cladding.

UNIT II

Advances in casting: Introduction to advances in casting processes, Stir casting process: Process parameters in stir casting process, advantages, limitations and application, composite preparation, analysis of composite. Centrifugal casting: Process parameters, preparation of composites and characterization, Functional graded materials by centrifugal casting process, applications and limitations

UNIT III

Advances in Welding: Introduction friction welding processes, advantages, limitations and applications, processes parameters, Friction welding of similar and dissimilar metals, Friction stir welding process, parameters, tool geometry, applications, friction stir processing, Friction stir welding similar and dissimilar materials, Electron beam welding process Laser beam welding

processes, Hybrid welding process, advantages and limitations Defective analysis of friction welded components.

UNIT IV

Advances in forming: Introduction forming processes, advantages, limitations and applications, Vacuum forming, Explosive forming, and hydro forming, advantages and applications, High velocity forming and Mar forming, advantages and applications, Electromagnetic forming, advantages and applications.

UNIT V

Additive Manufacturing: Introduction to AM, AM evolution, Distinction between AM & CNC machining, Steps in AM, Classification of AM processes, Advantages of AM. Stereo lithography Apparatus (SLA): Principle, pre-build process, part-building and post-build processes, advantages, limitations and applications. Fused deposition Modeling (FDM), Laminated Object Manufacturing (LOM), Selective Laser Sintering (SLS), Solid Ground Curing process, working principle, process, strengths, weaknesses and applications.

Text Books :

1. R.K.Rajput, A Text book of Manufacturing Technology, Laxmi Publications, New Delhi, 2012.
2. Gibson, I., Rosen, D.W. and Stucker, B., ―Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing‖, Springer, 2010.

Reference Books:

1. James G Bralla, Hand Book of Manufacturing Processes, Industrial Press, New York, 2007

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADDITIVE MANUFACTURING

Course Code: GR22D5060 **L/T/P/C:3/0/0/3**
I Year II Semester

Course Objectives

1. Knowledge related to basics of additive manufacturing
2. Information related to different liquid based additive manufacturing processes
3. Principles related to various powder based additive manufacturing processes
4. Acquaintance related to various solid based additive manufacturing processes
5. Importance of post processing in additive manufacturing

Course Outcomes

1. Understand the working principle and Steps involved additive manufacturing process
2. Explore different liquid based additive manufacturing processes and suggest suitable method for building a particular component
3. Compare and choose suitable powder based additive manufacturing processes for printing a prototype
4. Classify different solid based additive manufacturing Processes
5. Perform suitable post processing operation based on product requirement

UNIT I

Introduction to Additive Manufacturing (AM): AM evolution, Distinction between AM & CNC machining, Steps in AM, Classification of AM processes, Advantages, limitations and application of AM and Types of materials for AM.

UNIT II

Stereolithography (SL): Materials, Process Modeling, SL resin curing process, SL scan patterns, Process Benefits and Drawbacks, Applications
Solid Ground Curing (SGC): Process, advantages, limitations, and applications
Continuous Liquid Interface Production (CLIP): Process, advantages, limitations, and applications
Two-Photon vat photopolymerization: Process, advantages, limitations, and applications

UNIT III

Selective laser Sintering (SLS): Materials, Powder fusion mechanism and powder handling, Process Modelling, SLS Metal and ceramic part creation,
Electron Beam melting (EBM): Process, Benefits and Drawbacks, Applications of Powder Bed Fusion Processes

Material Jetting AM Processes: Process, Materials, Process Benefits and Drawbacks, Applications of Material Jetting Processes.
Binder Jetting AM Processes: Process, Process Benefits and Drawbacks, Applications of Binder Jetting Processes.

UNIT IV
Extrusion-Based AM Processes: Fused Deposition Modelling (FDM), Principles, Materials, Process Modelling, Plotting and path control, Benefits and Drawbacks, Applications of Extrusion-Based Processes
Sheet Lamination AM Processes: Bonding Mechanisms, Materials, Laminated Object Manufacturing (LOM), Ultrasonic Consolidation (UC), Gluing, Thermal bonding, LOM and UC applications
Directed Energy Deposition AM Processes: Process Description, Material Delivery, Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Electron Beam Based Metal Deposition, Benefits and drawbacks.

UNIT V
Post Processing of AM Parts: Support Material Removal, Surface Texture Improvement, Accuracy Improvement, Aesthetic Improvement, Preparation for use as a Pattern, Property Enhancements using Non-thermal and Thermal Techniques

Text Books:

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital
2. Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, Springer, 2015, 2nd Edition.

References Books:

1. Rapid Prototyping: Principles and Applications, Chua Chee Kai, Leong Kah Fai, Lim Chu-Sing, World Scientific, 2003, 2nd Edition.
2. Rapid Prototyping: Laser-based and Other Technologies, Patri K. Venuvinod and Weiyin Ma, Springer, 2004.
3. Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, D.T. Pham, S.S. Dimov, Springer 2001.
4. Rapid Prototyping: Principles and Applications in Manufacturing, Rafiq Noorani, John Wiley & Sons, 2006.
5. Additive Manufacturing, Second Edition, Amit Bandyopadhyay Susmita Bose, CRC Press Taylor & Francis Group, 2020.
6. Additive Manufacturing: Principles, Technologies and Applications, C.P Paul, A.N Junoop, McGrawHill, 2021.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

HYDRAULICS AND PNEUMATICS SYSTEMS
(Professional Elective III)

Course Code: GR22D5061 **L/T/P/C: 3/0/0/3**
I Year II Semester

Course Objectives:

1. Impart the students, the basic concepts of hydraulic and pneumatic systems.
2. Expose the students with various hydraulic and pneumatic actuators.
3. Provide knowledge on fluid power systems and its applications to real time.
4. Analyze the problem, that occurs in fluid power systems and take necessary troubleshooting maintenance activities.
5. Get practiced in designing hydraulic and pneumatic systems.

Course Outcomes:

1. Gain knowledge on hydraulic and pneumatic system concepts.
2. Differentiate between various pumps and actuators.
3. Determine the components and accessories required in constructing a hydraulic power pack.
4. Design hydraulic & pneumatic circuits for the required applications.
5. Gain skills on troubleshooting of hydraulic and pneumatic components/ accessories.

UNIT I

Introduction to fluid power systems, merits, demerits &Application of fluid power system. Types of fluid power systems, Properties of hydraulic fluids, Types of fluids, Pascal's Law, Effect of temperatures, fluid power system elements and their representation in the circuits. Comparison of Mechanical, Electrical, Hydraulic & Pneumatic systems.

UNIT II

Classification of Pumps, Gear Pump, Vane Pump, piston Pump, bent axis in line piston pumps. Internal and external Gear pumps. Selection and specification of Pumps. Actuators: linear Actuators, Cushioning, Seals, Mounting details, Rotary Actuators.

UNIT III

Elements of Power pack, Heating and cooling systems for Hydraulic Power pack, Directional control valves, check valve, pressure control valve, Flow control valve, solenoid valves, Servo controlled valves, Accumulators, Types of accumulators, intensifier &Hydro Pneumatic circuits.

