

B.Tech. in Mining Engineering (Duration of Study: 4 Years)

GRBT - 19

(Applicable to batches admitted from A.Y 2019-20)

DEPARTMENT OF MINING ENGINEERING



GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY (An Autonomous Institution)

Approved by AICTE, Permanently Affiliated to JNTUK, Accredited by NBA, NAAC with A+ Grade,
Recognized by UGC under the sections 2(f) and 12(B) of UGC act 1956,
GIET Campus, NH-16, Rajahmundry - 533296, East Godavari, Andhra Pradesh.

www.giet.ac.in

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Brief Profile of the Institution

Godavari Institute of Engineering & Technology (GIET) was established in 1998, under the aegis of Sri Koundinya Educational Society, to offer engineering education of world-class standards. Over the years, the Institute has come a long way to gain a place of repute and a preferred destination for quality engineering education marking it as the best engineering colleges in Andhra Pradesh. Located in the serene and sylvan suburbs of Chaitanya Nagar, Rajahmundry on NH-16, the sprawling 300 - acre campus of GIET campus reflects the finest educational facilities around. The stately 5 - storeyed structure set amid idyllic setting ensures a most congenial atmosphere for scholastic pursuit in right earnest.

Sparks of GIET- Autonomous in past TWO years

- Attainment of NAAC A+ Grade on 26th September, 2018
- Achievement of NIRF Ranking in the Band of 151-200 in Overall Category in 2019
- Achievement of NIRF Ranking in the Band of 251-300 in Engineering Category in 2020.
 - a. We are in 17-20 rank band in AP and
 - b. 37-46 rank band in AP / TELANGANA colleges
- GIET Autonomous received the Best Engineering Colleges 2020 Awards by Economic Times in AP & Telangana.
- UGC- Paramarsh-2019
 - a. GIET stood one among the 167 institutions as mentor Institutions approved under the scheme of Paramarsh for Mentoring NAAC Accreditation.
- AICTE-Chhatra Vishwakarma Awards 2019
- THREE Proposals (2- ECE & 1-EEE) submitted for "AICTE Chhatra Vishwakarma Awards 2019 are shortlisted for regional convention".
- Recognition of the Institute as Host Institute (HI) / to setup/establish Business Incubator (BI) for implementation of the scheme namely 'Support for Entrepreneurial and Managerial Development of MSMEs through Incubator'- 5th Jan 2020.
- MHRD 'NATIONAL TEST CENTRE' (NTC) Empanelment Application is uploaded in Sep., 2019 and institute got selected as TEST CENTRE.
- APSSDC and APS European Centre for Mechatronics.
- Received Shield of Appreciation for setting-up of "Indo European Skilling Centres for Mechatronics and Industrial Robotics" in the state of Andhra Pradesh on 17th Oct 2019, Thursday 10.30 am at The Gateway Hotel, Vijayawada.

- Three final year students; K. Chaitanya, B Vijay Sai and Chandra Sekhar are selected as student leaders by APSSDC and APS European Centre for Mechatronics based on the performance in training classes and examinations.
- Merger of GIET College of Engineering with GIET(A) [Under the same Society]- Approved by All India Council for Technical Education in Extension of Approval (EoA) dated 15-Jun-2020.
- New UG programmes from A.Y. 2020-21
 - a. COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)
 - b. COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)
- Education Excellence award from ASSOCHAM - 2020
 - a. The Minister of Skill Development and Entrepreneurship of India, Dr. Mahendra Nath Pandey handed the award to Ms. K.V. Lakshmi Sashi Varma, Executive Director, GIET Institutions, at the ASSOCHAM 13th National Education Conclave, Expo & Awards recently (on February 25th & 26th; 2020), at New Delhi.
- Recognized as Swachhta Action Plan Institution. The Institution has successfully formed the Swachhta Action Plan Committee and constituted the working groups Post COVID-19 for Sanitation & Hygiene, Waste Management, Water Management, Energy management and Greenery along with the observation of two environment related days to inculcate in faculty, students and community, the practices of Swachhta and Reduction, Reuse and Recycling of Resources.
- Recognized as a Member of National Rural Entrepreneurship Mission. The Institution has constituted Rural Entrepreneurship Development Cell in their campus. This Institution has formed a Team consisting of Student Development Officers for handling
 - i. Placement and Internship
 - ii. Personality
 - iii. Technology
 - iv. Entrepreneurship and Rural Engagement with the Mission of inculcating entrepreneurship among students.
- Ek Bharat Shreshtha Bharat (EBSB) club conducted online quiz from 05/06/2020 to 10/06/2020 on History and Heritage of the State: "Punjab" for creating awareness of paired state due to national level lockdown because of deadly pandemic disease Covid - 19.
 - a. Distributed food and butter milk in local area as social responsibility and humanity.
 - b. All students and employees are advised to download the AROGYA SETU APP

- MoU with “Automation Anywhere University” -leading intelligent automation platform where certifications can be done in Robotic Process Automation. [<http://automationanywhere.com/>]
- a. Online training is On-going for interested Faculty members from MECH, ECE and CSE
- MoU with National Highways Authority of India (NHAI) in the department of Civil Engg. where UG/PG students will be given internships/projects on live problems with stipend.
- Faculty members have published more than 150 papers in SCOPUS indexed Journals in addition to other reputed journals/conferences during last three years.
- Thirteen FDPs/ Workshops/Seminars were organized from various departments during last academic year.

Centers of Excellences

To further GIET's Institute-Industry partnership initiatives, 'Centers of Excellence' have been established by the college. These centers strive to improve student competencies to help them achieve their career objectives. They also help foster and support the spirit of knowledge creation, insight and implementation. The centers promote multi-disciplinary academics as well as practice-oriented research and encourage the formation of strong research groups to promote true excellence in research.

- b. Cyber Security Simulation Lab
- c. Dassault Lab
- d. AVEVA Center
- e. Microsoft Innovation Centre
- f. Virtusa Center of Excellence
- g. Siemens Centre of Excellence for skill development
- h. Andhra Pradesh State Skill Development Centre (APSSDC)
- i. Hebeon Incubation Centre
- j. Automatic Robotic Control Lab (ARC, Germany)

Institute's Vision and Mission

Vision

To foster outstanding engineering graduates, facilitate cutting-edge research and promote innovations anchored to ethical and environmentally responsible engineering practice for the benefit of a global society.

Mission

To be recognised as the epicentre of the engineering ecosystem with a pioneering spirit and an incubator of entrepreneurial engineers par excellence promoting inclusiveness and collaborations on a world-wide basis.

Department's Vision and Mission

Vision

To be recognised as a National Centre of Excellence in Mining Engineering to cope with the challenges of Sustainable Development in Mining Industry.

Mission

1. To provide high quality programs supported by up-to-date curriculum and practical courses.
2. To prepare students to understand eco-friendly and sustainable development in mining industry.
3. Extensive practical courses to foster learning by observation.
4. Expose the students to various mining projects to reinforce their classroom / laboratory learning.
5. Sensitizing the students towards ethical, social responsibilities, leadership, entrepreneurship, communication skills and lifelong learning.

Department Profile

Mining Engineering Branch Started in 2009 with an intake of 60. First Batch of students passed-out in the year 2013. The department is equipped with State of art laboratories and faculty drawn from premiere institutes Like IITs, NITs and other universities. Gas Testing centre is another strength of the department. It was started in the year 2016. Since its inception, Familiarity certificates were issued to hundreds of students.

All Students of 2nd, 3rd & 4th year are undergoing internship/project work. Experienced Faculty in the department to guide the students in right direction for the prospective bright career of the individual students. The department is equipped with the following laboratories.

- Geology Lab
- Mine Surveying Lab
- Mineral Processing Lab
- Rock Mechanics Lab
- Mine Ventilation Lab
- Mine Planning and Design Lab
- Computer Applications in Mining Lab

Programme Educational Objectives (PEOs)

Our Graduates will,

1. Plan and design mine project operations.
2. Apply engineering skills/techniques to manage mining operations effectively and able to solve mining engineering problems.
3. Be able to design/execute all project operations of surface and underground mining projects in an eco-friendly manner.
4. Be able to analyse and evaluate the economics of mining projects for sustainable development.
5. Apply the skills/techniques in project management, execution, and decision-making.
6. Execute/ apply engineering principles in the exploration, exploitation and reclamation of mineral resources.

Programme Outcomes (POs)

Our graduates will,

1. Apply skills/techniques to solve the problems of projects.
2. Critically analyse and interpret the data to solve project problems.
3. Plan and design the mine layouts to evaluate the project performance and productivity.
4. Manage & execute the project plans to meet goals of economic, environmental, social, political, ethical, health and safety.
5. Apply latest skills/techniques of computer software, modern instrumentation, novel technologies in engineering activities.
6. Comprehend the efficiency of mines and allied industries, suggest solutions in improving the economics, safety and optimization.
7. Comprehend the professional and ethical values.
8. Comprehend need for higher learning and engage in life-long learning.
9. Make effective communication in verbal and written forms with confidence.
10. Demonstrate leadership in project planning/ execution to obtain quality and quantity.
11. Demonstrate teamwork with other teams of inter-disciplinary department.
12. Excel and improvise their skills under challenging circumstances at their projects.

Programme Specific Outcomes (PSOs)

13. Develop strong skills in systematic planning, developing, implementing in different domains for betterment of life.
14. Plan and operate mining projects by using various engineering/technological tools to meet the volatile needs of the industry.

Structure of B. Tech. Programme in Mining Engineering

I YEAR I SEMESTER

S. No.	Course Code	Course Type	Course Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
1	19198101	BSC	Mathematics-I	3	0	0	3	30	70	100
2	19198102	HSMC	Communicative English-I	3	0	0	3	30	70	100
3	19198103	BSC	Engineering Chemistry	3	0	0	3	30	70	100
4	19198194	MC	Professional Ethics & Human Values	2	0	0	0	30*	-	-
5	19192105	ESC	Basic Electrical & Electronics Engineering	3	0	0	3	30	70	100
6	19193176	ESC	Engineering Graphics	1	0	3	2.5	30	70	100
7	19198111	HSMC	Communicative English Laboratory	0	0	3	1.5	50	50	100
8	19198112	BSC	Engineering Chemistry Laboratory	0	0	3	1.5	50	50	100
9	19198113	ESC	Basic Electrical & Electronics Engineering Lab	0	0	3	1.5	50	50	100
TOTAL				15	0	12	19	300	500	800
BSC = 7.5		ESC=7	HSMC=4.5	MC=0						

YEAR II SEMESTER

S. No.	Course Code	Course Type	Course Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
1	19198201	BSC	Mathematics-II	3	0	0	3	30	70	100
2	19198202	HSMC	Communicative English -II	3	0	0	3	30	70	100
3	19198293	MC	Environmental Studies	2	0	0	0	30*	-	-
4	19193204	ESC	Engineering Mechanics	2	1	0	3	30	70	100
5	19198205	BSC	Engineering Physics and its Applications	3	0	0	3	30	70	100
6	19195206	ESC	Problem Solving & Programming in C	2	1	0	3	30	70	100
7	19198211	HSMC	Communicative English Laboratory -II	0	0	3	1.5	50	50	100
8	19198212	BSC	Engineering Physics Laboratory	0	0	3	1.5	50	50	100
9	19198213	ESC	Basic Engineering Workshop	0	0	3	1.5	50	50	100
10	19198214	ESC	Problem Solving & Programming Laboratory using C	0	0	3	1.5	50	50	100
TOTAL				15	2	12	21	350	550	900
BSC=7.5		ESC=9	HSMC=4.5	MC=0						

II YEAR I SEMESTER

S. No.	Course Code	Course Type	Course Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
1	19169301	BSC	Mathematics-III	3	0	0	3	30	70	100
2	19163302	ESC	Fluid Mechanics & Hydraulic Machinery	2	1	0	3	30	70	100
3	19160303	PCC	Mine Surveying	2	1	0	3	30	70	100
4	19160304	PCC	Introductory Geology	3	0	0	3	30	70	100
5	19160305	PCC	Development of Mineral Deposits	3	0	0	3	30	70	100
6	19160306	PCC	Drilling & Blasting	2	1	0	3	30	70	100
7	19160387	MC	Design Thinking & Product Innovation	2	0	0	0	30*	-	-
8	19163311	ESC	Fluid Mechanics & Hydraulic Machinery Laboratory	0	0	3	1.5	50	50	100
9	19160312	PCC	Mine Surveying Laboratory	0	0	3	1.5	50	50	100
TOTAL				17	3	6	21	380	520	800
BSC = 3		ESC = 4.5	PCC = 13.5	MC=0						

II

YEAR II SEMESTER

S. No.	Course Code	Course Type	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
1	19169401	BSC	Numerical Methods and Probability & Statistics	3	0	0	3	30	70	100
2	19163466a	OEC	Open Elective-I	3	0	0	3	30	70	100
3	19160402	PCC	Advanced Mine Surveying	2	1	0	3	30	70	100
4	19160403	PCC	Surface Mining	2	1	0	3	30	70	100
5	19160404	PCC	Underground Coal Mining	3	0	0	3	30	70	100
6	19160405	PCC	Mining Geology	3	0	0	3	30	70	100
7	19160411	PCC	Advanced Mine Surveying Laboratory	0	0	3	1.5	50	50	100
8	19160412	PCC	Mining Geology Laboratory	0	0	3	1.5	50	50	100
TOTAL				16	2	6	21	280	520	800
BSC = 3		ESC = 0	PCC = 15	OEC = 3						

III YEAR I SEMESTER

S. No.	Course Code	Course Type	Course Title	Periods per week			C	Scheme of Examination		
								Maximum Marks		
				L	T	P		Int.	Ext.	Total
1	19160501	PCC	Mine Systems Engineering	2	1	0	3	30	70	100
2	19160502	PCC	Underground Metal Mining	3	0	0	3	30	70	100
3	19160503	PCC	Mine Ventilation	2	1	0	3	30	70	100
4	19160504	PCC	Mine Planning & Design	3	0	0	3	30	70	100
5		PEC	Professional Elective-1	2	1	0	3	30	70	100
6	19163566a	OEC	Open Elective-2	3	0	0	3	30	70	100
7	19160587	MC	Constitution of India	2	0	0	0	30*	-	-
8	19160511	PCC	Mine Ventilation Laboratory	0	0	3	1.5	50	50	100
9	19160512	PCC	Mine Planning & Design Laboratory	0	0	3	1.5	50	50	100
10	19160521	PR	Mini Project-1/Study Project/Internship	0	0	0	2	100	-	100
TOTAL				17	3	6	23	380	520	900
PEC = 3		PR = 2		PCC = 15		OEC = 3				