UNIT IV

Pneumatic Components: Properties of air – Compressors – Filter, Regulator, Lubricator Unit, muffler Unit, Meter-in circuit, Meter-out circuit, Bleed off circuits, counter balance circuit, Sequential circuit design for simple applications using cascade method, synchronizing circuits.

UNIT V

Hydraulic and Pneumatic equipment in Automation, Low Cost Automation, fluidic sensors, PLC – PLC Circuits in automation, Trouble shooting of various Hydraulic &Pneumatic equipment's, causes and remedies, Hydraulic and Pneumatic Equipment maintenance activities.

Text Books:

1. Anthony Esposito, "Fluid Power with Applications", Pearson Education2005.
2. Majumdar S.R., "Oil Hydraulics Systems Principles and Maintenance", Tata McGrawHill, 2001.

Reference Books:

1. Srinivasan.R, "Hydraulic and Pneumatic controls", Vijay Nicole, 2006.
2. Shanmugasundaram.K, "Hydraulic and Pneumatic controls", Chand & Co, 2006.
3. Majumdar S.R., "Pneumatic systems, Principles and maintenance", Tata McGraw Hill, 1995

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FLEXIBLE MANUFACTURING SYSTEMS
(Professional Elective III)

Course Code: GR22D5062 **L/T/P/C:3/0/03**
I Year II Semester

Course Objectives:

1. Expose the knowledge on flexible manufacturing system and its importance.
2. Design a good FMS Layout in the industry.
3. Impart knowledge on various FMS machining centre's and inspection methods.
4. Inculcate concepts on material handling and the various methods of material handling to real time applications.
5. Implement various FMS management techniques in a industry and improve the profit/productivity.

Course Outcomes:

1. Gain knowledge on concepts of flexible manufacturing systems.
2. Design and create an innovative layout for flexible manufacturing.
3. Explain processing stations and inspection process carried out in FMS environments.
4. Develop material handling systems for the required application.
5. Analyze the production management problems in planning, loading, scheduling, routing and breakdown in a typical FMS.

UNIT I

Introduction to Flexible Manufacturing Systems, Understanding FMS, Types of Manufacturing Systems, Definition, objective and Need, Components, Merits, Demerits and Applications Flexibility in Pull and Push type, Planning and scheduling and control of FMS, Knowledge based scheduling.

UNIT II

Classification of FMS Layout, FMS: Layouts and their Salient features, Single line layout, dual line layout, loop layout, ladder layout, robot centre type layout, merits, demerits and applications.

UNIT III

Processing Stations, Salient features Machining Centers, Turning centre, Coordinate measuring machine (CMM), Washing/ Deburring station.

UNIT IV

Material Handling System, Introduction and need for material handling system, Types of material handling system, merits and demerits of various material handling system, Conveyors, Robots, Automated Guided Vehicle(AGV), Automated Storage Retrieval System (ASRS). Kanban systems.

UNIT V

FMS Management Technology, Tool Management, Tool Magazine, Tool Preset, Identification, Tool Monitoring and Fault Detection, Planning and Routing, Production Planning and Control, Scheduling and loading of FMS, Various Types of Maintenance Activities.

Text Books:

1. William W Luggen, "Flexible Manufacturing Cells and System" Prentice Hall of Inc New Jersey, 1991.
2. Groover,M.P "Automation, Production Systems and Computer Integrated Manufacturing", Prentice Hall of India Pvt.Ltd. New Delhi2009

Reference Books:

1. Hand Book of Flexible Manufacturing Systems/ Jha N K/ Academic Press.
2. Production System leyond Large Scale Production/ Talichi Ohno/Toyota Productivity Press India Pvt.
3. Flexible Manufacturing Systems/ H K Shivanand/New Age International/2006.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

AUTOMATION IN MANUFACTURING
(Professional Elective IV)

Course Code: GR22D5063 **L/T/P/C:3/0/0/3**
I Year II Semester

Course Objectives:

1. Introduce the fundamental concepts of automation in manufacturing.
2. Impart the knowledge on design and fabrication of automated flowlines.
3. Gain the skill of analysis and implementation on transfer lines.
4. Prioritize the line balancing methods in automated assembly systems.
5. Inculcate knowledge on analysis of automated material handling systems in automation.

Course Outcomes:

1. Identify the manufacturing tools, solutions to industrial applications.
2. Visualize the automation systems and take up multi-disciplinary tasks. Analyze the impact of automation in engineering solutions for society in global and economic context.
3. Design and construct automated flow lines for simple products.
4. Classify the various manufacturing cells.
5. Select the various material handling systems used in advanced automations systems.

UNIT I

Fundamentals of Manufacturing Automation: Basic Principles of automation, types of automated systems, degrees of automation, automation reasons, Production operations and automation strategies, Plant Layout, Production concepts and mathematical models, design the parts for automation, Automatic loading systems.

UNIT II

High volume production systems: Automated flow lines. Methods of work flow, transport transfer mechanism buffer storage, Control functions, Automation for machining operations Design and fabrication considerations.

UNIT III

Analysis of Automated Flow Lines: Analysis of transfer lines without storage, partial automation automated flow lines with storage buffers implementing of automatic flow lines, Line balancing problems, Considerations in assembly line design.

UNIT IV

Assembly Systems and Line Balance: Manual assembly lines, line balancing problem, methods of line balancing, ways to improve line balancing, flexible manual assembly lines, automated assembly systems, analysis of multi station assembly, manufacturing Cells, Automated Cells, Analysis of single station cells.

UNIT V

Automated Material Handling: Types of equipment and functions, design and analysis of material handling system, conveyor system. Automated guided vehicle system, components operation, types, design of automated guided vehicles and applications. Automated storage and Retrieval systems, types, basic components and applications. Transfer lines, Design for Automated Assembly, Partial Automation, Communication Systems in Manufacturing.

Text Books:

1. Mikell.P.Groover "Automation, Production Systems and CIM", PHI Pvt., Ltd,1998.

Reference Books:

1. P. Radha Krishan & S. Subrahamanyan and Raju "CAD/CAM/CIM', New Age International Pub,2003
2. Singh, "System Approach to Computer Integrated Design and Manufacturing', John Wiley.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DESIGN FOR SUSTAINABLE MANUFACTURING AND ASSEMBLY
(Professional Elective-IV)

Course Code: GR22D5064 **L/T/P/C: 3/0/0/3**
I Year II Semester

Course Objectives:

1. Introduce the basics of design concepts and selection of materials while assembly.
2. Provide knowledge on design considerations for various manufacturing processes.
3. Impart knowledge on design criteria's to be considered while welding and forging processes.
4. Provide knowledge on Sustainable Manufacturing, its Scope, Need and Benefits.
5. Expose the students with various Tools and Techniques of Sustainable Manufacturing.

Course Outcomes:

1. Understand the quality aspects of design for manufacture and assembly.
2. Apply the concept of DFM for casting, welding, forming and assembly.
3. Apply the metal joining processes
4. Explain the importance of sustainable development.
5. Identify the link between manufacturing process models and sustainable manufacturing
   metrics for product and process improvement

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 – Developments in Material Technology – Criteria for material selection – Material selection interrelationship with process selection – process selection charts.

UNIT II

Machining Process: Overview of various machining processes – general design rules for machining - Dimensional tolerance and surface roughness – Design for Machining ease – Redesigning of components for machining ease with suitable examples, General design recommendations for machined parts Metal Casting: Appraisal of various casting processes, Selection of casting process, General design considerations for casting – Use of Solidification Simulation in casting design– Product design rules for sand casting.

UNIT III

Metal Joining: Appraisal of various welding processes, Factors in design of weldments – General design guidelines – pre and post treatment of welds – Effects of thermal stresses in weld

joints -Design of brazed joints. Forging – Design factors for Forging – Closed die forging design,– Location of parting lines of dies – Drop forging die design – General design recommendations.

UNIT IV

Concepts of sustainability and sustainable development – Need for sustainable development - Components of sustainability- Social, Economic, Environmental dimensions - Linkages between technology and sustainability - Sustainable Manufacturing –Scope, Need and Benefits.

UNIT V

Tools and Techniques of Sustainable Manufacturing – Environmental Conscious Quality Function Deployment, Life cycle assessment, Design for Environment, R3 and R6 cycles, Design for Disassembly -Sustainable Product Development – Various Phases.

Text Books:

1. Engineering design-Material & Processing Approach/ George E. Deiter, Mc. Graw Hill Intl. 2nd Ed.2000.
2. Product design for Manufacture and Assembly/ Geoffrey Boothroyd/Marcel Dekker Inc NY, 1994.

Reference Books:

1. G. Atkinson, S. Dietz, E. Neumayer, ― "Handbook of Sustainable Manufacturing". Edward Elgar Publishing Limited,2007.
2. Product design and Manufacturing / A.K Chitale and R.C Gupta / Prentice – Hall of India, New Delhi,2003.
3. Design and Manufacturing / Surender Kumar &GouthamSutradhar / Oxford & IBH Publishing Co. Pvt .Ltd., New Delhi,1998.
4. Hand Book of Product Design/ Geoffrey Boothroyd Marcel Dekken Inc. NY,1990
5. D.Rodick,"Industrial Development for the 21st Century: Sustainable Developmen Perspectives",UNNew York,2007.
6. Rogers, P.P., Jalal, K.F. and Boyd, J.A., "An Introduction to Sustainable Development", Earthscan, London,2007

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INTELLIGENT MANUFACTURING SYSTEMS
(Professional Elective IV)

Course Code: GR22D5065 **L/T/P/C:3/0/0/3**
I Year II Semester

Course Objectives:

1. To provide students with the concepts of statistics and optimization methodologies in intelligent manufacturing systems.
2. Inculcate concepts on Knowledge Based Manufacturing systems.
3. To understand the importance of intelligence in manufacturing systems, so as to apply the artificial intelligence in the application of manufacturing.
4. Impart knowledge on various automated Planning manufacturing systems.
5. Expose the knowledge on group technology in automated manufacturing systems.

Course Outcomes:

1. Assess the performance of Intelligent manufacturing systems
2. Demonstrate the various schemes of knowledge based systems.
3. Develop a systematic approach on machine learning and ANN for Intelligent manufacturing.
4. Suggest new procedures on automated process planning to improve the productivity of existing manufacturing systems
5. Apply various methods to solve group technology problems and demonstrate the structure on knowledge based system for group technology.

UNIT I

Computer Integrated Manufacturing Systems Structure and functional areas of CIM system – CAD, CAPP, CAM, CAQC, ASRS, Advantages of CIM. Manufacturing Communication Systems – MAP/TOP, OSI Model, Data Redundancy, Top- down and Bottom-up Approach, Volume of Information. Intelligent Manufacturing System Components, System Architecture and Data Flow, System Operation.

UNIT II

Components of Knowledge Based Systems – Basic Components of Knowledge Based Systems, Knowledge Representation, Comparison of Knowledge Representation Schemes, Interference Engine, Knowledge Acquisition.

UNIT III

Machine Learning – Concept of Artificial Intelligence, Conceptual Learning, Artificial Neural Networks – Biological Neuron, Artificial Neuron, Types of Neural Networks, Applications in Manufacturing.

UNIT IV

Automated Process Planning – Variant Approach, Generative Approach, Expert Systems for Process Planning, Feature Recognition, Phases of Process planning. Knowledge Based System for Equipment Selection (KBSES) – Manufacturing system design. Equipment Selection Problem, Modeling the Manufacturing Equipment Selection Problem, Problem Solving approach in KBSES, Structure of the KRSES.

UNIT V

Group Technology: Models and Algorithms Visual Method, Coding Method, Cluster Analysis Method, Matrix Formation – Similarity Coefficient Method, Sorting-based Algorithms, Bond Energy Algorithm, Cost Based method, Cluster Identification Method, Extended CI Method. Knowledge Based Group Technology – Group Technology in Automated Manufacturing System. Structure of Knowledge based system for group technology (KBST) — Data Base, Knowledge Base, Clustering Algorithm.

Text Books:

1. Intelligent Manufacturing Systems/ Andrew Kusiak/Prentice Hall.
2. Artificial Neural Networks/ Yagna Narayana/PHI/2006

Reference Books:

1. Automation, Production Systems and CIM / Groover M.P./PHI/2007
2. Neural networks: A comprehensive foundation/ Simon Haykin/ PHI.
3. Artificial neural networks/ B. Vegnanarayana/PHI
4. Neural networks in Computer intelligence/ Li Min Fu/ TMH/2003
5. Neural networks/ James A Freeman David M S kapura/ Pearson education/2004
6. Introduction to Artificial Neural Systems/Jacek M. Zurada/JAICO Publishing House Ed. 2006.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPUTER AIDED MANUFACTURING LAB

Course Code: GR22D5066 **L/T/P/C:0/0/2/2**
I Year II Semester

Course Objectives:

1. Gain the knowledge of CNC programming.
2. Simulate the CNC programs.
3. Inculcate the constructional features of CNC machines.
4. Produce the machine components using CNC machines.
5. Implement CAM software for automatic generation of programs.
6.

Course Outcomes:

1. Illustrate the constructional features of Computer Numerical Control (CNC) Lathe and Milling Machines.
2. Identify various G-codes and M-codes related to NC Part programming.
3. Acquire programming skills to create components using CNC machine.
4. Simulate the machining process involved in the creation of engineering components
5. Produce complex parts using various canned cycles.