III

YEAR II SEMESTER

S. No.	Course Code	Course Type	Course Title	Periods per week			C	Scheme of Examination		
								Maximum Marks		
				L	T	P		Int.	Ext.	Total
1	19160601	PCC	Rock Mechanics	2	1	0	3	30	70	100
2	19160602	PCC	Mineral Processing	2	1	0	3	30	70	100
3	19160603	PCC	Mineral Economics	2	1	0	3	30	70	100
4		PEC	Professional Elective-2	2	1	0	3	30	70	100
5	19163665a	OEC	Open Elective - 3	3	0	0	3	30	70	100
6	19160621	PR	Community Service Oriented Project	0	0	1	0.5	100	-	100
7	19169686	HSMC	Soft Skills	0	0	3	1.5	50	50	100
8	19160611	PCC	Rock Mechanics Laboratory	0	0	3	1.5	50	50	100
9	19160612	PCC	Mineral Processing Laboratory	0	0	3	1.5	50	50	100
TOTAL				11	4	10	20.0	400	500	900
PEC = 3		HSMC = 1.5		PCC = 12		OEC = 3		PR = 0.5		

IV YEAR I SEMESTER

S. No.	Course Code	Course Type	Course Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
1	19160701	PCC	Mine Legislation and General Safety	3	0	0	3	30	70	100
2	19160702	PCC	Mining Machinery	2	1	0	3	30	70	100
3	19160703	PCC	Computer Applications in Mining	3	0	0	3	30	70	100
4		PEC	Professional Elective-3	2	1	0	3	30	70	100
5	19169765_	OEC	Open Elective-4	3	0	0	3	30	70	100
6	19169786	MC	Intellectual Property Rights and Patents	2	0	0	0	30*	-	-
7	19160711	PCC	Computer Applications in Mining Laboratory	0	0	3	1.5	50	50	100
8	19160712	PCC	Mining Machinery Laboratory	0	0	3	1.5	50	50	100
9	19160721	PR	Mini Project-2/ Internship	0	0	0	2	100	-	100
TOTAL				15	2	6	20	350	450	800
PEC = 3		MC = 0	PCC = 12	OEC = 3	PR = 2					

IV

YEAR II SEMESTER

S. No.	Course Code	Course Type	Course Title	Periods per week			C	Scheme of Examination Maximum Marks		
				L	T	P		Int.	Ext.	Total
1	19160861_	PEC	Professional Elective-4	2	1	0	3	30	70	100
2	19160862_	PEC	Professional Elective-5	2	1	0	3	30	70	100
3	19160841	PR	Project	0	0	18	9	80	120	200
TOTAL				4	2	18	15	140	260	400
PEC = 06		PR = 09								

PROFESSIONAL ELECTIVES COURSES

Professional Electives	Elective - I	Elective - II	Elective - III	Elective - IV	Elective - V
Planning & Design	Mine Transportation (19160565A)	Planning of Surface Mines (19160664A)	Mine Construction Engineering (19160764A)	Planning of Underground Metal Mines (19160861A)	Open Pit Slope Analysis and Design (19160862A)
Statistics and Management	Mine Valuation (19160565B)	Enterprise Resource Planning (19160664B)	Geostatistics (19160764B)	Mine Management (19160861B)	Waste Management (19160862B)
Ground Control	Rock Excavation Engineering (19160565C)	Mine Strata Control (19160664C)	Rock Slope Engineering (19160764C)	Mine Subsidence Engineering (19160861C)	Rock Fragmentation Engineering (19160862C)
Special Mining Methods	Advanced Coal Mining (19160565D)	Innovative Mining Systems (19160664D)	Tunneling Engineering (19160764D)	Dimensional Stone Mining (19160861D)	Deep Sea Mining (19160862D)
Safety and Environmental Science	Environmental Pollution & Control in Mines (19160565E)	Environmental Impact Assessment in Mines (19160664E)	Mine Safety Engineering (191607643E)	Environmental Management in Mines (19160861E)	Mine Hazards & Rescue (19160862E)

LIST OF OPEN ELECTIVE COURSES

(Common to all Branches)

Notes:

- Each branch shall have option to select any open elective course (OEC) from each column corresponding to the slot in Programme structure of that particular branch.
- The OEC selected shall be other than that offered by the parent department.
- The OECs given in column 4 i.e. Open Elective - IV relates to courses of HSMC type.

S. No.	OPEN ELECTIVE-I (19163466a)	OPEN ELECTIVE-II (19163566a)	OPEN ELECTIVE-III (19163665a)	OPEN ELECTIVE-IV
1	MECH - Robotics	MECH - MEMS	MECH - Nano Technology	Managerial Economics and Financial Analysis (19169765a)
2	CSE- Operating Systems	CSE- Information Security	CSE- Human Computer Interaction	Entrepreneurship Qualities for Engineers (19169765b)
3	EEE- Utilization of Electrical Energy	EEE - Energy management	EEE- Renewable Energy Resources	Principles of Management (19169765c)
4	ECE- Internet of Things	ECE- Digital Image Processing	ECE - Data Communication	Financial Management for Engineers (19169765d)
5	CE- Environmental Pollution & Control	CE- Solid Waste Management	CE - Global Environment: Problems & Policies	Operations management (19169765e)
6	AME - Basic Automobile Engineering	AME - Hybrid and Electric Vehicles	AME - Modern Vehicle Technology	Digital Marketing (19169765f)
7	MM - Elements of Mining Technology	MM - Disaster Management in Mining	MM- Remote Sensing & GIS in Mining	Total Quality Management (19169765g)
8				Organizational Behavior (19169765h)
9				Human Resource Management (19169765i)



GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Autonomous)
RAJAHMUNDRI-533 296, AP

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY (BACHELOR OF TECHNOLOGY) ACADEMIC REGULATIONS, 2019

Rajahmundry, the 29th July, 2019

These regulations may be called Godavari Institute of Engineering & Technology (Bachelor of Technology) Academic Regulations, 2019, hereinafter referred to as GIET Academic Regulations (B.Tech.) 2019 or in short GRBT-19.

RBT 1.0 TITLE & DURATION OF THE PROGRAMME

1.1 Title of the Programmes

The programmes shall be called the degree programme in Bachelor of Technology, abbreviated as B.Tech.

1.2 Duration

- a) **Minimum duration:** The programme shall be of four years duration having eight semesters for regular entry and three years duration having six semesters for lateral entry students (diploma holders admitted directly in second year). Each semester shall be of 16 weeks excluding examinations. The academic calendar of the programme shall be fixed by the Institute from time to time.
- b) **Maximum duration:** The maximum time frame for completion of the programme for regular students is eight years from the admitted academic year.

The maximum time frame for completion of the programme for lateral entry students is six academic years from the admitted academic year.

Notwithstanding those students who are not able to complete the programme within the above period shall forfeit their admission into the programme and their admission shall stand cancelled.

Provided that those students who have completed the course work but have pending theory/hybrid backlog courses and need additional time, shall be provided two more academic years of time after which the admission shall stand cancelled. Fee should be 30 percent of all semesters lapsed after completion of maximum duration of the programme.

1.3 **Applicability of the Regulations**

The GRBT-19 shall be applicable to all degree programmes in Bachelor of Technology admitted in the academic year 2019-20 onwards.

RBT 2.0 GENERAL

2.1 **Definitions**

Academic Council: A statutory body constituted by the Institute for overseeing the academic matters directly and indirectly related to smooth running of all programmes of the Institute. Chaired by the Head of the Institute and abbreviated as AC.

APSCHE: Andhra Pradesh State Council for Higher Education is the authority looking after the policy planning, implementation and quality of all higher educational institute in the state of Andhra Pradesh.

Affiliating University: The Jawaharlal Nehru Technological University, Kakinada, hereinafter referred to as JNTUK or University, is the state technological university to which the Institute is affiliated to.

Branch of study: Various disciplines, domains or sectors of study in engineering such as mechanical engineering, civil engineering, etc.

Board of Studies: A committee of experts belonging to a particular branch of study. Abbreviated as BoS and is chaired by a senior faculty member, say a professor, usually by the head of the department.

External assessment: Individual or set of assessments carried out by external faculty members, primarily consisting of Semester End Examination (SEE), Final review of major project work, etc.

Faculty Advisor/Class Counsellor: means, the Faculty Advisor or the Panel of Faculty Advisors, in a Parent Department, for a group (admission-batch) of students. Also known as Class Counsellor.

Internal assessment: Set of assessments carried out by faculty members of the Institute, primarily consisting of Mid Semester Examination (MSE) [Subjective type], MSE [Objective type], Assignments, Reviews, Seminars, Mini Projects, etc.

Lateral Entry scheme: Aspirants who passed diploma in engineering seeking admission directly into second year of bachelor's programme in engineering come into the lateral entry scheme. Abbreviated as LE.

Programme: An organized duration of study in a particular level of knowledge leading to a degree, for instance, a bachelor's programme, a master's programme, doctoral programme, etc. It can be in areas like arts, science, engineering, and so on and can run yearly, half yearly (or semester) or tri-semester wise.

Parent Department: means the department that offers the degree programme that a student undergoes. Also called Degree Awarding Department.

Project Guide: means the faculty member who guides the Major Project of the student.

SBTE: State Board of Technical Education is the authority regulating diploma level institutions in engineering within the state. Every state has one such regulatory body.

- 2.2 The terms "he", "him", or "his" are used to include all genders of students.
- 2.3 The academic regulation should be read as a whole for the purpose of any interpretation.
- 2.4 In the case of any doubt or ambiguity in the interpretation of the provisions of this Regulation, the decision of the Chairman, AC shall be final.
- 2.5 The Institute may change or amend the academic regulations or syllabi at any time and the changes or amendments made therein shall be applicable to all the students with effect from the dates notified by the Institute.
- 2.6 Medium of instruction of the programmes shall be English.
- 2.7 The provisions contained in this set of Regulations govern the policies and procedures, on the imparting of instructions of courses, conducting of the examinations, and evaluation and certification of students' performance leading to the said Degree Programme.
- 2.8 This set of Regulations may evolve and get revised/refined or updated or amended or modified or changed through approvals from the Academic Council from time to time, and shall be binding on all parties concerned, including the Students, Faculty, Staff, Departments, Institute Authorities and offices.
- 2.9 In order to guarantee fairness and justice to all the stake holders concerned, in view of the periodic evolutionary refinements, any specific issues or matters of concern shall be addressed separately, by the AC and/or GB, as and when found necessary.

- 2.10 The AC may consider any issues or matters of concern relating to any or all the Academic Activities of the Institute, for appropriate action, irrespective of whether a reference is made (or the nature and extent of any reference if so present) here in this set of Regulations or otherwise.

RBT 3.0 QUALIFICATION FOR ADMISSION

- 3.1 Admissions shall be done as per the norms fixed by Government of Andhra Pradesh from time to time.
- 3.2 The qualifying examination shall be the Board of Intermediate Examination of Andhra Pradesh or its equivalent.
- 3.3 For admission under Lateral Entry category (diploma holders or others admitted directly into second year through specific admission criteria as decided by the APSCH) the qualifying examination shall be the Engineering diploma examinations conducted by the SBTE, Andhra Pradesh or its equivalent.
- 3.4 A limited number of admissions may be offered to Foreign Nationals and Indians living abroad in accordance with the rules applicable for such admission.
- 3.5 If, at any time after admission, it is found that a candidate had not in fact fulfilled all the requirements stipulated in the offer of admission, in any form whatsoever, including possible misinformation, etc., the matter will be reported to the AC, recommending revoking the admission of the candidate.
- 3.6 The Institute reserves the right to cancel the admission of any student at any stage of his study programme in the Institute on the grounds of unsatisfactory academic performance or indiscipline or any misconduct.
- 3.7 Student exchange programmes and the transfer of credits in such cases will be as per the corresponding Memorandum of Understanding (MoU) approved by AC.
- 3.8 The decisions of the AC regarding the admissions are final and binding.

RBT 4.0 BRANCHES OF STUDY

- 4.1 The following branches of study are offered as specializations for the B.Tech.

S. No.	Branch Code	Abbr.	Branch
01	01	CE	Civil Engineering
02	02	EEE	Electrical & Electronics Engineering
03	03	ME	Mechanical Engineering
04	04	ECE	Electronics & Communication Engineering

S. No.	Branch Code	Abbr.	Branch
05	05	CSE	Computer Science & Engineering
06	24	AME	Automobile Engineering
07	26	MM	Mining Engineering
08	And any other course approved by authorities from time to time and appended to the list		

RBT 5.0 STRUCTURE OF THE PROGRAMME

- 5.1 Based on the type of courses, each course shall normally be assigned certain number of credits/ marks. Every course comprises of specific Lecture-Tutorial-Practical (L-T-P) Schedule. General guidelines are as follows:

Credits	Course description	Maximum marks
3 credits	4 (3+1) Theory course periods per week	100 marks
1.5 credits	3 Laboratory periods per week	100 marks
2 credits	Internship/mini project-II /training	100 marks
2 credits	Mini project I	100 marks
9 credits	Project work	200 marks
1 credit	Audit /Add-on courses	100 marks
4 credits	Hybrid courses (courses with 25% theory content and 75% practical content)	100 marks

Specific credits have already been stated clearly in the programme structure indicating the credits against each course.

- 5.2 The BoS will recommend the exact credits offered for the programme for the above components, the semester-wise distribution among them, as well as the syllabi of all undergraduate courses offered by the department from time to time before sending the same to the AC for consideration and approval.

RBT 6.0 DISTRIBUTION / WEIGHATAGE OF MARKS & MODE OF EVALUATION

- 6.1 Almost all the courses shall have an internal assessment component where the evaluation shall be done by faculty members of the Institute. Evaluation of the semester end component shall be done by faculty members of other institutions or a suitable combination of examiners from this Institute and other institutions. The credits and marks are as specified in programme structure.

6.2 Theory courses - 3 Credits - 100 Marks

The theory course syllabus shall be divided into 5 units and total marks that can be awarded shall be 100. The internal assessment component shall be for 30 marks and the semester end component shall be of 70 marks.