Task 1: Creating a job on CNC Turning machine using G90 cycle

Task 2: Creating a job on CNC Turning machine using G94 cycle

Task 3: Creating a job on CNC Turning machine using G70-G71 cycle

Task 4: Creating a job on CNC Turning machine using G70-G71cycle

Task 5: Creating a job on CNC Turning Machine using G70-G71 cycle and Drilling-G74cycle

Task 6: Creating a job on CNC Turning Machine using Grooving-G75, and Threading-G76 cycles

Task 7: Creating a job on CNC Turning Machine using G70-G71, Drilling-G74, Grooving-G75, and Threading-G76 cycles

Task 8: Creating a job on CNC Milling Machine using Linear Interpolation Codes

Task 9: Creating a job on CNC Milling Machine using Circular Interpolation Codes

Task10: Creating a job on CNC Milling Machine using Linear Interpolation and Circular Interpolation Codes

Task 11: Creating a job on CNC Milling Machine using Spot-drilling cycle

Task 12: Creating a job on CNC Milling Machine using threading cycle.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED MANUFACTURING PROCESSES LAB

Course Code: GR22D5067 **L/T/P/C:0/0/4/2**
I Year II Semester

Course Objectives:

1. Know how to manufacture the complex parts
2. Optimization the production time in material handling
3. Know motion drives in CNC machines
4. Validate the experimental data
5. Know the influence of parameters

Course Outcome

1. Manufacture complex parts using Additive manufacturing.
2. Understand optimization of production time in material handling.
3. Understand the motions of drives in CNC machines.
4. Analyze experimental data to derive valid conclusions.
5. Analyze factors influencing process.

Task 1 Fabrication of Bevel gear using 3-D printing

Task 2 Fabrication of turbine blade using 3-D printing

Task 3 Fabrication and assemble of knuckle joint using 3-D printing

Task 4 Material handling simulation of shop floor layout and determination of process time –

Model 1 using FlexSim software

Task 5 Material handling simulation of shop floor layout and determination of process time –

Model 2 using Flexsim software

Task 6 Material handling simulation of shop floor layout and determination of process time –

Model 3 using Flexsim software

Task 7 X-Y Table motion control with varying velocity and acceleration on LSM controller

Task 8 Demonstration of rotation of synchronized motors with and without PLC on LSM controller.

Task 9 Demonstration of Double acting pneumatic drive with and without PLC on LSM controller.

Task 10 Pin On Disc based tribological characterization on Mild steel materials

Task 11 Pin On Disc based tribological characterization of strain less steel materials

Task 12 Pin On Disc based tribological characterization of aluminium materials

II YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED METAL FORMING
(Professional Elective V)

Course Code: GR22D5068 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives:

1. Make students learn the important theoretical forming concepts, and the state-of-the-art technological developments in the area of modern metal forming operations.
2. Understand bulk forming and sheet metal forming processes.
3. Analyze various metal forming processes to decide their application in the given situation.
4. Make the student conversant with various press tool design and special features of machine tool design for forming operations.
5. Learn introductory concepts of various advanced Metal forming processes.

Course Outcomes:

1. Analyze the various processes of forming used for given application.
2. Illustrate various needs of metal forming processes and their comparison to other manufacturing processes.
3. Analyze effect of parameters influencing metal forming and compare hot working and cold working with applications.
4. Examine effects of friction & lubrication and causes of common defects in metal forming.
5. Analyze various sheet metal and advanced metal forming processes.

UNIT I

Fundamentals of Metal Forming: Classification of forming processes, mechanisms of metal forming: slab method, Upper and lower bound analysis, Deformation energy method and finite element method temperature of metal working, hot working, cold working, friction and lubricants.

UNIT II

Rolling of metals: Rolling processes, forces and geometrical relationship in rolling, simplified analysis, rolling load, rolling variables, theories of cold and hot rolling, problems and defects in rolling, torque and power calculations.

UNIT III

Forging: Classification of forging processes, forging of plate, forging of circular discs, open die and closed-die forging, forging defects, and powder metallurgy forging. Press tool design:

Design of various press tools and dies like piercing dies, blanking dies, compound dies and progressive blanking dies, design of bending, forming and drawing dies.

UNIT IV

Extrusion: Classification, Hot Extrusion, Analysis of Extrusion process, defects in extrusion, extrusion of tubes, production of seamless pipes.

Drawing: Drawing of tubes, rods, and wires: Wire drawing dies, tube drawing process, analysis of wire, deep drawing and tube drawing.

UNIT V

Sheet Metal forming: Forming methods, Bending, stretch forming, spinning and Advanced techniques of Sheet Metal Forming, Forming limit criteria, defect in formed parts. Advanced Metal forming processes: HERF, Electromagnetic forming, residual stresses, in process heat treatment and computer applications in metal forming. Problems on Blanking force, Blank diagram in Cup Diagram, Maximum considering shear.

Text Books:

1. Mechanical Metallurgy by George E. Dieter,McGraw HillEducation.
2. Manufacturing Engineering and Technology,Kalpakjian, PearsonPublishers.

References Books:

1. ASM Metal Forming Handbook.
2. Narayansamy, R., Metal Forming Technology, Ahuja Book Publishers, New Delhi(1995)
3. Principles of Metal Working processes / G.W.Rowe
4. Principles of Metal Working / SunderKumar

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MECHATRONICS AND ROBOTICS
(Professional Elective V)

Course Code: GR22D5069 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives:

1. Have knowledge on mechatronic based systems and its importance.
2. Impart knowledge on various types of sensors and transducers used in mechatronic systems to measure various physical parameters.
3. Design PLC circuits, according to the required applications.
4. Familiar with concepts on robotics, Programming methods & Languages of robot.
5. Incorporate knowledge about various robots, robot cell design and their applications in material transfer, loading and unloading etc.

Course Outcomes:

1. Develop an intelligent microprocessor based automated systems.
2. Select appropriate sensors, transducers and actuators to monitor and control the behavior of a process or product.
3. Develop PLC systems and programs for a given task.
4. Familiar with basics of Robots and Nurtured with the Programming Languages of robots.
5. Acquainted with the concepts of Robot cell design control and various applications of robots in various fields.

UNIT I

Mechatronics, Scope and Significance of Mechatronics systems, Elements of Mechatronic Systems, Needs and Benefits of Mechatronics in Manufacturing, Control Systems, Overview of Mechatronic Products, Microprocessor Based Controllers, Case Studies - Automatic Flush Tank, Car Engine Management System, Automated Washing Machine, Automated Camera. pick and place robot, Bar code system, Car park barrier system.

UNIT II

Sensors & Transducers in Manufacturing: Sensor-Classification, Performance Terminology, Selection of Sensors, Sensors for Displacement, Force, Fluid Pressure, Liquid Flow, Light Sensors, Potentiometers, LVDT, Incremental and Absolute Encoders. Strain Gauges. Load cells, Temperature Sensors, Tachometers, Proximity & Tactile Sensors, MicroSwitch, Read Switch, and Vision Sensor.

UNIT III

PLC in Manufacturing: Programmable Logic Controllers, Basic Structure, Input Output Processing, Programming–Mnemonics, Timers, Internal relays and counters, Shift Registers, master and Jump Controls Data Handling Analogs Input /Output Selection of a PLC.

UNIT IV

Introduction: Automation and Robotics, Robot anatomy, robot configuration, motions joint notation work volume, robot drive system, precision of movement. Control System and Components, Robot Programming: Lead through programming, Robot programming as a path in space, Motion interpolation, WAIT, SINGNAL AND DELAY commands, Branching capabilities and Limitations. Robot Languages.

UNIT V

Robot Cell Design and Control: Robot cell layouts- Robot centered cell, In-line robot cell, Considerations in work design, Work and control, Interlocks, Error detection, Work cell controller. Robot Application: Material transfer, Machine loading/ unloading Processing operation, Assembly and Inspection, Feature Application.

Text Books:

1. Bolton,W,"Mechatronics",Pearsoneducation,secondedition,fifthIndianReprint,2003
2. Industrial robotics, Mikell P.Groover /McGrawHill.

References Books

1. Rajput. R.K, A textbook of mechatronics, S. Chand & Co, 2007.
2. BradleyD.A.,DawsonD.,BuruN.C.and.LoaderA.J,"Mechatronics",Chapmanand Hall,B1993.
3. Yoram Koren,"Robotics for Engineers' Mc Graw-Hill, 1987.
4. Kozyrey,Yu. "Industrial Robots", MIR Publishers Moscow, 1985.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPTIMIZATION TECHNIQUES

Course Code: GR22D5070 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives:

1. To have an understanding of research design and plot layout
2. To analyze the data and interpret the results
3. To create the factor and factorial design like single, multiple, full and fractional
4. To understand the statistical terms like ANOVA, regression expected R square, F-test etc.
5. To optimize the data using the techniques of RSM and Taguchi method

Course Outcomes:

1. Understand the fundamentals of experiments and its uses and analyze and apply the basic statistics including ANOVA and regression
2. Understand the sigle factor experimentation and estimation and checking of model.
3. Design of multi factor experiments of full factorial and fractional factorial designs
4. Explain the application of different design concepts for various data types and the use of F-tests.
5. Apply Taguchi to optimize response of interest from an experiment.

UNIT I

Experimental Design Fundamental Importance of experiments, experimental strategies, basic principles of design, terminology, ANOVA, steps in experimentation, sample size, normal probability plot, linear regression model.

UNIT II

Single Factor Experiments Completely randomized design, Randomized block design, Latin square design. Statistical analysis, estimation of model parameters, model adequacy checking, pair wise comparison tests.

UNIT III

Multi factor Experiments Two and three factor full factorial experiments, 2K factorial Experiments, Confounding and blocking designs.

UNIT IV

Special Experimental Designs Fractional factorial design, nested designs, Split plot design, Introduction to Response Surface Methodology, Experiments with random factors, rules for expected mean squares, approximate F- tests.

UNIT V

Taguchi Methods Steps in experimentation, design using Orthogonal Arrays, data analysis,Robust design- control and noise factors, S/N ratios, parameter design, case studies.

Text Books:

1. Montgomery, D.C., Design and Analysis of experiments, John Wiley and Sons, 2003.

References Books:

1. Nicolo Belavendram, Quality by Design; Taguchi techniques for industrial xperimentation, Prentice Hall,1995.
2. Phillip J.Rose, Taguchi techniques for quality engineering, McGraw Hill,1996.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COST MANAGEMENT OF ENGINEERING PROJECTS
(Open Elective I)

Course Code: GR22D5147 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives

1. To attain knowledge in Cost Management process and Costing System.
2. Ability to understand the basic concepts of Project planning, execution, and cost control.
3. Discuss about Various types of costs and its behaviour along with Quality Management.
4. Identify various types of Budgets involved in Cost Management process.
5. Broaden the career potential of available techniques and problems available in Cost Management.

Course Outcomes

1. Discuss various construction costs to manage a construction project.
2. Summarize different construction activities and its application related to cost based on the field requirements.
3. Identify Cost behaviour of various types of cost and Quality Management.
4. Identifying various construction Budgets involved Cost Management process.
5. Discussing various types of Techniques and Problem-solving techniques involved in Construction.

UNIT I
COST MANAGEMENT PROCESS

Introduction and Overview of the Strategic Cost Management Process, Cost concepts indecision-making; relevant cost, Differential cost, Incremental cost, Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

UNIT II
PROJECT MANAGEMENT

Project: Meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non-technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process.

UNIT III
PROJECT PLANNING

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision- making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value- Chain Analysis.

UNIT IV
BUDGET CONTROL
Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

UNIT V
QUANTITATIVE TECHNIQUES
Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

Reference Books

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi.
2. Charles T. Horngren and George Foster, Advanced Management Accounting.
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting.
4. 4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher.
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co.Ltd.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDUSTRIAL SAFETY
(Open Elective I)

Course Code: GR22D5148 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives

1. Understand the importance of maintaining a safe work place.
2. Maintain safety standards incompliance with regulatory requirements and with in engineering limits understand personal safety and industrial safety.
3. Create a job safety analysis (JSA) for a given work project.
4. Follow safety record keeping and management, and the role of the safety manager.
5. Utilize personal proactive equipment.

Course Outcomes

1. Understanding of Safety principles.
2. Analyze different types of exposure and biological effects, exposure guidelines and basic work place monitoring. Ability to do Hazard analysis.
3. Demonstrate and understanding of work place injury prevention, risk management, and incident investigations.
4. Understand the acute and chronic health effects of exposures to chemical, physical and biological agents in the work place.
5. Demonstrate knowledge of the types of hazards, planning, organization and training needed to work safely with hazardous materials.

UNIT I
INDUSTRIAL SAFETY

Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, washrooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and fire fighting, equipment and methods.

UNIT II
FUNDAMENTALS OF MAINTENANCE ENGINEERING

Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost& its relation with replacement economy, Service life of equipment.

UNIT III
WEAR AND CORROSION AND THEIR PREVENTION

Wear-types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, **i.** Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT IV
FAULT TRACING

Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault

finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT V

PERIODIC AND PREVENTIVE MAINTENANCE

Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, over hauling of mechanical components, over hauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of : i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

Reference Books

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H.P. Garg, S.Chandand Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans,Chapman & HallLondon.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPERATIONS RESEARCH
(Open Elective I)

Course Code: GR22D5149 **L/T/P/C:3/0/0/3**
II Year I Semester

Course Objectives

1. Define and formulate linear and Non-linear programming problems and appreciate their limitations arising from a wide range of applications.
2. Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change.
3. Distinguish various inventory models and develop proper inventory policies.
4. Solve the scheduling and sequencing models.
5. Understand how to model and solve problems using dynamic programming, Game Theory, design the simulation models.

Course Outcomes

1. Formulate and solve problems as networks and graphs for optimal allocation of limited resources such as machine, material and money.
2. Carry out sensitivity analysis.
3. Solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
4. Distinguish various inventory models and develop proper inventory policies.
5. Propose the best strategy using decision making methods under uncertainty and game theory and design the simulation models.

UNIT I
OPTIMIZATION TECHNIQUES
Model Formulation, models, General L.R Formulation, Simplex techniques, Sensitivity Analysis, Inventory Control Models.

UNIT II
FORMULATION OF A LPP
Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.

UNIT III
NONLINEAR PROGRAMMING PROBLEM
Kuhn-Tucker conditions min cost flow problem - max flow problem -CPM/PERT.

UNIT IV
SCHEDULING AND SEQUENCING
Single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT V
COMPETITIVE MODELS
Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks,

Elementary Graph Theory, Game Theory Simulation.