- i. **The award of 30 marks for internal assessment shall be done as follows:** (MSE [Subjective type] - 20 marks, MSE [Objective type] - 5 marks, Assignments - 5 marks)
 - a. There shall be two MSEs. The first MSE shall be for Units 1 to 2 and second MSE shall be for Units 3 to 5. Question paper for each MSE shall consist of a descriptive part and an objective part.
 - b. There shall be two written descriptive internal assessment tests (MSEs) for 20 marks each termed as MID1 and MID2. The tests shall be of 90 minutes duration and shall consist of i) 2 essay questions (with internal choice) carrying 7 marks each and ii) 5 short answer questions from which 3 are to be answered, carrying 2 marks each. There shall also be two objective internal assessments for 5 marks each for every theory course in all semesters. The tests shall be of 10 minutes duration and shall consist of 10 questions which shall be compulsory.
 - c. The higher marks of the two MSEs for any course shall be given a weightage of 80% and the other a weightage of 20%. The marks are accordingly reduced/proportionate to 25.
 - d. There shall be a minimum of 5 assignments per semester with a minimum of 2 classroom assignments and 3 home assignments. Assignments shall carry 5 marks.
 - e. The MSEs weighted average marks reduced to 25 shall be added to the marks obtained in assignments to obtain the maximum total mark in theory for the internal assessment.
 - f. In the case of courses like Engineering Drawing, out of the 30 marks for internal assessment 20 marks shall be allocated by continuous evaluation of the day to day work. The remaining 10 marks shall be awarded by conducting two subjective MSEs of 10 marks each. The better marks of these two MSEs shall be given a weightage of 80% and the other a weightage of 20%. The marks are reduced to 10.
 - g. The marks distribution for internals and externals is - 30% for internal assessments and 70% for external assessments in case of theory courses. 50% each for Internals and Externals for all the Practical/ Workshops etc., For the practical part of the Hybrid courses the internal assessment rules of practical will hold good and for the theory part of the Hybrid course the internal assessment rules of theory papers will hold good.
 - h. The passing minimum in SEE for theory is 35% and 50% overall.
- ii. **The award of 70 marks for external assessment shall be done as follows:**
 - a. There shall be a descriptive written examination of 3 hours duration for 70 marks covering all the 5 units of the syllabus. Question paper for this examination shall be prepared externally by paper setters from the panel of paper setters recommended by the Chairperson of the BoS. The evaluation of the answer scripts shall be done externally by evaluators belonging to University colleges, Autonomous colleges or by evaluators recommended by the Chairpersons of BoS.

- b. The number of units in each course are limited to 5 (Five) (with limitations for the courses for Building Design/ Machine Drawing, etc.) covering the required syllabus. Question papers under GRBT-19 shall be made with the model set of one question from each unit to be answered compulsorily from all five units but a choice shall be provided with-in the questions in the form of either/or method.

6.3 Practical - 2 credits - 100 marks

Practical(s) shall be evaluated for 100 marks out of which 50 marks shall be for continuous internal assessment and the remaining 50 marks shall be for summative assessment.

- i. Award of 50 marks for internal assessment shall be done as follows:
 - a. A maximum of 25 marks shall be assigned by continuous evaluation for the best 10, day to day experimental work.
 - b. A maximum of 25 marks shall be awarded by conducting an internal practical examination at the end of the semester. There shall be two examiners for the internal examination. One shall be the faculty member concerned and the other shall be an internal faculty member nominated by the HoD.
- ii. The SEE shall be conducted by the teacher concerned and another examiner nominated by HoD/Principal.
- iii. The passing minimum in SEE for practical is 50% and 50% overall.

6.4 Hybrid Courses - 3 credits - 100 Marks

- a. A standard theory course of a branch is replaced by a hybrid course.
- b. In a hybrid course syllabus 25% is theory and 75% is practical.
- c. Evaluation is done separately for theory and practical.
- d. For the theory part and laboratory/practical part of the Hybrid courses, the internal assessment rules of theory and practical respectively will be:
 - 1) **Theory part:** Out of 30 marks of Theory, 10 marks are for internal assessment and 20 marks are for SEE. The internal assessment examination will be conducted for 30 marks like any other theory course and the final marks obtained will be reduced to 10. The SEE will be held for 100 marks and the marks obtained will be reduced to 20.
 - 2) **Practical part:** Out of 70 marks for practical, 30 marks are allotted for internal assessment and 40 marks are allotted for SEE. The internal assessment component will be evaluated for 30 marks. The SEE component will be evaluated for 80 marks and the marks obtained will be reduced to 40.
- e. The passing minimum for theory in SEE is 35% and for practical is 50%. If a student fails to secure the minimum pass requirement either in theory or practical (refer rule RBT 9 below) both the theory and practical part are to be repeated.

6.5 Mini Project I/ Study project - 2 credits - 100 Marks

Mini Project / Study Project carrying 2 credits shall be done during summer vacation after II Year II semester and will be evaluated for 100 marks by the Departmental Committee consisting of HoD, mini project supervisor and a senior faculty member. There shall be no external examination for mini project.

6.6 Mini project II/Summer internship/ Summer training - 2 credits - 100 Marks

Summer internship/ Summer training of minimum 3 weeks duration carrying 2 credits shall be done during summer vacation after III Year II semester and will be evaluated in accordance to the rubrics for 100 marks by the Departmental Committee consisting of HoD, Summer internship/ Summer training supervisor and a senior faculty member.

Internships shall be conducted at large industrial complexes and exposes the students to real-life situations. Students may also carry out internships at various production and manufacturing units, design, development and consulting agencies, national laboratories, R&D centers, etc. The students solve real-life problems of interest to the host organizations. The professional expert acts as a consultant while resident faculty member of the department supervises the work.

Evaluation is continuous and through seminar presentation. There shall be no external examination for Summer internship/ Summer Training project. The components of evaluation are invariably reports, certifications and seminars and the complete details will be worked out by the BoS in the form of rubrics. Also attention is paid to certain aspects which do not surface in the conventional class room situation like professional judgment, decision-making ability, team spirit, etc.

6.7 Add on courses/Audit courses

1 credit for specific Audit /Add on courses with a maximum of 100 marks and are compulsory to get the award of the degree and are detailed in structure and syllabus. There shall be no external examination for add- on/audit courses.

6.8 Seminars

Specific credits were given for seminar in the respective programme structure based on the rubrics. Respective programme structure for the branch may be referred for further information. There shall be no external examination for seminars.

6.9 Project Work - 9 credits - 200 Marks

Out of a total of 200 Marks for the project work, 80 marks shall be for internal valuation and 120 marks shall be for the semester end evaluation.

The project work shall be spread across both Semester VII and Semester VIII but shown in Semester VIII grade sheet. It shall be innovative in nature with adequate industry/ research orientation. A project batch shall comprise of not more than four students.

- i. **The award of 80 marks for internal evaluation shall be done as:**
Two mid course reviews each semester based on a standardized rubric shall be conducted for 20 marks by a Project Review Committee (PRC) of which the project coordinator is a member.
- ii. **The award of 120 marks for external evaluation shall be done as:** External evaluation shall be done by a three member committee consisting of a) an external examiner nominated by the Principal, who may be from the panel of evaluators recommended by the BoS, b) HoD concerned, and c) the project coordinator, based on the comprehensive project report submitted by the candidate followed a viva-voce examination.

Provided that the student/student group shall prepare their project report in accordance with the guidelines issued on preparation of project reports.

Provided that the student/student group shall comply with the guidelines issued on acceptable levels of plagiarism since all final project reports are subjected to plagiarism checks.

RBT 7.0 REGISTRATION OF COURSES

7.1 Registration of courses in each semester is mandatory, with following conditions:

- i) Every student after consulting his Faculty-Advisor is required to register for the approved courses with the HOD of parent department at the commencement of each semester on the days fixed for such registration as notified.
- ii) **Mandatory Pre-Registration for Subsequent semester:** In order to facilitate proper planning of the academic activities of a semester, it is essential for the students to declare their intent to register for a course well in advance, before the actual start of the academic session, through the process of Pre-Registration, which is mandatory for all those students of second or subsequent semesters who propose to deviate from recommended scheme of studies.
- iii) All students (other than the freshly admitted students) intending to register for the next semester are required to have completed the Pre-Registration, at least 10 days before the Last Day of Classes in the current semester. To facilitate this pre-registration, all teaching departments shall announce the list of courses to be offered for the next higher semester, at least three weeks before the Last Day of Classes in the current semester.

- iv) A student found deficient in any area of knowledge/skill needed for programmes of study e.g. Communication Skill, Mathematics, etc. may be required to do suitable additional course(s) on audit basis which will not be shown on his Grade Card.
- v) Students who do not register on the day announced for the purpose may be permitted Late Registration up to the notified day on payment of late fee.
- vi) A student will be permitted to register in the next semester only if he fulfills the following conditions:
 - (a) Satisfied all the Academic Requirements to continue with the programme of study;
 - (b) Cleared all Institute, Library and Hostel dues and fines (if any) of the previous semester.
 - (c) Paid all required advance payments of the Institute and hostel for the current semester.
 - (d) Not been debarred from registering on any specific ground by the Institute.

RBT 8.0 ATTENDANCE REQUIREMENTS

8.1 Attendance requirements are given appropriate weightage like academic requirements as hereunder:

- i) All students must attend all lecture, tutorial and practical classes in a course. The attendance will be counted course wise.
- ii) To account for approved leave of absence e.g. representing the Institute in sports, games or athletics, professional society activities, placement activities, NCC/NSS activities, etc. and/or any other such contingencies like medical emergencies, etc., the attendance requirement shall be considered on a base minimum of 75% of the classes scheduled in each semester subject to a maximum of 10 days in a semester.
- iii) A student shall be eligible to write the SEE if he acquires a minimum of 75% of attendance in aggregate of all the courses.
- iv) Condonation of shortage of attendance in aggregate up to 10% (attendance below 75% but 65% and above) in each semester may be condoned by the College Academic Committee (CAC). [The number of times condonation can be availed by a student shall be $(n - 1)$ where n is the number of years of study of the programme]. A stipulated fee shall be payable towards condonation of shortage of attendance.
- v) Shortage of attendance below 65% in aggregate shall not be condoned and such students shall be detained in that semester.
- vi) A student who is short of attendance in any semester may seek re-admission into that semester when it is offered again but within one week from the date of commencement of class work of the new semester.

- vii) A student shall be promoted to next semester if he satisfies the a) attendance requirement of the present semester b) the credits requirements, if any and c) paid the SEE fee.
- viii) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for re-admission into the same semester.

8.2 Leave of Absence

- i) If the period of leave is more than three days and less than 10 days, prior application for leave shall have to be submitted to the HoD concerned, with the recommendation of the Faculty-Advisor, stating fully the reasons for the leave requested, along with supporting documents.
- ii) If the period of leave is 10 days or more, prior application for leave shall have to be made to the In-charge of Academics with the recommendations of the Faculty-Advisor and HoD concerned stating fully the reasons for the leave requested, along with the supporting documents. The In-charge of Academics may, on receipt of such application, grant leave or reject the application.
- iii) It will be the responsibility of the student to intimate the Course Instructors, and also the In-charge of Academics as well as the Chief Warden of the hostel, if hosteller, regarding his absence before availing leave.
- iv) If a student fails to apply and get sanction for absence as in (i) and (ii) above, his parent/guardian may apply to the Principal with reasons duly recommended by the faculty advisor, HoD and In-charge of Academics and explain in person to the Principal the reasons for not applying in time. The Principal will consider on merit and decide to grant the leave or detain for that particular semester subject to any condition that he may like to impose. The decision of the Principal shall be final and binding.

RBT 9.0 MINIMUM ACADEMIC REQUIREMENTS

- 9.1 The following academic requirements shall be satisfied by every student in addition to the attendance requirements mentioned under Rule RBT 8.0 above:
- i. A student shall be deemed to have satisfied the minimum academic requirements in theory courses if he has earned the credits allotted to each theory course and secures not less than 25 marks out of 70 in SEE and a minimum of 40 % of marks in each theory course when the internal assessment marks and SEE marks are added together.
 - ii. A student shall be deemed to have satisfied the minimum academic requirements in practical courses if he has earned the credits allotted to each practical course by securing not less than 50% marks in SEE practical examinations and a minimum of 50 % of marks in each practical course when the internal assessment marks and SEE marks are added together.

- iii. A student shall be deemed to have satisfied the minimum academic requirements in design /drawing /mini project/industry oriented mini project/ summer internship and project if he has earned the credits allotted to each of this course and secures not less than 40% marks in SEE, if any and a minimum of 40 % of marks in each course when the internal assessment marks and SEE marks are added together.
- iv. A student shall be promoted from 1st year to 2nd year if he fulfills the minimum attendance requirement.
- v. A student shall be promoted from 2nd year to 3rd year if he fulfills the academic requirement of 50% of the credits up to 2nd Year 2nd semester from all the examinations till date, whether or not the candidate took the examination and secures the prescribed minimum attendance in 2nd Year 2nd Semester (R – Regular, S – Supplementary).
- vi. A student shall be promoted from 3rd Year to 4th Year if he fulfills the academic requirement of 50% of the credits up to 3rd Year 2nd semester from all the examinations till date, whether or not the candidate took the examination and secures the prescribed minimum attendance in 3rd Year 2nd Semester. (R – Regular, S – Supplementary).
- vii. A regular B. Tech student shall register in all the 160 credits and earn all the 160 credits. Marks obtained in all the 160 credits shall be considered for the calculation of grade awarded. A lateral entry B.Tech student shall register from 2nd year 1st semester and shall complete all courses/ laboratory works as per the structure till 4th year 2nd semester and only 2nd year to 4th year credits/marks/grades obtained in all the 3 years (i.e. 2nd year through 4th year of the complete programme) amounting to 120 credits shall be considered for the calculation of grade awarded.

RBT 10.6 AWARD OF GRADES AND B.Tech DEGREE

- 10.1 A student (regular admission) shall be declared eligible for the award of the B. Tech. degree if he fulfills the following academic regulations:
 - a) Pursued a programme of study for not less than four academic years and not more than eight academic years.
 - b) Registered for 160 credits and secured 160 credits.
- 10.2 A student (LE admission) shall be declared eligible for the award of the B. Tech. degree if he fulfills the following academic regulations:
 - a) Pursued a programme of study for not less than three academic years and not more than six academic years.
 - b) Registered for all the courses from 2nd year 1st semester onwards and secured all the prescribed 120 credits from 2nd year 1st semester to 4th year 2nd semester as per the Programme Curriculum of GRBT-19 of respective branch of study.
- 10.3 **Method of considering MOOC courses**
 - a) A student is allowed to take an additional course either through regular class work or through open learning i.e. through massive open

online courses (MOOCs) carrying weightage of 3 credits. Such allowance is only for one course per semester. Accumulation of 15 such additional credits over and above the defined credits in Clause 10.1 and 10.2 above will be considered for award of degree “with Honours” provided other programme requirements are also met.

Provided that the grades would be considered when the course selected by student should not be already available in the programme structure and the course should be from the same domain of study. These courses shall not appear in the final grade card.