Simulation: Implementation of simulation modelling, Design of simulation models. Generation of random deviates, the uniform distribution and its importance to simulation, Generation of random numbers (Properties of uniformly distributed numbers, Mid-square technique, Mid-product, technique, Fibonacci method).

Reference Books

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008.
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimization: Operations Research, Jain Brothers, Delhi, 2008.
4. Hitler Libermann Operations Research: McGraw Hill Pub.2009.
5. Panner selvam, Operations Research: Prentice Hall of India2010.
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ARTIFICIAL NEURAL NETWORKS AND FUZZY SYSTEMS
(Open Elective I)

Course Code: GR22D5150 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives

1. Cater the knowledge of Neural Networks.
2. Know about concepts of feed forward neural networks.
3. Learn about the Paradigms of Associative Memory and Architecture of Hopfield Network.
4. Recall of adequate knowledge about fuzzy set theory.
5. Learn about applications of Fuzzy and Neural networks.

Course Outcomes

1. Summarize about Neural Networks.
2. Gain knowledge on feed forward neural networks.
3. Illustrate about Paradigms of Associative Memory and Architecture of Hopfield Network.
4. Comprehend about Classical and Fuzzy sets.
5. Simulate and Design Real time applications using Fuzzy and Neural networks.

UNIT I
INTRODUCTION TO NEURAL NETWORKS

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.

UNIT II
FEED FORWARD NEURAL NETWORKS

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications. Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Back propagation Algorithm, Kolmogorov Theorem, Learning difficulties and Improvements.

UNIT III
ASSOCIATIVE MEMORIES

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem

Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network.

UNIT IV

CLASSICAL& FUZZY SETS

Basic concepts of crisp sets and fuzzy sets, Types of fuzzy sets, Properties Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

Fuzzification, Membership value assignment, development of rule base and decision-making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT V

APPLICATION OF FUZZY AND NEURAL NETWORKS:

Application in pattern recognition, Image processing and computer vision, Application in control: Fuzzy controllers, neuro controllers and fuzzy neuro controllers, applications in expert systems and decision-making systems, application in real world computing, Simulation Tools.

Text Books

1. Rajasekharan and Rai , "Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications",PHI Publication.
2. Jacek M. Zuarda, "Introduction to Artificial Neural Systems" , Jaico Publishing House, 1997.

Reference Books

1. N. Yadaiah and S.Bapi Raju,"Neural and Fuzzy Systems: Foundation, Architectures and Applications", Pearson Education.
2. A Freeman and Davis Skapura , "Neural Networks",Pearson, 2002.
3. Simon Hykin "Neural Networks", Pearson Education.
4. C.Eliasmith and CH.Anderson, "Neural Engineering", PHI Publications.
5. Bork Kosko, "Neural Networks and Fuzzy Logic System", PHI Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

CYBER SECURITY
(Open Elective I)

Course Code: GR22D5151 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives

1. Illustrate Cyber security challenges and their threats.
2. Summarize Cyber-attacks and their vulnerabilities.
3. Analyze about ethical hacking concepts and social engineering targets.
4. Examine cyber forensic investigation process.
5. Recognize cyber laws and ethics.

Course Outcomes

1. Recall the importance and challenges of Cyber security.
2. Investigate cybercrime and collect evidences.
3. Identify security risks and take preventive steps.
4. Able to use knowledge of forensic tools and software.
5. Knowledge about Indian IT act and international law.

UNIT I
INTRODUCTION TO CYBER SECURITY

Introduction to Cyber Security, Importance and challenges in Cyber Security, Cyberspace, Cyber threats, Cyber warfare, CIA Triad, Cyber Terrorism, Cyber Security of Critical Infrastructure, Cyber security - Organizational Implications.

UNIT II
HACKERS AND CYBER CRIMES

Types of Hackers, Hackers and Crackers, Cyber-Attacks and Vulnerabilities, Malware threats, Sniffing, Gaining Access, Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks, Worms, Trojans, Viruses, Backdoors.

UNIT III
ETHICAL HACKING AND SOCIAL ENGINEERING

Ethical Hacking Concepts and Scopes, Threats and Attack Vectors, Information Assurance, Threat Modelling, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration Testing, Types of Social Engineering, Insider Attack, Preventing Insider Threats, Social Engineering Targets and Defence Strategies.

UNIT IV
CYBER FORENSICS AND AUDITING

Introduction to Cyber Forensics, Computer Equipment and associated storage media, Role of forensics Investigator, Forensics Investigation Process, and Collecting Network based Evidence, Writing Computer Forensics Reports, Auditing, Plan an audit against a set of audit criteria, Information Security Management System Management. Introduction to ISO 27001:2013.

UNIT V

CYBER ETHICS AND LAWS

Introduction to Cyber Laws, E-Commerce and E-Governance, Certifying Authority and Controller, Offences under IT Act, Computer Offences and its penalty under IT Act 2000, Intellectual Property Rights in Cyberspace.

Text Books

1. Donaldson, S., Siegel, S., Williams, C.K., Aslam, A., Enterprise Cyber security -How to Build a Successful Cyber defense Program Against Advanced Threats, A-press .
2. Nina Godbole, Sumit Belapure, Cyber Security, Willey.
3. Roger Grimes, Hacking the Hacker ,Wiley.
4. Cyber Law By Bare Act, Govt of India, It Act 2000.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INTERNET OF THINGS ARCHITECTURE AND DESIGN PRINCIPLES
(Open Elective I)

Course Code: GR22D5152 **L/T/P/C: 3/0/0/3**
II Year I Semester

Course Objectives

1. Assess the vision and introduction of IoT.
2. Know aboutNetworking & Communication aspects of IoT.
3. Explore the System hardware and prototyping.
4. List various hardware platforms of IoT and to analyze the current needs.
5. Classify Real World IoT Design Constraints, Industrial Automation in IoT, Case studies.

Course Outcomes

1. Summarize the concepts of Internet of Things.
2. Analyze basic protocols in Network & Communication aspects.
3. Illustrate about System hardware and prototyping in IoT.
4. Understand the Hardware Platform concepts of Internet of Things.
5. Design IoT applications in different domain studies and be able to analyze their performance.

UNIT I
INTRODUCTION TO IOT

The Internet of Things: An Overview, Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs. Design Principles for Connected Devices. Design Principles for the Web Connectivity for connected-Devices.

UNIT II
NETWORK & COMMUNICATION ASPECTS

Internet Connectivity Principles, Connectivity terminologies-IOT Node, LAN, WAN, Gateway, IOT Stack vs. Web Stack, IoTIdentification and Data Protocols-IPV4, IPV6, HTTP, MQTT, COAP.
IoT & M2M Data Acquiring, Organizing and Analytics in IoT/M2M Applications/ Services/Business Processes, Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services.

UNIT III
SYSTEM HARDWARE AND PROTOTYPING

Sensors, Actuators, Radio Frequency Identification, Wireless Sensor Networks and Participatory Sensing Technology. Prototyping the Embedded Devices for IoTs. Prototyping Devices, Gateways, Internet and Web/Cloud Services Software Components.

UNIT IV
HARDWARE PLATFORMS: INTRODUCTION

Programming with Arduino-Features of Arduino, Components of Arduino Board, Arduino IDE, Raspberry Pi Board introduction and Booting of OS introduction. Introduction to Python, Introduction to different IoT tools.

UNIT V
DEVELOPING IOTS ANDAPPLICATIONS AND CASE STUDIES
Developing sensor-based application through embedded system platform, Implementing IoT conceptswith python. IoT Project Case Studies.

Text Books

1. Raj Kamal, “Internet Of Things Architecture & Design Principles”,Mcgraw Hill Education.
2. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”.
3. Jeeva Jose, “Internet of Things”, Khanna Publishing, 2018.
4. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks:Theory and Practice".

Reference Books

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1 st Edition, Academic Press, 2014. (ISBN-13: 978-0124076846).
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”,1st st Edition, Apress Publications, 2013. (ISBN-13: 978- 1430257.
3. Quas F.Hassan, Atta Ur Rehaman Khan, and Sajiad A. Madani, “Internet of Things Challenges, Advances and Applications”.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH FOR RESEARCH PAPER WRITING
(AUDIT COURSE)

Course Code: GR22D5153

L/T/P/C: 2/0/0/0

Course Objectives:

1. Understand how to improve their writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title and ensure the good quality of paper at very first-time submission
4. Understand the process of research
5. Write quality research papers

Course Outcomes:

1. Give a view of what writing is all about
2. Understand Research and its process
3. Comprehend the steps and methods involved in research process
4. Have learned various skills necessary that are necessary for doing research
5. Have learned how to write quality research papers along with other research areas

UNIT I

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II

Hedging and Critiquing, Paraphrasing and Plagiarism, Sections of a Paper

UNIT III

A**:** Abstracts and writing an Introduction, Review of the Literature, Methods and Results

B: Key skills that are needed when writing a Title, an Abstract, an Introduction, and Review of the Literature,

UNIT IV

A. Methods, the Results, Discussion, Conclusions, the Final Check, Clarifying Who Did What, Highlighting Your Findings

B. Key Skills that are needed when writing the Methods, the Results, the Discussion, and the Conclusion

UNIT V

Useful phrases, how to ensure paper is as good as it could possibly be the first- time **s**ubmission

Text Books:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Ian Wallwork , English for Writing Research Papers, Springer New York DordrechtHeidelberg London, 2011

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DISASTER MANAGEMENT
(AUDIT COURSE)

Course Code : GR22D5154

L/T/P/C: 2/0/0/0

Course Objectives:

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches,
5. Planning and programming in different countries, particularly their home country or the countries they work in.

Course Outcomes:

1. Capacity to integrate knowledge and to analyze, evaluate and manage the different public health aspects of disaster events at a local and global levels, even when limited information is available.
2. Capacity to describe, analyze and evaluate the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
3. Capacity to work theoretically and practically in the processes of disaster management (disaster risk reduction, response, and recovery) and relate their interconnections, particularly in the field of the Public Health aspects of the disasters.
4. Capacity to manage the Public Health aspects of the disasters.
5. Capacity to obtain, analyze, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them

UNIT I

Introduction: Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

UNIT II

Repercussions of Disasters and Hazards: **Economic Damage**, Loss of Human And Animal Life, Destruction Of Ecosystem. **Natural Disasters**: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III

Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone To Floods And Droughts, Landslides and Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

UNIT IV

Disaster Preparedness and Management: Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

UNIT V

Risk Assessment: Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co- Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival. Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

SUGGESTED READINGS:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company
2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SANSKRIT FOR TECHNICAL KNOWLEDGE
(AUDIT COURSE)

Course Code: GR22D5155 **L/T/P/C: 2/0/0/0**

Course Objectives:

1. Get a working knowledge in illustrious Sanskrit, the scientific language in theworld
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects
4. Enhancing the memory power
5. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Course Outcomes:

1. Understanding basic Sanskrit alphabets and Understand tenses in Sanskrit Language.
2. Enable students to understand roots of Sanskrit language.
3. Students learn engineering fundamentals in Sanskrit.
4. Students can attempt writing sentences in Sanskrit.
5. Ancient Sanskrit literature about science & technology can be understood

UNIT I

Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

UNIT II

Order, Introduction of roots, technical information about Sanskrit Literature

UNIT III

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics and Applications of OCR for Sanskrit and Indian Languages, Tool and Techniques, Survey

UNIT IV

Interactive Sanskrit Teaching Learning Tools: Interactive Sanskrit Learning Tools, Introduction, Why Interactive Tools for Sanskrit? E-learning, Basics of Multimedia, Web based tools development HTML, Web page etc., Tools and Techniques

UNIT V

Standard for Indian Languages (Unicode) Unicode Typing in Devanagari Scripts, Typing Tools and Software, Text Processing and Preservation Tools, Text Processing, Preservation, Techniques, Text Processing and Preservation, Tools and Techniques, Survey

Suggested reading

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.
4. Bharti A., R. Sangal, V. Chaitanya, "NL, Complexity Theory and Logic" in Foundations of Software Technology and Theoretical Computer Science, Springer, 1990.
5. Tools developed by Computational Linguistics Group, Department of Sanskrit, University of Delhi, Delhi-110007 available at: http://sanskrit.du.ac.in
6. Basic concept and issues of multimedia: http://www.newagepublishers.com/samplechapter/001697.pdf

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

VALUE EDUCATION
(AUDIT COURSE)

Course Code: GR22D5156 **L/T/P/C: 2/0/0/0**

Course Objectives:

1. Understand value of education and self-development
2. Imbibe good values in students
3. Let the should know about the importance of character
4. To understand the significance of human conduct and self-development
5. To enable students to imbibe and internalize the value and Ethical behaviour in personal and professional lives.

Course Outcomes:

1. Knowledge of self-development
2. Learn the importance of Human Values
3. Developing the Professionalism Ethics, Risks, Responsibilities and Life Skills.
4. Student will be able to realize the significance of ethical human conduct and self-development
5. Students will be able to inculcate positive thinking, dignity of labor and religious tolerance.

UNIT I

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

UNIT II

Importance of cultivation of values, Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

UNIT III

Personality and Behaviour Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature.

UNIT IV

Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

UNIT V

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

Suggested reading

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi
2. Jagdish Chand, “Value Education”
3. N. Venkataiah, “ Value Education”, APH Publishing, 1998 - Education

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDIAN CONSTITUTION
(AUDIT COURSE)

Course Code: GR22D5157

L/T/P/C : 2/0/0/0

Course Objectives:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals 'constitutional
3. Role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
4. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.
5. To understand the role and functioning of Election Commission of India.

Course Outcomes:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of1956.
5. Discuss the significance of Election Commission of India.