- b) A student is allowed to take MOOC courses in lieu of regular theory/ hybrid courses with following conditions:
- The course selected should be registered in pre-registration process (see clause ii of Rule RBT 7.1 above)
 - The course selected should be from the same domain of study
 - The course selected should have a weightage corresponding to credits of the theory/hybrid course whose substitute is sought

10.4 Method of awarding letter grade and grade points for a programme

A letter grade and grade point will be awarded to a student in each course based on performance as per grading system given below, subject to minimum Academic Regulations:

Theory/Drawing / Projects/ Summer internship (%) Total (Internal + External)	Laboratory (%) / Workshop Total (Internal + External)	Grade Points	Letter Grade	Remark
Percentage of Marks ≥ 90	Percentage of Marks ≥ 90	10	O	OUTSTANDING
≥ 80 & < 90	≥ 80 & < 90	9	A ⁺	EXCELLENT
≥ 70 & < 80	≥ 70 & < 80	8	A	VERY GOOD
≥ 60 & < 70	≥ 60 & < 70	7	B ⁺	GOOD
≥ 50 & < 60	≥ 50 & < 60	6	B	AVERAGE
≥ 40 & < 50	-	5	P	PASS
< 40	< 50	F	F (Fail)	FAIL
Absent		Ab	Ab	ABSENT

10.5 Calculation of Grade Point Average (GPA) for a semester

The performance of each student at the end of the each semester is indicated in terms of GPA. The semester grade point average (SGPA) is calculated as below:

$$\text{SGPA} = \sum (\text{CR} \times \text{GP}) / \sum \text{CR}$$

where **CR** = Credits of a course

GP = Grade points awarded for a course

* SGPA is calculated only for the candidates who passed all the courses in that year/semester.

10.6 Calculation of Cumulative Grade Point Average (CGPA) for entire programme

The CGPA is calculated as below:

$$\text{CGPA} = \sum (\text{CR} \times \text{GP}) / \sum \text{CR} \quad (\text{for entire programme})$$

Where **CR** = Credits of a course

GP = Grade points awarded for a course

* Method of calculation is similar for both SGPA and CGPA

** CGPA is awarded to candidates who have no backlogs till that particular semester

10.7 The Student's Grade Card shall contain the letter grade for each registered course along with the SGPA at the end of the semester and the CGPA at the completion of the programme.

10.8 Award of division

A student who has passed all the examinations and satisfied all the requirements prescribed for the programme shall be eligible for the award of B.Tech. Degree and he shall be placed in a grade / division as given below:

Sl. No.	CGPA range	Grade/Division awarded
a.	CGPA $\geq$ 8.5	Degree with Honours (Subject to having additional 15 credits over and above the normal requirement of programme and not having any 'Back-Log' or supplementary re-appearance in any of the subjects in any semester)
b.	CGPA $\geq$ 7.5	Degree with Distinction (Subject to not having any 'Back-Log' or supplementary re-appearance in any of the subjects in any semester, else Degree with First Class)
c.	CGPA $\geq$ 6.5 and $<$ 7.5	Degree with First Class
d.	CGPA $\geq$ 5.5 and $<$ 6.5	Degree with Second Class
e.	CGPA $<$ 5.5	Degree with Pass Class

10.9 Appeal/Re-evaluation of Marks

- i) The entire process of evaluation shall be transparent, and the Course Coordinator/Instructor shall explain to a student the marks he has awarded in various components of internal assessments.

- ii) In case of any grievance about the marks obtained in SEE, the student may apply for re-evaluation of marks in theory courses to the Examination Cell before the date in prescribed form.
- iii) The fee for such an appeal will be decided from time to time.
- iv) In case there is a difference of less than 15 percent of marks between first (or original) and re-evaluation, the highest would be taken up.
- v) In case there is a difference of 15 percent or more marks between first (or original) and re-evaluation, the matter would be taken up automatically for a third evaluation at no extra fee. In such an event and to avoid any bias, average of two nearest marks will be taken as the final marks.

RBT 11.o MINIMUM INSTRUCTION DAYS

11.1 Minimum instruction days for each semester shall be 90 working days.

11.2 Academic Calendar

- i) Each academic year shall be divided into two semesters, each of 16 weeks duration, excluding evaluation.
- ii) The schedule of academic activities for a semester, including the dates of registration, MSE, SEE, inter-semester breaks, etc. shall be referred to as the Academic Calendar of the semester, which shall be prepared by the In-charge of Academics, tabled before the AC, and announced at least two weeks before the closing date of the previous semester.
- iii) The Academic Calendar must be strictly adhered to, and all other activities including co-curricular and/or extra-curricular activities must be scheduled so as not to interfere with the Curricular Activities as stipulated in the Academic Calendar.

RBT 12.o WITHHOLDING OF RESULTS

12.1 If the student has not paid the dues payable to the Institute or if any case of indiscipline is pending against him, the result of the student may be withheld. In addition, his degree may also be withheld.

12.2 Malpractice Rules as per Annexure I.

RBT 13.o PROVISIONS FOR TRANSITORY CASES

13.1 Transitory provisions for students seeking re-admission into 2019 regulations (Detained due to shortage of attendance / lack of credits in earlier Regulations)

- i. Prior approval from affiliating university should be obtained before re-admission of a candidate on case to case basis through Transitory Regulations. Details such as re-admission sought into, course to course mapping, credit gaps, course work to close the credit gaps, any alternative courses in new regulation, etc. shall be submitted to affiliating university for seeking approval.

- ii. The student has to continue the course work along with the regular students of the respective semester in which the student obtains re- admission.
- iii. Substitute / compulsory courses shall be offered in place of courses that have already been studied by the student. The student has to register for those specific courses.
- iv. The mode of internal evaluation (i.e., in-course assessments) and external evaluation (i.e. SEE) shall be on par with the regular students, i.e., the student has to follow the new mode of internal evaluation and the new question paper model for the SEE along with the regular students of the respective semester in which the student obtained re- admission.
- v. For the courses studied under earlier Regulations but failed, the student has to appear, pass and acquire credits from the supplementary examinations with-in the time provided as per the Clause 1.2 of Rule RBT 1 above.
- vi. The promotion criteria based on attendance as well as credits shall be in accordance with the Regulations under which the student is re- admitted into the new Regulation specific to the new courses/ substitute courses in the new regulation of the Institute into which the student is admitted.
- vii. Credits already awarded and approved as per new Regulation will be pro-rated in terms of new-credit system. To be eligible for the award of the degree, the student shall complete the attendance requirements and appear for the SEE in all the courses as per new Regulation, including the substitute/compulsory courses as prescribed in the transitory course structure and shall acquire at least the minimum of stipulated credits. If a student, in such exercise, crosses the said minimum number of credits, the lowest marks/grades scored will be excluded for calculating final grade.
- viii. All other academic requirements shall be in accordance with the regulations under which the student was re-admitted.
- ix. The decision of the affiliating university shall be final and binding on the transitory students on any clarification/ query/doubt.

RBT 14.0 GAP YEAR

14.1 Provision for making use of gap year is extended to students with following conditions:

- i. The student requiring such facility should approach Principal through HoD before going for such Internship/ Training in gap year and should take prior sanction from Principal in writing.
- ii. The said organization should be either of Public Sector Undertaking (PSU), Govt. Organization, National Research Laboratory, Multi- National Company (MNC) or Public Limited Company.
- iii. Student should secure minimum SGPA making him eligible for First Class as per prevalent Regulations either by Grade Point or Percentage System till the said completed years of study.
- iv. The student must not have been a "detained" candidate in any of the prior years.

- v. The student needs to pass all the courses till the previous academic year in order to be eligible for applying for gap year.
- vi. The gap year is restricted only to one academic year with-out interruption.
- vii. The gap year is not admissible for gainful employment.
- viii. The Principal should obtain necessary authorization in writing on case to case basis from affiliated university before providing such facility to any student.

ANNEXURE I

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

(Adopted from the Malpractice Rules of affiliating university JNTUK)

	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
MPR 1. a	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
b	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
MPR 2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that semester. The Hall Ticket of the candidate shall be cancelled.
MPR 3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the

	Nature of Malpractices/Improper conduct	Punishment
		original candidate, who has been impersonated, shall be cancelled in all the courses of the examination (including practical(s) and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. Continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
MPR 4.	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. Continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat.
MPR 5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
MPR 6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or	In case of students of the Institute, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations

	Nature of Malpractices/Improper conduct	Punishment
	instigates others to walk out, or threatens the officer in-charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the Institute campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	of the courses of that semester/year. The candidates also are debarred and their seats forfeited. In case of outsiders, they will be handed over to the police and a police case is registered against them.
MPR 7.	Leaves the examination hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat.
MPR 8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the

	Nature of Malpractices/Improper conduct	Punishment
		courses of that semester/year. The candidate is also debarred and forfeits the seat.
MPR 9.	If student of the Institute, who is not a candidate for the particular examination or any person not connected with the Institute indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and the seat forfeited. Person(s) who do not belong to the Institute will be handed over to police and a police case will be registered against them.
MPR 10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year.
MPR 11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that semester/year examinations.
MPR 12.	If any malpractice is detected which is not covered in the above Clauses MPR 1 to MPR 11 shall be reported to the Academic Council for further action to award suitable punishment.	

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem (1 semester)			
Course Code XXXXX	MATHEMATICS-I (ALL BRANCHES)				
Teaching	Total contact hours - 40	L	T	P	C
Prerequisite(s): Types of matrices, Limits, continuity.		3	-	-	3

Course Objective:

1. This course will illuminate the students in the concepts of calculus and linear algebra.
2. To equip the students understand advanced level mathematics to develop the confidence and ability to handle real world problems and their applications.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Solve a system of linear equations, find eigenvalues and eigenvectors, Cayley Hamilton theorem, Quadratic form.
CO2:	Apply mean value Rolls, Lagranges and Cauchy mean value theorem
CO3:	Find partial derivatives, applications of maxima and minima
CO4:	Evaluate multiple integrals and their applications
CO5:	Understand Beta and Gamma functions, evaluate improper integrals.

Syllabus:

Unit I: Matrix Operations and Solving Systems of Linear Equations (10 hrs)

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by diagonalisation and orthogonal transformation.

Unit II: Mean Value Theorems (6hrs)

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof);

Unit III: Multivariable calculus (8 hrs)

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Unit IV: Multiple Integrals (10 hrs)

Evaluation of double and triple integrals (cartesian and polar coordinates), change of variables, change of order of integration, areas enclosed by plane curves.

Unit V: Special Functions (6 hrs)

Beta and Gamma functions and their properties, relation between beta and gamma functions, evaluation of improper integrals.

Text books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

Reference Books:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. T.K.V.Iyenger, et.al., Engineering Mathematics, Volume-III, .Chand Publicationbns, 2018.
4. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2015.

Web Links:

1. <https://nptel.ac.in/courses/111105121/>
2. <https://nptel.ac.in/courses/111105035/>
3. <https://www.sanfoundry.com/engineering-mathematics-multiple-choice-questions-answers/>
4. <https://ocw.mit.edu/courses/mathematics/>

CO-PO Mapping:

(1: Slight[Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	2	2	1	1	1	1	1	1
CO2	3	2	3	2	2	2	1	1	1	1	1	1
CO3	2	3	3	2	3	3	1	1	1	1	1	1
CO4	2	2	3	3	2	2	1	1	1	1	1	1
CO5	3	2	2	2	3	3	1	1	1	1	1	1

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem (1 semester)			
Course Code XXXXX	COMMUNICATIVE ENGLISH –I (common for all the branches)				
Teaching	Total contact hours - 64	L	T	P	C
Prerequisite(s): Learner should be equipped with basic language and communication skills like Reading, Writing, Listening and Speaking .		3	-	-	3

Course Objective: The course aims

1. To focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
2. To impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
3. To Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Apply their learning in different fields and can serve the society accordingly.
CO2:	Identify safety measures against different kinds of accidents at home and also in the Workplace.
CO3:	Experiment the usefulness of animals for the human society.
CO4:	Appraise writing skills that is required for professional development
CO5:	Experience the innvative methods of using language in the professional context

Syllabus:

UNIT-I

(14H)

READING: Detailed Text: Exploration- A Proposal to Girdle the Earth (Excerpt) by Nellie Bly, from **English All Round: Communication Skills for Under Graduate Learners** by ORIENT BLACK SWAN.

Non-Detailed Text: 'An Ideal Family' by Katherine Mansfield from 'Panorama: A Course on Reading.'-OXFORD

GRAMMAR: Concept of word Formation, Verbs, adjectives, adverbs, Word order in sentences

VOCABULARY: Content words and function words; Word forms **WRITING SKILLS:**

Paragraph writing-Beginnings and endings of paragraphs - introducing a topic, providing a transition to the next paragraph.

UNIT-II

(12H)

READING: Detailed Text: On Campus - An excerpt from *The District School As It Was by One Who Went to It* by Warren Burton, From **English All Round: Communication Skills for Under Graduate Learners by ORIENT BLACK SWAN**

Non-Detailed Text: 'War' by Luigi Pirandello from 'Panorama: A Course on Reading.' - OXFORD

GRAMMAR: Use of articles and zero article; prepositions. **VOCABULARY:** Linkers, sign posts and transition signals; **WRITING SKILLS:** Summarizing an oral or written text

Unit-III (12H)

READING: Detailed Text: Working Together - The Future of Work? From **English All**

Round: Communication Skills for Under Graduate Learners by ORIENT BLACK SWAN

Non-Detailed Text: 'The Verger' by Somerset Maugham from **Panorama: A Course on Reading'**- OXFORD

GRAMMAR: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes. **VOCABULARY:** Prefixes and suffixes **WRITING SKILLS:** Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions

Unit-IV (12H)

READING: Detailed Text: Fabric of Change- H. G. Wells and the Uncertainties of Progress by

Peter J. Bowler From **English All Round:** Communication Skills for Under Graduate Learners by ORIENT BLACK SWAN

GRAMMAR: Correction of sentences-sequencing jumbled sentences **VOCABULARY:** use of antonyms and homophones **WRITING SKILLS:** Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables -Sensible writing –Defining and classifying

Unit – V (14 H)

READING: Detailed Text: Tools for Life -Leaves from the Mental Portfolio of a Eurasian by

Sui Sin Far From **English All Round:** Communication Skills for Under Graduate Learners by ORIENT BLACK SWAN

GRAMMAR: Editing short texts – Reading comprehension

VOCABULARY: Idioms and Phrases

WRITING SKILLS: Writing structured essays on specific topics using suitable claims and evidences-Précis writing

Text Books:

Detailed Textbook: ENGLISH ALL ROUND, : Communication Skills for Under Graduate Learners Published by Orient Blackswan Pvt Ltd

Non-detailed textbook: PANORAMA: A COURSE ON READING, Published by Oxford University Press India

REFERENCE BOOKS

1. Skilful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
2. Hewings, Martin. *Cambridge Academic English (B2)* . CUP, 2012.

WEB REFERENCES:

All Skills

<https://www.englishclub.com/>

<http://www.world-english.org/>

<http://learnenglish.britishcouncil.org/>

Grammar/ Vocabulary

English Language Learning Online

<http://www.bbc.co.uk/learningenglish/>

<http://www.better-english.com/>

<http://www.nonstopenglish.com/>

<https://www.vocabulary.com/>

BBC Vocabulary Games

Free Rice Vocabulary Game

CO-PO Mapping:

(1: Slight[Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	3	2	-	-	-	-
CO2	-	-	-	-	-	3	3	3	-	-	-	1
CO3	-	-	-	-	-	2	3	3	-	-	-	-
CO4	-	-	-	-	--	3	3	3	-	-	-	1
CO5	-	-	-	-	-	2	2	2	-	-	-	-

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem (1 semester)			
Course Code 19198204	ENGINEERING CHEMISTRY (COMMON for CSE, ECE, EEE)				
Teaching	Total contact hours - 65	L	T	P	C
Prerequisite(s):. Knowledge of theoretical and experimental from +2 level, Application of Chemistry theory and calculations to required		3	-	-	3

Course Objective:

1. To instruct electrochemical energy systems and their applications.
2. To impart knowledge on the basic concepts of battery technology.
3. To familiarize various sources of renewable energy and their harnessing.
4. To demonstrate the construction of photovoltaic cells.
5. To introduce different types of nano-materials
6. To expose the students to latest instrumental techniques such as scanning electronic microscope (SEM) & transmission electron microscope (TEM).

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	• Compare different types of cells. (L-1)
CO2:	• Explain the merits of fuel cells. (L-2)
CO3:	• List various sources of renewable energy. (L-3)
CO4:	• Distinguish between polymers and plastics (L-4)
CO5:	• Distinguish between nanoclusters & nanowires, polymers (L-5)

Syllabus:

Unit- I

9T+3P

ELECTROCHEMICAL ENERGY SYSTEMS - I

Introduction- concept of conductivity, Electrode Potential, Measurement of single Electrode Potentials, Nernst equation- Reference electrodes (Calomel electrode, Standard Hydrogen electrode) - electrochemical cell - Galvanic Cell vs Electrolytic Cell - Ion Selective Electrodes- glass membrane electrode- gas sensing electrodes - Concentration Cells.

Unit-II

8T+3P

ELECTROCHEMICAL ENERGY SYSTEMS - II

Basic concepts, battery characteristics, classification of batteries, Important applications of batteries, Classical batteries-dry/Leclanche cell, Modern batteries-zinc air, lithium cells-Li MnO₂ cell- challenges of battery technology. Fuel cells- Introduction - classification of fuel cells – hydrogen and oxygen fuel cell, propane and oxygen fuel cell- Merits of fuel cell.

Unit- III

8T

ENERGY SOURCES AND APPLICATIONS

Introduction- sources of renewable energy

Solar energy – Introduction - Physical and Chemical properties of Silicon- Production of Solar Grade Silicon from Quartz - Doping of Silicon- p and n type semi conductors- PV cell /solar cell - Manufacturing of Photovoltaic Cells using Chemical Vapor Deposition Technique-applications of solar energy.

Unit-IV**9T+6P****POLYMER CHEMISTRY**

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, Stereo polymers.

Plastics - Thermoplastics and Thermosettings, Preparation, properties and applications of – Bakelite, urea-formaldehyde, Nylon-66, carbon fibres, Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene – mechanism of conduction and applications.

Unit – V**8T+3P****NANOMATERIALS**

Nanomaterials: Introduction to nanomaterial: nanoparticles, nanocluster, carbon nanotube (CNT) and nanowires. Chemical synthesis of nanomaterials: sol-gel method. Characterization: Principle and applications of scanning electron microscope (SEM) and transmission electron microscope (TEM).

Text Books:

1. P.C. Jain and M. Jain, Engineering Chemistry, 15/e, Dhanapat Rai & Sons, Delhi (2014).
2. B.K. Sharma, Engineering Chemistry, Krishna Prakashan, Meerut.
3. O G Palanna, Engineering Chemistry, Tata McGraw Hill Education Private Limited, (2009).

References:

1. Sashi Chawla, A Textbook of Engineering Chemistry, Dhanapath Rai and sons, (2003)
2. B.S Murthy and P. Shankar, A Text Book of NanoScience and NanoTechnology, University Press (2013).
3. S.S. Dara, A Textbook of Engineering Chemistry, S.Chand & Co, (2010)
4. N. Krishna Murthy and Anuradha, A text book of Engineering Chemistry, Murthy Publications (2014).
5. K. Sesha Maheshwaramma and Mridula Chugh, Engineering Chemistry, Pearson India Edn services, (2016).

Weblink:

1. <https://www.btechguru.com/courses--npTEL--chemistry-and-biochemistry-video-lecture--cbc.html>
2. chem.tufts.edu
3. www.chem1.com

CO-PO Mapping:

(1: Slight[Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	2	3	3	2	3	3	2	3
CO2	2	3	3	2	3	3	2	3	3	3	2	3
CO3	3	2	3	3	3	2	2	3	3	2	3	3
CO4	2	3	2	3	3	2	3	3	2	2	3	3
CO5	3	2	3	2	3	3	2	3	3	2	2	3

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	<u>I B.Tech. I</u>			
Course Code 19198213	ENGINEERING CHEMISTRY LABORATORY (COMMON TO MECH , AME, CIVIL and MINING)	<u>Sem</u> (1 semester)			
Teaching	Total contact hours 45	L	T	P	C
Prerequisite(s): Basic knowledge of Engineering Chemistry Applications		0	0	3	1.5

COURSE OBJECTIVES

1. To familiarize the students with the basic concepts of Engineering Chemistry lab.
2. To train the students on how to handle the instruments.
3. To demonstrate the digital and instrumental methods of analysis.
4. To expose the students in practical aspects of the theoretical concepts.

COURSE OUTCOMES

On Completion of the course, the students will be able to-	
CO1:	• Explain the functioning of the instruments such as pH, Conductivity and Potentiometric meters. (L-1)
CO2:	• Determine the total hardness of water (L-2)
CO3:	• Perform various Redox titrations (L-3)
CO4:	• Preparation of polymers. (L-4)
CO5:	• Compare viscosities of different oils. (L-5)

LIST OF EXPERIMENTS

1. Determination of strength of an acid by pH metric method
2. Determination of Fe (II) in Mohr's salt by potentiometric method
3. Determination of conductance by conductometric method
4. Determination of Hardness of a ground water sample.
5. Determination of chromium (VI) in potassium dichromate
6. Determination of strength of KMnO_4 using standard Oxalic acid solution.
7. Determination of Zinc by EDTA method.
8. Preparation of Phenol-Formaldehyde resin
9. Determination of viscosity of a liquid
10. Determination of surface tension of a liquid
11. Estimation of active chlorine content in Bleaching powder

TEXT BOOKS

1. Mendham J, Denney RC, Barnes JD, Thomas M and Sivasankar B Vogel's Quantitative Chemical Analysis 6/e, Pearson publishers (2000).
2. N.K Bhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, Dhanpat Rai Publishing Company (2007).

CO-PO Mapping:

(1: Slight[Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	3	3	1	2	3	3	2	2
CO2	3	3	3	2	3	2	1	2	3	2	2	3
CO3	2	2	2	3	2	3	1	2	3	2	3	2
CO4	2	3	2	3	2	2	1	2	3	3	2	3
CO5	3	2	3	2	2	2	1	2	3	2	3	2

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem (1 semester)			
Course Code XXXXX	COMMUNICATIVE ENGLISH LAB- I				
Teaching	Total contact hours – 48	L	T	P	C
Prerequisite(s) Learner should be equipped with basic language and communication skills like, Listening and Speaking which ensure good pronunciation and ease in communication			-	-	3

Course Objective:

The course aims to

1. Adopt activity based teaching-learning methods to ensure that learners would be engaged in the use of language both in the classroom and laboratory sessions.
2. Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
3. Help to improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Appraise the importance of functional English
CO2:	Relate the knowledge to the competitive world.
CO3:	Identify the necessity to follow native speakers' accent
CO4:	Appreciate the usage of Language
CO 5:	Improve LSRW skills that make communication effective

Syllabus:

UNIT 1:

BASIC AURAL ORAL SKILLS

(12H)

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and other

Speaking: Phonetics-Accent and pronunciation

UNIT 2:

CONVERSATIONAL SKILLS

(12H)

Listening: Listening to audio texts, framing question in order to find out the gist of the text.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks

UNIT 3: LANGUAGE IN USE

(12H)

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: 1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating
2. Apologizing, Advising, Suggesting, Agreeing and Disagreeing

UNIT 4: LANGUAGE APPLICATION

(6H)

Listening: Making predictions while listening to conversations/ transactional dialogues;
Listening to video-Summarizing

Speaking: word stress-di-syllabic words, Poly-Syllabic words -Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

UNIT5: FORMAL INTERPRETATION

(6H)

Listening: TED Talks – understanding the summary

Speaking: Formal oral presentations on topics from academic contexts - with the use of PPT slides.

Reference Books:

1. Infotech English, Maruthi Publications. (with Compact Disc)
2. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
3. English Pronunciation in use- Mark Hancock, Cambridge University Press
4. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
5. English Pronunciation in use- Mark Hewings, Cambridge University Press.
6. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
7. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications Sample Web Resources
8. Grammar/Listening/Writing
 - 1-language.com
 - <http://www.5minuteenglish.com/>
 - <https://www.englishpractice.com/>

Reference Books

1. Bailey, Stephen. *Academic writing: A handbook for international students* . Routledge,
2. 2014.
3. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley
4. ELT; 2nd Edition, 2018.
5. Skilful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
6. Hewing, Martin. *Cambridge Academic English (B2)* . CUP, 2012. (Student Book,

Teacher Resource Book, CD & DVD

WEB SOURCES:

Grammar/ Vocabulary

English Language Learning Online

<http://www.bbc.co.uk/learningenglish/>

<http://www.better-english.com/>

<http://www.nonstopenglish.com/>

<https://www.vocabulary.com/>

BBC Vocabulary Games

Free Rice Vocabulary Game

Reading

<https://www.usingenglish.com/comprehension/>

<https://www.englishclub.com/reading/short-stories.htm>

<https://www.english-online.at/>

All Skills (LSRW Skills)

<https://www.englishclub.com/>

<http://www.world-english.org/>

<http://learnenglish.britishcouncil.org/>

Online Dictionaries

Cambridge dictionary online

MacMillan dictionary

Oxford learner's dictionaries

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	3	3	-	-	-	3
CO2	-	-	-	-	-	2	3	2	-	-	-	1
CO3	-	-	-	-	-	3	2	3	-	-	-	1
CO4	-	-	-	-	-	3	2	2	-	-	-	2
CO5	-	-	-	-	-	2	2	3	-	-	-	2

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. II Sem (2 nd semester)			
Course Code XXXXX	MATHEMATICS-II ODE, PDE and Multivariable Calculus (Common to all branches of Engineering except CSE)				
Teaching	Total contact hours - 40	L	T	P	C
Prerequisite(s): Fundamentals of ODE, PDE and Vectors		3	-	-	3

Course Objective:

1. To enlighten the learners in the concept of differential equations and multivariable calculus.
2. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Solve higher order differential equations with constant coefficients, apply method of variation of parameters.
CO2:	Solve Cauchy's and Legendre's linear equations, applications of differential equations
CO3:	Solve first order linear and nonlinear pde's , Solve higher order pde's
CO4:	apply del to Scalar and vector point functions, illustrate Gradient, Divergence and Curl operators
CO5:	Understand Green's, Stokes and Gauss divergence theorems and applications

Syllabus:

UNIT I:

Linear Differential Equations of Higher Order (8 hrs)

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

UNIT II:

Equations Reducible to Linear Differential Equations and Applications (8 hrs)

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, Applications: Mass spring system and L-C-R Circuit problems.

UNIT III:

Partial Differential Equations (8 hrs)

First order partial differential equations, solutions of first order linear and non-linear PDEs. Solutions to homogenous and non-homogenous higher order linear partial differential equations.

UNIT IV:

Multivariable Calculus (Vector differentiation)

(8 hrs)

Scalar and vector point functions, vector operator del, del applies to scalar point functions- Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT V:

Multivariable Calculus (Vector integration)

(8 hrs)

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

Text books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

Reference Books:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. T.K.V.Iyenger, et.al., Engineering Mathematics, Volume-I, S.Chand Publications, 2016.
5. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
6. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

Web Links:

1. <https://nptel.ac.in/courses/111108081/>
2. <https://nptel.ac.in/courses/111105093/>
3. <https://nptel.ac.in/courses/111105122/>
4. <https://nptel.ac.in/courses/111107108/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	3	2	1	1	1	1	1	1
CO2	3	3	3	2	2	2	1	1	1	1	1	1
CO3	3	3	3	2	3	3	1	1	1	1	1	1
CO4	2	3	3	3	2	2	1	1	1	1	1	1
CO5	3	3	2	2	3	3	1	1	1	1	1	1

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem (1 semester)			
Course Code 17198104	ENGINEERING PHYSICS (Civil, Mechanical, Mining and Automobile)				
Teaching	Total contact hours - 44	L	T	P	C
Prerequisite(s): Knowledge of theoretical and experimental physics From+2		3	-	3	4.5

Course Objective

1. Physics Curriculum is re-oriented to the needs of Civil, Mechanical, Mining and Automobile branches of graduate engineering courses that serve as a transit to understand the specific advanced topics.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	To identify forces and moments in mechanical systems using scalar and vector techniques and interpret the equation of motion of a rigid rotating body (torque on a rigid body)
CO2:	To apply Newton's second law for inertial and non-inertial frame of reference and to relate the effect of the Earth's rotation to the formation and movement of winds such as typhoons and cyclones by using Foucault pendulum
CO3:	To explain how sound is propagated in buildings and to analyze acoustic properties of typically used materials in buildings
CO4:	To recognize sound level descriptors and their use in architectural acoustics and to identify the use of ultrasonics in different fields
CO5:	To interpret stress and strain curve and to develop the relationship between elastic constants
CO6:	To identify the different modes of heat, transfer and to determine the thermal conductivity of metals and nonmetals
CO7:	To identify different types of sensors and applications and to explain physics behind the working principles of sensors with different applications

Syllabus:

UNIT –I

MECHANICS

Basic laws of vectors and scalars, rotational frames-conservative forces $F = \text{grad } V$, torque and angular momentum, Newton's laws in inertial and linear accelerating non-inertial frames of reference, rotating frame of reference with constant angular velocity, qualitative explanation of Foucault's pendulum-rigid body and angular velocity vector

UNIT –II

ACOUSTICS AND ULTRASONICS

Classification of Sound, decibel, Weber–Fechner law – Sabine's formula (qualitatively) - Absorption coefficient and its determination –factors affecting acoustics of buildings and their remedies.