UNIT I

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)

UNIT II

Philosophy of the Indian Constitution: Preamble Salient Features

UNIT III

Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT IV

Organs of Governance and composition of judiciary: Parliament- Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, composition of judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT V

Local Administration and Election Commission: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PEDAGOGY STUDIES
(AUDIT COURSE)

Course Code: GR22D5158

L/T/P/C: 2/0/0/0

Course Objectives:

1. Review existing evidence on the review topic to inform Programme design and policy making
2. Undertaken by the DFID, other agencies and researchers.
3. Identify critical evidence gaps to guide the development.
4. Establishing coordination among people in order to execute pedagogy methods.
5. To study pedagogy as a separate discipline.

Course Outcomes:

1. What pedagogical practices are being used by teachers in formal classrooms in developing countries?
2. What pedagogical practices are being used by teachers in informal classrooms in developing countries?
3. Synergy from the work force.
4. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population oflearners?
5. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

UNIT I

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

UNIT II

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT III

Evidence on the effectiveness of pedagogical practices, Methodology for the in-depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices.

Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT IV

Professional development: alignment with classroom practices and follow- up support, Peer support, Support from the head teacher and the community, Curriculum and assessment,Barriers to learning: limited resources and large class sizes

UNIT V

Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRESS MANAGEMENT BY YOGA
(AUDIT COURSE)

Course Code: GR22D5159 **L/T/P/C: 2/0/0/0**

Course Objectives

1. To achieve overall health of body and mind.
2. To overcome stress.
3. To lower blood pressure and improve heart health.
4. Relaxation and Sleeping aid and to become non-violent and truthfulness.
5. To increase the levels of happiness and to eliminate all types of body pains.

Course Outcomes:

1. Develop healthy mind in a healthy body thus improving social health also improve efficiently.
2. Develop body awareness. Learn how to use their bodies in a healthy way. Perform well in sports and academics.
3. Will balance, flexibility, and stamina, strengthen muscles and connective tissues enabling good posture.
4. Manage stress through breathing, awareness, meditation and healthy movement.
5. Build concentration, confidence and positive self-image

UNIT I

Definitions of Eight parts of yoga. (Ashtanga)

Ashtanga, the eight limbs of yoga, is Patanjali's classification of classical yoga, as set out in his Yoga Sutras. He defined the eight limbs as yama (abstinences), niyama (observances), asana (postures), pranayama (breathing), pratyahara (withdrawal), dharana (concentration), dhyana (meditation) and Samadhi (absorption).

UNIT II

Orientation to Patanjala Yoga sutra:

Introduction to Yoga sutra - Nature of Yoga science, Definition of yoga, the nature of seer in pure and modified state, Vrittis - Nature, classification, definition, method to control of chitta vrittis. Samprajnata Samadhi and its classification, Iswarapranidhana - a means to attain Samadhi, definition and quality of Iswara. Astanga yoga-Vama, Niyama, Asana, Pranayama, Ratyahara-Bahiranga Yoga, Dharana, Dhyana, Samadhi-Antaranga Yoga, Powers Introduction.

UNIT III

Orientation of Hath yoga pradipika :

Hath yoga - Introduction, relationship of Hath yoga and Raja yoga, greatness of Hath yoga, Hath yogi parampara, importance of Hath and its secrecy, place of Hath yoga Practice, Destructives and constructive of yoga, Yama and Niyama, Asana, methods of Hath yoga Practice, Mitahara, Pathya and Apathya. Rules in food taking, Hath yoga achievements. Paranayama - Benefits of Pranayama, Nadishuddi and Pranayama. Duration and time for pranayama practice, Gradation of Pranayama, Sweat and Pranayama, Food during pranayama practice, Yukta and Ayukta pranayama, Nadishuddi, Satkriya-Neti, Dhouti, Basti, Nauli, Trataka, Kapalbhati, Gajakarani, Importance of Pranayama practice. Symtoms of Nadishuddhi, Manonnani, Varieties of Kumbhaka-Methods of practice, Classification of their benefits, Hathayogasiddhilakshanam. Kundalini as base for all yoga, Results of Kundalini prabyodha,

Synonyms for Susumna, Mudras Bandhas-classification, benefits and methods of practice, Nadanusandhana.

UNIT IV

Yam and Niyam. Do`s and Don'ts in life. Ahinsa, satya, astheya, bramhacharya & aparigrahaShaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT V

Asan and Pranayam - Various yoga poses and their benefits for mind & body. Regularization of breathing techniques and its effects-Types of pranayam

Suggested reading

1. 'Yogic Asanas for Group Training - Part-I" : Janardan Swami Yogabhyasi Mandal,Nagpur
2. "Rajayoga or conquering the Internal Nature" by SwamiVivekananda, AdvaitaAshrama (Publication Department),Kolkata
3. Rajayoga - Swami Vivekananda - Ramakrishna Ashrama Publications.
4. Hathayoga Pradipika of Swatmarama - Kaivalyadhama, Lonavala
5. The Science of Yoga - Taimini - Theosophical Publishing House, Adyar, Madras.
6. Yogasutras of Patanjali - Harihara nanda Aranya, University of Calcutta Press, Calcutta.
7. Patanjal Yoga Pradeepa Omananda Tirtha- Geeta Press, Gorakhpur.
8. Gherandasamhita - Bihar School of Yoga, Munger, Bihar.
9. Shivayogadipika - Sadashivabrahmendra, Ananda Ashramagranthavali, Choukhamba Press
10. Yoga Darshan : Swami Niranjanananda-Sri Panchadashanam Paramahamsa Alakh Bara, Deoghar.
11. Four chapters on Freedom (commentary on the Yoga sutras of Patanjali), Swami Satyananda (1983), Bihar School of Yoga, Munger.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS (AUDIT COURSE)

Course Code: GR22D5160 **L/T/P/C: 2/0/0/0**

Course Objectives

1. Learn to achieve the highest goal happily
2. Become a person with stable mind, pleasing personality and determination
3. Awaken wisdom in students
4. Differentiate three types of happiness (Sukham)
5. Describe the character traits of a spiritual devotee

Course Outcomes

1. Study of Shrimad- Bhagwad-Gita wiil help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neethishatakam will help in developing versatile personality of students
4. To develop self-developing attitude towards work without self-aggrandizement and to develop suffering free meditative mind
5. To develop tranquil attitude in all favorable and unfavorable situations and to develop high spiritual intelligence

UNIT I
Neetisatakam-Holistic development of personality

- **Verses- 19,20,21,22 (wisdom)**
- **Verses- 29,31,32 (pride & heroism)**
- **Verses- 26,28,63,65 (virtue)**

UNIT II
Neetisatakam-Holistic development of personality

- **Verses- 52,53,59 (dont's)**
- **Verses- 71,73,75,78 (do's)**

UNIT III
Approach to day to day work and duties.

- **Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,**
- **Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,**
- **Chapter 18-Verses 45, 46, 48.**

UNIT IV
Statements of basic knowledge.

- **Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68**
- **Chapter 12 -Verses 13, 14, 15, 16,17, 18**
- **Personality of Role model. Shrimad Bhagwad Geeta:**

UNIT V

- **Chapter2-Verses 17, Chapter 3-Verses 36,37,42,**
- **Chapter 4-Verses 18, 38,39**
- **Chapter18 – Verses 37,38,63**

TEXT BOOKS / REFERENCES:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.