Production of ultrasonics by magnetostriction and piezoelectric methods, Non-Destructive Testing – pulse echo system through transmission and reflection modes, A, B and C – scan displays, Medical applications

UNIT -III

ELASTICITY

Concepts of elasticity, plasticity, strain hardening, failure (fracture / yielding); Idealization of one-dimensional stress-strain curve; Generalized Hooke's law; elastic constants and their relationships; Strain energy

UNIT –IV

HEAT TRANSFER

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips -thermal conduction, convection and radiation and their fundamental laws – heat conduction in solids – thermal conductivity - Fourier's and Lee's disc method: theory and experiment – applications (qualitative only)

UNIT –V

SENSORS

Sensors:(qualitative description only): Different types of sensors and applications; Strain and Pressure sensors- Piezoelectric, magnetostrictive sensors, Temperature sensor - bimetallic strip and pyroelectric detectors.

Text books:

1. D. Kleppner and Robert Kolenkow “An introduction to Mechanics”-II -Cambridge University Press,2015
2. Gaur R.K. and Gupta S.L., “Engineering Physics”- Dhanpat Rai publishers, 2012
3. M.N.Abadhanulu & P.G.Kshirsagar “A Text book of Engineering Physics” - S. Chand Publications, 2017
4. Ian R Sinclair, Sensor and Transducers 3rd eds, 2001, Elsevier (Newnes)

Reference Books:

1. M K Varma “Introduction to Mechanics”-Universities Press-2015.
2. D.K. Bhattacharya and A. Bhaskaran, “Engineering Physics”- Oxford Publications-2015

Web Links:

1. <https://www.britannica.com/science/interference-physics>
2. <http://vlab.amrita.edu/index.php> -Virtual Labs, Amrita University

CO-PO Mapping:

1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	3	2	3	3	2	3	2
CO2	3	3	2	3	2	3	3	3	2	3	2	2
CO3	3	3	3	2	3	3	2	3	2	3	3	2
CO4	3	3	2	3	2	3	3	3	3	3	2	2
CO5	3	3	2	3	3	3	2	3	3	2	3	2
CO6	3	3	2	3	3	2	3	3	2	3	3	2
CO7	3	3	3	2	3	3	2	3	3	2	3	2

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem (1 semester)			
Course Code XXXXX	COMMUNICATIVE ENGLISH –II				
Teaching	Total contact hours – 64	L	T	P	C
Prerequisite(s): Learner should possess the primary communicative abilities suitable for global exposure and professional communication		3	-	-	3

Course Objective:

This course aims to

1. Provide training and opportunities to develop fluency in English through participation in formal group discussions and presentations using audio-visual aids.
2. Demonstrate good writing skills for effective paraphrasing, argumentative essays and formal Correspondence.
3. Encourage use of a wide range of grammatical structures and vocabulary in speech and writing.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Prioritize information from reading texts after selecting relevant and useful points
CO2:	Paraphrase short academic texts using suitable strategies and conventions
CO3:	Make formal structured presentations on academic topics using PPT slides with relevant graphical elements
CO4:	Decipher the meaning of unfamiliar text and transform into the familiar form
CO5:	Build the ability to convey in different communicative forms.

Syllabus:

UNIT: I (14H)

READING: Detailed Text: Mohammad Yunus' Speech at the Nobel Prize ceremony.

AVENUES-Course Book-II by ORIENT BLACK SWAN Pvt Ltd

Non-Detailed Text: The Scare Crow by Satya jit Ray from 'Panorama: A Course on Reading.'-OXFORD

GRAMMAR: Conjunctions and sentence connectors **VOCABULARY:** Adjective-noun collocations **WRITING SKILLS:** E-mail: structure, etiquette.

UNIT : II (12H)

READING: DETAILED TEXT: Biography of A. R. Rahman from **AVENUES-Course Book-II by ORIENT BLACK SWAN Pvt Ltd**

NON-DETAILED TEXT: A village Lost to the Nation by Krishna Chandra Pujari from 'Panorama: A Course on Reading.'-OXFORD

GRAMMAR: Active and passive voice, foreign expressions in English. **VOCABULARY:** ACRONYMS

WRITING SKILLS: Formal letter writing and e-mail writing (enquiry, complaints, seeking permission, seeking internship); structure, conventions and etiquette.

UNIT III : (12H)

READING: Detailed Text: Reading: “You Start Dying Slowly” by Pablo Neruda.

AVENUES-Course Book-II by ORIENT BLACK SWAN Pvt Ltd

Non-Detailed Text: Martin Luther King by Chinua Achebe from 'Panorama: A Course on Reading.'-OXFORD

Grammar & Vocabulary: Noun-pronoun agreement, verb-noun collocations **Writing:** Resume drafting & cover letter for job application.

UNIT IV: (14H)

Reading: ‘Most Beautiful’ by Ruskin Bond. **AVENUES-Course Book-II by ORIENT BLACK SWAN Pvt Ltd**

Grammar: Misplaced modifiers-conditional clauses **Vocabulary:** Idiomatic expressions

Writing: Note taking- avoiding redundancies and clichés in written communication

UNIT V: (12H)

READING: “Film Making” by Satyajit Ray. **From AVENUES-Course Book-II by ORIENT BLACK SWAN Pvt Ltd**

Grammar & Vocabulary: Editing short texts, correcting common errors in grammar and usage, words often confused

Writing: Structure and contents of a Project Report; identifying sections in project reports; understanding the purpose of each section; significance of references. Writing Introduction and Conclusion

Text books:

DETAILED TEXTBOOK: AVENUES-Course Book-II by ORIENT BLACK SWAN Pvt Ltd
NON-DETAIL TEXT BOOK: 'Panorama: A Course on Reading.'-OXFORD

Reference Books

1. Bailey, Stephen. *Academic writing: A handbook for international students* . Routledge, 2014.
2. 2014.
3. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley
4. ELT; 2nd Edition, 2018.
5. Skilful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
6. Hewing, Martin. *Cambridge Academic English (B2)* . CUP, 2012. (Student Book,
7. Teacher Resource Book, CD & DVD

WEB SOURCES:**Grammar/ Vocabulary**

English Language Learning Online

<http://www.bbc.co.uk/learningenglish/>

<http://www.better-english.com/>

<http://www.nonstopenglish.com/>

<https://www.vocabulary.com/>

BBC Vocabulary Games

Free Rice Vocabulary Game

Reading

<https://www.usingenglish.com/comprehension/>

<https://www.englishclub.com/reading/short-stories.htm>

<https://www.english-online.at/>

All Skills (LSRW Skills)

<https://www.englishclub.com/>

<http://www.world-english.org/>

<http://learnenglish.britishcouncil.org/>

Online Dictionaries

Cambridge dictionary online

MacMillan dictionary

Oxford learner's dictionaries

CO-PO Mapping:

(1: Slight[Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	3	2	-	-	-	1
CO2	-	-	-	--	-	2	3	2	-	-	--	2
CO3	-	-	-	-	-	3	3	2	-	-	-	1
CO4	-	-	-	-	-	3	3	2	-	-	-	2
CO5	-	-	-	-	-	2	2	2	-	-	-	2

B.Tech I Year Syllabus
Engineering Physics
(Civil, Mechanical, Mining and Automobile Branches)

ENGINEERING PHYSICS LABORATORY SYLLABUS

Learning Outcomes:

The students will be able to

1. Estimate the mechanical properties of materials (L5)
2. Determine moment of inertia of a flywheel (L3)
3. Compare heat transfer in different material (L4)
4. Determine thermal conductivity of good and bad conductors (L3)
5. Measure the elastic constants of the material (L5)

List of Physics Experiments

1. Rigidity modulus of material of a wire-dynamic method (torsional pendulum)
2. Moment of inertia by Flywheel
3. Hooke's Law experiment
4. Sonometer
5. Compound Pendulum
6. To determine the thermal conductivity of a bad conductor by Lee's disc method
7. Determination of velocity of sound – Volume Resonator
8. Study of Weight Measurement by using Strain Gauge.
9. p-n Junction Diode characteristics
10. To determine the resistivity of semiconductor by Four probe method
11. Hall Effect
12. Thermo Couple-Seebeck Effect
13. Thermal expansion of solids – bimetallic strip
14. Verification of Newton's law of cooling of different materials and liquids

References

1. A Text book of Practical Physics, Balasubramanian S, Srinivasan M.N, S Chand Publishers, 2017
2. <https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=354&cnt=1>
3. <https://www.egr.msu.edu/.../HeatExchanger/Double%20Pipe%20HE%20Write%20U>
4. <https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=802&cnt=1>

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem (2 semester)			
Course Code XXXXX	COMMUNICATIVE ENGLISH LAB- II				
Teaching	Total contact hours – 48	L	T	P	C
Prerequisite(s) Learner should be equipped with basic language skills and communication skills like Listening and Speaking			-	-	3

Course Objectives The course aims

1. To enable students to develop listening skills for better comprehension of academic presentations, lectures and speeches.
2. To hone the speaking skills of students by engaging them in various activities such as just a minute (JAM), group discussions, oral presentations, and role plays.
3. To expose learners to key Reading techniques such as Skimming and Scanning for comprehension of different texts.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	☐ Communicate confidently in English in social and professional contexts with improved skills of fluency and accuracy.
CO2:	☐ Write grammatically correct sentences employing appropriate vocabulary suitable to different contexts.
CO3:	☐ Comprehend and analyze different academic texts.
CO4:	☐ Meet communicative needs across the globe
CO5:	☐ Identify their skills like leadership, teambuilding and managerial skills

UNIT1: ARGUMENTATIVE SKILLS (12H)

Listening: Listening for presentation strategies and answering questions on the speaker, audience, and key points.

Speaking: Formal presentations using PPT slides without graphic elements and Debating

UNIT : CONVERSATIONAL SKILLS (12H)

Formal and informal conversations-Following an argument/ logical flow of thought; answering questions on key concepts after listening to extended passages of spoken academic discourse

UNIT 3: CO-ORDINATING SKILLS- Group Discussion (12H)

Listening: Identifying views and opinions expressed by different speakers while listening to discussions.

Speaking: Group discussion on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position.

UNIT 4: INTERVIEW SKILLS-industry readiness (6H)

Listening: Watching and listening to job interviews

Speaking: Mock Interviews-Interview etiquette

UNIT 5: PROFESSIONAL COMPETENCE

(6H)

Listening: Watching and listening to news and panel discussions; workplace communication
-formal dialogues/ conversations.

Speaking: speech presentation.

Reference Books:

References books:

1. Infotech English, Maruthi Publications. (with Compact Disc)
 2. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
 3. English Pronunciation in use- Mark Hancock, Cambridge University Press
 2. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
 3. English Pronunciation in use- Mark Hewings, Cambridge University Press.
 4. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
 5. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications
- Sample Web Resources
- Grammar/Listening/Writing
 - 1-language.com
 - <http://www.5minuteenglish.com/>
 - <https://www.englishpractice.com/>

Reference Books

1. Bailey, Stephen. *Academic writing: A handbook for international students* . Routledge,
2. 2014.
3. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley
4. ELT; 2nd Edition, 2018.
5. Skilful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
6. Hewing, Martin. *Cambridge Academic English (B2)* . CUP, 2012. (Student Book, Teacher Resource Book, CD & DVD

WEB SOURCES:

Grammar/ Vocabulary

English Language Learning Online

<http://www.bbc.co.uk/learningenglish/>

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<http://www.nonstopenglish.com/>

<https://www.vocabulary.com/>

BBC Vocabulary Games

Free Rice Vocabulary Game

Reading

<https://www.usingenglish.com/comprehension/>

<https://www.englishclub.com/reading/short-stories.htm>

<https://www.english-online.at/>

All Skills (LSRW Skills)

<https://www.englishclub.com/>

<http://www.world-english.org/>

<http://learnenglish.britishcouncil.org/>

Online Dictionaries

Cambridge dictionary online

MacMillan dictionary

Oxford learner's dictionaries

CO-PO Mapping:

(1: Slight[Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	2	3	-	-	-	1
CO2	-	-	-	-	-	2	2	3	-	-	--	1
CO3	-	-	-	-	-	3	2	2	-	-	-	2
CO4	-	-	-	-	--	3	3	1	-	--	--	2
CO5	-	-	-	-	-	3	1	3	-	-	-	1

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 rd semester)			
Course Code XXXXX	MATHEMATICS-III (Applications of PDE, Complex Variables and Transform Techniques) (MECH, MINING, AME and CIVIL)				
Teaching	Total contact hours - 40	L	T	P	C
Prerequisite(s): Derivatives, integration and complex numbers		3	-	-	3

Course Objective:

1. To familiarize the techniques in partial differential equations and complex variables.
2. To equip the students to solve application problems in their disciplines.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Continuity, analytic and C-R equations of complex function, evaluate Taylor and Laurent series and apply Cauchy residue theorem
CO2:	Understand properties of Laplace and inverse Laplace transformations, apply to solve differential equations
CO3:	Evaluate Fourier series for different functions
CO4:	Understand properties of Fourier transformation apply for different function
CO5:	Classify nature of pde's and solve boundary value problems

Syllabus:

UNIT-I

10 hrs

Complex Variables : Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate. Contour integrals, Cauchy theorem (without proof), Cauchy integral formula (without proof), Taylor's series, zeros of analytic functions, singularities, Laurent's series, residues, Cauchy residue theorem (without proof).

UNIT-II

6 hrs

Laplace transforms : Definition of Laplace transform, existence conditions, properties of Laplace transforms, inverse Laplace transforms, transforms of derivatives, transforms of integrals, multiplication by t^n , division by t , convolution theorem, periodic functions, unit step function, unit impulse function, applications to ordinary differential equations. (Without proofs).

UNIT-III**10 hrs**

Fourier series: Dirichlet's conditions, Fourier series, conditions for a Fourier expansion, functions of any period, odd and even functions - half range series.

UNIT-IV**8 hrs**

Fourier transforms: Fourier integrals, Fourier cosine and sine integrals, Fourier transform, sine and cosine transform, properties, convolution theorem.

UNIT-V**6 hrs**

Applications of Partial Differential Equations: Method of separation of variables, Classification of second order partial differential equations, solution of 1D-wave, 1D-heat and 2D-Laplace's equation in Cartesian coordinates.

Text books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

Reference Books:

1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
2. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, McGraw Hill, 2004.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

Web Links:

1. <https://nptel.ac.in/courses/111103070/>
2. <https://nptel.ac.in/courses/111/106/111106084/>
3. <https://nptel.ac.in/courses/111/106/111106046/>
4. <https://nptel.ac.in/courses/111105093/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	3	2	1	1	1	1	1	1
CO2	3	3	3	2	2	2	1	1	1	1	1	1
CO3	3	3	3	2	3	3	1	1	1	1	1	1
CO4	2	3	3	3	2	2	1	1	1	1	1	1
CO5	3	3	3	3	3	3	1	1	1	1	1	1

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 rd semester)			
Course Code XXXXX	FLUID MECHANICS & HYDRAULIC MACHINERY				
Teaching	Total contact hours-	L	T	P	C
Prerequisite(s):Engineering Mechanics		3	-	-	3

Course Objective:

1. The applications of the conservation laws of flow through pipes and hydraulic machines are studied .To understand the importance of dimensional analysis. To understand the importance of various types of flow in pumps and turbines.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understand the basis fluid properties and fluid flow phenomenon
CO2:	Generate mathematical models of fluid motion including steady, unsteady flow and boundary layer theory
CO3:	State and visualize fluid kinematics.
CO4:	Describe basic working of single and multi-stage air compressors
CO5:	Calculate performance and design of pumps

Syllabus:

UNIT-I

Fluid Properties: Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, Specific gravity, viscosity, compressibility, capillarity and surface tension.

Fluid Flow Phenomena: Types of fluids, Concept of stream lines, stream tubes, types of fluid flow, turbulence and its nature, flow in boundary layers.

UNIT-II

Pressure and its measurements of liquids: Pressure, atmospheric pressure, gauge and absolute pressure. Simple manometers– piezometer, U-tube manometer, single column manometer. Differential manometers- U-tube differential manometer, Inverted U-tube differential manometer. Bourdon's pressure gauge, Diaphragm pressure gauge and Dead weight pressure gauge.

Basic Equations of fluid flow: Continuity, Momentum and Bernoulli's equations.

UNIT -III

Flow Through Circular Conduits: Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli- Boundary layer concepts – types of

boundary layer thickness – Darcy Weisbach equation – friction factor- Moody diagram- commercial pipes- minor losses – Flow through pipes in series and parallel.

UNIT –IV

Air compressors: Single stage and multi stage reciprocating air compressors. Expression for work done during single stage air compression with and without clearance volume. Volumetric efficiency. Simple problems on single stage compressors.

UNIT –V

Pumps: Impact of jets - Euler's equation - Theory of roto dynamic machines – various efficiencies– velocity components at entry and exit of the rotor- velocity triangles. Types of pumps - Centrifugal pumps– working principle - work done by the impeller. Reciprocating pump- working principle – indicator diagram - work saved by fitting air vessels. Rotary pumps –classification – comparison of working principle with other pumps – advantages.

Text books:

1. Hydraulics and fluid mechanics including hydraulics machines - Dr. P.N. Modi, S.M. Seth, Rajsons publications Pvt.Ltd.
2. A Text book of Fluid Mechanics and Hydraulic Machines - Bansal, Laxmi publications 2006.
3. “Fluid Mechanics” Streeter, V. L. and Wylie E. B., McGraw Hill Publication
4. “Engineering Fluid Mechanics” Kumar K. L., Eurasia Publishing House (p) Ltd. New Delhi (2004)

Reference Books:

1. “Hydraulics and Fluid Mechanics”, Modi P.N. and Seth, S.M., Standard publishers New Delhi, 1999.
2. “Fluid Mechanics and Machinery”, Robert W. Fox, Alan T. McDonald, Philip J. Pritchard,
3. A Text book of Fluid Mechanics and Hydraulic Machines - Bansal, Laxmi publications 2006.

Web Links:

1. <https://www.nptel.ac.in/courses/112105171/>
2. <https://www.nptel.ac.in/courses/101103004/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	2	-	-	-	-	-	3	-	-
CO2	-	-	2	-	-	-	-	3	-	-	-	-
CO3	-	3	-	-	-	-	1	-	-	-	-	2
CO4	-	-	3	-	-	-	-	-	2-	-	1	-
CO5	-	-	-	2	-	-	1	-	-	-	-	-

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 semester)			
Course Code	MINE SURVEYING				
Teaching	Total contact hours-	L	T	P	C
Prerequisite(s): Basic knowledge of various surveying instruments and their working methods.		3	-	-	3

Course Objective:

1. To determine relative positions of objects below or above the earth surface.
2. To calculate the areas and angles by using various instruments in mines.
3. To determine various surveying instruments using in their fields.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understanding the measurements of areas, bookings and plotting by handle the surveying instruments.
CO2:	Identifying the parts of surveying instruments and calculation of horizontal and Vertical angles
CO3:	Measuring reduced levels and contour intervals.
CO4:	Understanding the of surveying instruments.
CO5:	The students will be able to use advanced surveying techniques of total station.

Syllabus:

UNIT -I

Introduction of surveying: Plane and geodetic survey, Classifications of survey, conventional signs, conventional instruments, Linear measurements, principles, instruments, methods, obstacles, offsets, error in chaining, booking and plotting, problems, Compass Surveying: Types of bearing, calculation of angles and bearings, prismatic and surveyor compass, trough compass, tabular compass, local attraction and declination, errors, problems.

UNIT -II

Theodolite: Definition and terms, parts, temporary adjustments, permanent adjustments, horizontal and Vertical angles, miscellaneous operation, errors. Methods of theodolite traversing-Checks, plotting, closing error, balancing, coordinate calculation, degree of accuracy, problems.

UNIT -III

Levelling and contouring: Principle and definition, types of levels, adjustments, reduction of levels, curvature and refraction, sensitivity of bubble, problems. Contour-Contour interval and characteristics, methods, interpretation of contours and uses of contours. Methods of plane table, radiations. Intersection, traversing and resection. 2-point and 3-point problem. Adjustment and common error in plane table surveying.

UNIT -IV

Plane table survey: Accessories, working operation, precise plane table equipment, methods of plane tabling, intersection (graphic triangulation), traversing, resection, three point problem, two point problem, errors, advantages and disadvantage.

UNIT -V

Modern surveying techniques: Types of modern surveys, Total station & its application, Global positioning system & its application in mining, introduction to geographies information system (GIS), Remote sensing and its application in mining industry.

Text books:

1. Surveying Vol I - B. C. Punmia, Laxmi Publication, 1999 16TH edition.
2. Surveying Vol II - B. C. Punmia, Laxmi Publication, 1999 15TH edition

Reference Books:

1. Surveying Vol I - S. K. Duggal, Tata McGraw Hill Publications, New Delhi, 2000
2. Elementary plane and mine surveying - V. Borshch, Kom Powets, B Federar M. Kolesnikova, Mir Publications, Moscow, 1986
3. Mine Surveying Vol I, II & III – S. Ghatak, Coal Field Publishers, 2008, 7th edition

Web Links:

1. <https://civiltoday.com/surveying/87-surveying-lecture-notes-pdf>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	-	-	-	-	-	1	1	3	-
CO2	3	-	2	-	-	-	-	-	1	1	3	-
CO3	3	-	2	-	-	-	-	-	1	1	3	-
CO4	3	-	2	-	-	-	-	-	1	1	3	-
CO5	2	-	-	-	3	-	-	-	-	-	2	-

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3rd semester)			
Course Code	INTRODUCTORY GEOLOGY				
Teaching	Total contact hours-	L	T	P	C
Prerequisite(s): Basic knowledge of Physics, and chemistry		3	-	-	3

Course Objective:

1. To lay emphasis on the study of minerals, rocks and structures. At the end of the course the students will have an understanding of the sciences minerals and rocks.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understand the role of geology in the design and construction process of underground openings in rock
CO2:	Be able to use knowledge in identifying the minerals basing on physical properties
CO3:	Be able to use knowledge in identifying the minerals basing on optical properties
CO4:	Be able to identify and classify rock using basic geologic classification systems
CO5:	Be able to apply geologic concepts and approaches on rock engineering projects

Syllabus:

UNIT –I

Introduction to Geology: Definition of Geology, Branches of Geology, Importance of Geology in Mining, Interior of the earth, Weathering, Erosion, Denudation. Geological processes. Ground water Origin and occurrence, Hydrological cycle, Sources of water in Mines. Classification of rocks based on porosity and permeability Water table and types of ground water. Geological controls on ground water movement in mines.

UNIT –II

Introduction to Mineralogy: Definition of mineral, Classification of minerals, Physical and chemical properties of minerals, Study of Silicate structures of individual minerals.

Study of individual silicate groups- Quartz, Feldspar, Pyroxenes, Amphiboles, Micas, Aluminum silicates, Garnets, Olivine

UNIT –III

Optical Mineralogy: Ordinary light and Polarized light, reflection, refraction, double refraction. Polarizing and Ore microscopes, Polarizer and analyzer, thin sections and polished sections, Examination of the minerals under the microscope, Optical properties, pleochroism, Extinction, Interference colors.

UNIT –IV

Petrology: Igneous petrology, Rocks three folds classification- Origin, form, structures, textures and classification of igneous rocks. Bowen's reaction principle, Study of rocks, Granite., syenite, gabbro, pegmatite, dolerite.

UNIT –V

Sedimentary and metamorphic Petrology: Sedimentary Petrology- Formation, structures, textures and classification. Petrographic characteristics of conglomerate, breccia, sandstone, shale, limestone. Metamorphic petrology- Formation, structures, textures and classification of metamorphic rocks, Petrography of gneiss. schist, slate, marble, quartzite, charnockite.

Text books:

1. "Engineering Geology", Parbin Singh
2. "Principles of Engineering Geology", K.M.Bangar
3. "A text book of Geology", G.B.Mahapathra

Reference Books:

1. RUTLE'S Elements of mineralogy, 27th EDITION Revised by C.D. Gribble
2. The PRINCIPLES of Petrology, an Introduction to the science of Rocks- By G.W. TYRRELL

Web Links:

1. <http://geologylearn.blogspot.com/>
2. <https://blog.geolsoc.org.uk/>
3. <https://www.reddit.com/r/geology/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	2	3	-	2	-	1	-	3
CO2	3	3	1	2	1	3	-	1	-	-	-	1
CO3	2	3	1	1	1	2	-	-	-	1	-	2
CO4	3	3	3	3	3	2	-	-	-	1	-	2
CO5	3	1	2	2	3	2	-	-	-	1	-	2

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (1 semester)			
Course Code	DEVELOPMENT OF MINERAL DEPOSITS				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite(s): Basic knowledge of science and mathematics		3	1	-	3

Course Objective:

1. To introduce the field of mining engineering and provide basic input about mining unit operations.
2. To know the history of mining and describe the correlation between the development of mining and cultural, economic progress.
3. To study concept of exploration & development drilling, blasting and the technology deployed.
4. To learn the various modes of access and study the methods of designing the access.
5. To study about mining support system.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	To gain exposure in field of mining activities along with concept relating to history of mining, role of mining in economic development, various mineral exploration techniques, various mining methods and unit operations in mining.
CO2:	To gain exposure in various modes of mine access in underground and opencast mining. Basic of bench formation and slope stability
CO3:	To gain exposure in shaft sinking operation in mining. Various factors affecting shaft sinking, various method of shaft sinking including special methods
CO4:	To gain exposure for mining development including incline, raise, winze, crosscut, drift etc, ventilation, transportation and lighting arrangements.
CO5:	To gain exposure in field of mining support system.

Syllabus:

UNIT-I

Introduction of Mining Engineering: Introduction to mining industry, role of Mining in national economy and infrastructure building, Basic mining terminologies, sequence in opening out a deposits, prospecting and geotechnical investigations in brief. Selection criteria for underground or open cast mining methods. Classification of mining methods.

UNIT-II

Opening up of deposits: Types, size and location of entries for underground mine. Introduction to surface mining methods. Box cut and formation of benches in mine.

UNIT-III

Shaft Sinking operations: Preliminary geo-technical investigations for a shaft sinking project. Surface arrangements for sinking shafts, apparatus and equipment. Unit operations of drilling, blasting, mucking, defuming, temporary and permanent lining, construction of insets and shaft stations. Methods of sinking shaft in water-logged, pressurized strata in loose and running soils, mechanized sinking, multi-deck platforms, and shaft borers, blind shaft boring and pilot shaft boring. Drop raise method, Need for widening and deepening of operating shafts.

UNIT-IV

Development of workings : Drivage of cross-cut, drifts, inclines and raises by conventional and mechanized methods. Ventilation, supporting, lighting and transporting arrangements.

UNIT-V

Mine supports: Need of supports in excavation. Types of support- Timbers, stone, concrete, steel, hydraulic supports, Powered Supports. Yielding and rigid supports. Roof stitching, roof bolting. Supports for roadways, faces and junctions.

Text books:

1. "Elements of Mining Technology, Vol-I", D. J. Deshmukh, Vidyasewa prakashan, Nagpur.
2. "Introductory Mining Engineering", Hartman H.L., John Wiley sons.
3. "Principles and practices of modern coal mining", Singh R. D., New Age International Publihers.

Reference books:

1. "Underground Mining Methods Handbook", W. A. Hustrulid, Published by S. M. E of the American institute of Mining, Metallurgical & Petroleum Engineers Inc., New York,
2. "Universal Mining School Volumes", Cardiff Gt. Britain,

Web Links:

1. https://en.wikipedia.org/wiki/Shaft_mining#targetText=Shaft%20mining%20or%20shaft%20sinking,typically%20sunk%20for%20mining%20projects.
2. <https://www.britannica.com/technology/coal-mining/Underground-mining>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	3	2	1	-	-	-	-
CO2	2	1	2	-	-		2	-	-	-	-	-
CO3	3	2	2	-	-	2	-	-	-	-	-	-
CO4	3	2	2	-	-	2	-	-	-	-	-	-
CO5	3	2	2	-	-	2	-	-	-	-	-	-

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 rd Semester)			
Course Code	DRILLING AND BLASTING				
Teaching	Total Contact hours-45.	L	T	P	C
Prerequisite(s): Fundamental activates for extraction of mineral.		3	-	-	3

Course Objectives:

1. Basic principles of drilling & blasting, drill machines and explosives.
2. Blasting theories and types of explosives and blast initiation procedures;
3. Blast vibration and impact on structures.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Learn the various methods of drilling and rock breakage process.
CO2:	Select appropriate methods of drilling and rock breakage for given in-situ rock conditions.
CO3:	Identify relevant requirements for the security, storage and handling of explosives.
CO4:	Design blasts to achieve optimum results; manage and control blast damage and environmental impact.;
CO5:	Apply fundamental principles to the design and selection of safe and efficient blasting.

Syllabus:

UNIT -I

Principles of Drilling - Principles of rock drilling, Drilling methods- Percussive, Rotary, Rotary-Percussive, applicability, advantages and disadvantages, drillability studies, factors effecting drillability, mechanics of drilling. Selection of drills, Care of drills. Various types of drill bits and their design aspects. Study of bit life, factors effecting bit life. Thrust/feed and rotation, alignment and deviation in drilling.

UNIT -II

Explosives& Blasting Accessories - Historical development, properties of explosives, low and high explosives, liquid oxygen explosive (LOX), ANFO, slurries, emulsion explosives, heavy ANFO, permitted explosives, testing of permitted explosives, bulk explosive system-PMS, SMS, Safety fuses, detonating cord and accessories, detonators, exploders, electric firing and non-electric firing, electronic detonators, NONEL blasting.

UNIT -III

Handling of Explosives - Surface and underground transport of explosives, bulk transport in opencast mines. Magazines, accidents due to explosives. Precautions and safety measures during transportation of explosives.

UNIT – IV

Blasting methods in Underground and Surface mines - Preparation of charge, stemming and short firing. Choice and economical use of explosives, miss fires, blown out shots, incomplete detonation, their causes and prevention and remedies.

UNIT – V

Mechanics of blasting and environmental impacts - Factors affecting rock breakage, Mechanism of rock blasting, Coupling, shock waves impedance, critical diameter etc. Calculation of charge and powder factor, Ground vibrations due to blasting and damage criteria, Controlled blasting methods, Design of blasting rounds, Noise and air overpressure, fly Rock, dust and fumes, Economics of blasting.

Textbooks:

1. “Explosives and Blasting techniques”, G. K. Pradhan, 3rd Edition, MineTech Publication, 2018.
2. “Explosives and blasting practices in mines”, S. K. Das, Lovely Prakashan, Dhanbad, 1993.
3. “Rotary Drilling and Blasting in Large Surface Mines”, B. V. Gokhale, Taylor & Francis Group, London, 2011.
4. “Theory and Technology of Rock Excavation for Civil Engineering”, Dingxiang Zou, Springer - Singapore, 2017.

Reference Books:

1. “Surface mining”, G.B. Mishra, Dhanbad Publishers, Dhanbad, 1978.
2. “Rock blasting effect and operation”, Roy Pijush Pal, A.A. Balkema, 1st ed, 2005.
3. “Blasting in ground excavations and mines”, Roy Pijush Pal, Oxford and IBH, 1st Edition, 1993.
4. “Elements of mining technology”, Vol-1, D.J. Deshmukh, Central techno, 7th ed, 2001.
5. “Principles and practices of modern coal mining”, R.D. Singh, New age International, 1st ed, 1977.

Web Links:

1. <https://nptel.ac.in/courses/123105003/> - NPTEL – Course – Drilling and Blasting Technology (Video Course) – By – Prof. Kaushik Dey.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	2	3	2	2	1	2	3
CO2	3	3	2	1	2	1	3	1	2	3	1	2
CO3	3	3	3	3	2	3	1	2	2	3	3	3
CO4	3	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	2	3	2	3	3	3

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 rd semester)			
Course Code	FLUID MECHANICS & HYDRAULIC MACHINERY LAB				
Teaching	Total contact hours-	L	T	P	C
Prerequisite(s):		-	-	3	1.5

Course Objective:

The students completing this course are expected to

1. Provide practical knowledge in verification of principles of fluid flow
2. Impart knowledge in measuring pressure, discharge and velocity of fluid flow
3. To understand Major and Minor Losses
4. To gain knowledge in performance testing of Hydraulic Turbines and Hydraulic Pumps at constant speed and Head

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understand the importance and theory of Fluid mechanics(Level 5)
CO2:	Finding head loss due to friction in pipes by Dracyweisbach equation (Level 4)
CO3:	Calculating performance analysis in turbines and pumps (Level 3)
CO4:	Conduct experiments (in teams) in pipe flows and open-channel flows and interpreting data from model studies to prototype cases(Level 2)
CO5:	Given the required flow rate and pressure rise, select the proper pump to optimize the pumping efficiency(Level 1)

Syllabus:

The list of experiments are:-

A. Flow Measurement

1. Calibration of Rotometer
2. Flow through Venturimeter
3. Flow through a circular Orifice
4. Determination of mean velocity by Pitot tube
5. Verification of Bernoulli's Theorem

B. Losses in Pipes

6. Determination of friction coefficient in pipes
7. Determination of losses due to bends, fittings and elbows

C. Pumps

8. Characteristics of Centrifugal pumps
9. Characteristics of Reciprocating pump

D. Air Compressor

10. Determination of volumetric efficiency of an Air compressor

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	1	-	-	-	-	3	-	-
CO2	-	-	-	2	-	-	-	3	-	-	-	-
CO3	-	3	-	-	-	-	1	-	-	-	-	2
CO4	-	-	3	-	-	-	-	-	2	-	-	-
CO5	-	-	-	1	-	-	3	-	-	-	-	-

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IIB.Tech. I Sem (1 semester)			
Course Code	MINE SURVEYING LAB				
Teaching	Total contact hours-	L	T	P	C
Prerequisite(s): Basic knowledge of various surveying instruments and their working methods.		3	-	-	3

Course Objective:

1. To familiarize the students with the basic concepts of Mine surveying lab.
2. To train the students on how to handle the instruments in field.
3. To demonstrate the digital and instrumental methods of analysis.
4. To expose the students in practical aspects by using various surveying instruments.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understanding the field knowledge measurements of areas, by the surveying instruments.
CO2:	Identifying the parts of surveying instruments and calculation of horizontal and Vertical angles
CO3:	Measuring reduced levels and contour intervals.
CO4:	Understanding the curve settings in field by surveying instruments.
CO5:	The students will be able to use the various advanced surveying techniques.

LIST OF EXPERIMENTS

1. Triangulation survey.
2. Study of theodolite in detail- practice for measurement of horizontal and vertical angles.
3. Measurement of horizontal angles by method of repetition and reiteration.
4. Trigonometric leveling - heights and distance problem.
5. Heights and distance using principles of tachometric surveying.
6. Curve setting – different methods.
7. Determine of area using surveying instruments.
8. Traversing & Contouring using surveying instruments.
9. Determination of remote height using total station.
10. Distance, gradient, Diff., height between two inaccessible points using theodolite.

ADDITIONAL EXPERIMENTS

1. Determine the Reduced Level of the Ground by Height of Instrument Method.
2. Determine the Location of a objects by Plain Table Survey.
3. Determine the Reduced Level of the Ground by Rise and Fall Method.
4. Determine the Contour of an Area by Grid Method
5. Determination of Area of the given boundary using compass (Closed Traverse)

6. Plane table Survey; finding the area of a given boundary by Radiation method.
7. Measurement of Bearings of sides of Traverse with prismatic Compass and calculation of angles.
8. Plane table Survey; finding the area of a given boundary by Intersection method.
9. Determination of horizontal distance between two inaccessible points using compass survey.
10. Determination of multiplying constant & additive constant of the Theodolite.

CO-PO Mapping:

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	-	-	-	-	-	1	1	3	-
CO2	3	-	2	-	-	-	-	-	1	1	3	-
CO3	3	-	2	-	-	-	-	-	1	1	3	-
CO4	3	-	2	-	-	-	-	-	1	1	3	-
CO5	2	-	-	-	3	-	-	-	-	-	2	-

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (3 rd semester)			
Course Code XXXXX	MATHEMATICS-III (Applications of PDE, Complex Variables and Transform Techniques) (Common for MECH, MINING, AME and CIVIL)				
Teaching	Total contact hours - 40	L	T	P	C
Prerequisite(s): Derivatives, integration and complex numbers		3	-	-	3

Course Objective:

1. To familiarize the techniques in partial differential equations and complex variables.
2. To equip the students to solve application problems in their disciplines.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Continuity, analytic and C-R equations of complex function, evaluate Taylor and Laurent series and apply Cauchy residue theorem
CO2:	Understand properties of Laplace and inverse Laplace transformations, apply to solve differential equations
CO3:	Evaluate Fourier series for different functions
CO4:	Understand properties of Fourier transformation apply for different function
CO5:	Classify nature of pde's and solve boundary value problems

Syllabus:

UNIT-I

10 hrs

Complex Variables Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate. Contour integrals, Cauchy theorem (without proof), Cauchy integral formula (without proof), Taylor's series, zeros of analytic functions, singularities, Laurent's series, residues, Cauchy residue theorem (without proof).

UNIT-II

6 hrs

Laplace transforms: Definition of Laplace transform, existence conditions, properties of Laplace transforms, inverse Laplace transforms, transforms of derivatives, transforms of integrals, multiplication by t^n , division by t , convolution theorem, periodic functions, unit step function, unit impulse function, applications to ordinary differential equations. (Without proofs).

UNIT-III

10 hrs

Fourier series: Dirichlet's conditions, Fourier series, conditions for a Fourier expansion, functions of any period, odd and even functions - half range series.

UNIT-IV

8 hrs

Fourier transforms: Fourier integrals, Fourier cosine and sine integrals, Fourier transform, sine and cosine transform, properties, convolution theorem.

UNIT -V**6 hrs**

Applications of Partial Differential Equations: Method of separation of variables, Classification of second order partial differential equations, solution of 1D-wave, 1D-heat and 2D-Laplace's equation in Cartesian coordinates.

Text books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

Reference Books:

1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
2. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, McGraw Hill, 2004.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

Web Links:

1. <https://nptel.ac.in/courses/111103070/>
2. <https://nptel.ac.in/courses/111/106/111106084/>
3. <https://nptel.ac.in/courses/111/106/111106046/>
4. <https://nptel.ac.in/courses/111105093/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	3	2	1	1	1	1	1	1
CO2	3	3	3	2	2	2	1	1	1	1	1	1
CO3	3	3	3	2	3	3	1	1	1	1	1	1
CO4	2	3	3	3	2	2	1	1	1	1	1	1
CO5	3	3	3	3	3	3	1	1	1	1	1	1

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (IV semester)			
Course Code	MATHEMATICS-IV Numerical Methods, Probability and Statistics (common for CIVIL,EEE,MECH,AME & MINING)				
Teaching	Total contact hours - 40	L	T	P	C
Prerequisite(s): Knowledge of Mathematics at 10+2 , Basic Statistics		3	-	-	3

Course Objective:

1. Familiarize the students with Numerical Methods of solving the non-linear equations, interpolation, differentiation, integration, and ordinary differential equations.
2. Exemplify probability theory in order to evaluate the probability of real world events;
3. Apply discrete and continuous probability distributions to provide solutions for practical problems.
4. Monitoring hypotheses tests for population parameters
5. Reports in work place situations and in completing papers and research projects in other university and college courses.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Apply the knowledge of approximating the roots of polynomial and transcendental equation in practical engineering problems.
CO2:	Apply the Knowledge of different algorithms for approximating the solution of ordinary differential equations in practical Engineering problems.
CO3:	Demonstrate the knowledge of Probability distributions.
CO4:	Enhances knowledge of a classical hypothesis techniques.
CO5:	Enhances Knowledge in inferential methods based on small and large sampling tests.

Syllabus:

UNIT-I

8hrs

Solutions to algebraic equations : Solution of polynomial and transcendental equations: bisection method, Newton-Raphson method and Regula-Falsi method, finite differences, relation between operators, interpolation using Newton's Forward and backward difference formulae. Interpolation with unequal intervals.

UNIT II

6hrs

Numerical Differentiation and Integration : Numerical Differentiation, numerical integration,- trapezoidal rule and simpson's 1/3rd and 3/8 rules. Ordinary differential equations- Taylor's series, Euler and modified Euler's methods, Runge-Kutta method of fourth order.

UNIT-III**10 hrs**

Probability: Probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability distribution: Binomial, Poisson and normal distribution-their properties.

UNIT-IV**8 hrs**

Testing of hypothesis: Formulation of null hypothesis, alternative hypothesis, the critical regions, level of significance.

Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means.

UNIT V**8hrs**

Small sample tests: Student t-distribution (test for single mean and two means), testing of equality of variances (F-test), χ^2 - test for goodness of fit, χ^2 - test for independence of attributes. One-way ANOVA Classified data.

Text books:

1. B.S.Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. P.Kandasamy, K.Thilagavathy K.Gunavathi, Numerical Methods, S.Chand & Company, 2/e, Reprint 2012.
3. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
4. Miller and Freund, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
5. Probability and statistics for Engineering and Scientists: Ronald E. Walpole, Sharon L. Meyers and Keying Ye: Pearson.

Reference Books:

1. S. Ross, a First Course in Probability, Pearson Education India, 2002.
2. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
3. N.P. Bali and Manish Goyal, A text Book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.

Web Links:

1. <https://nptel.ac.in/courses/111107105/>
2. <https://ocw.mit.edu/courses/audio-video-courses/#mathematics>
3. <https://nptel.ac.in/courses/111105041/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	3	2	2	1	2	3	2	3	3
CO2	2	3	3	3	3	2	1	2	3	2	3	3
CO3	3	3	3	3	3	2	1	2	3	2	3	3
CO4	2	3	3	3	3	3	1	2	3	2	3	3
CO5	3	3	3	3	3	3	1	2	3	2	3	3

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. IISem (4 semester)			
Course Code	ADVANCED MINE SURVEYING				
Teaching	Total contact hours-50	L	T	P	C
Prerequisite(s): Basic knowledge of various advanced surveying instruments and techniques their working methods.		3	-	-	3

Course Objective:

1. To determine the horizontal & vertical angles by using different surveying instruments.
2. To delineate the ore bodies in underground mines.
3. To estimate the amount of ore and waste.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understanding the measurements of distances and angles.
CO2:	Able to setting out various curves.
CO3:	Measuring the areas and volumes by using various methods.
CO4:	Understanding the various methods of plotting survey
CO5:	Using the advanced surveying techniques of total station.

Syllabus:

UNIT -I

Tachometric Survey: Definition and different systems of tachometric methods, determinations of Tachometric constants (K&C) - The stadia system – principle of stadia method. Fixed hair method - Distance and elevation formulae. Movable hair method staff normal, staff Vertical. Substance Method – Principle of substance (or movable Hair) method, the tangential method.

UNIT –II

Curves: Definitions and Notations, Designation of Curves, Elements of Simple Curves, Setting out simple curves - By ordinates from the long chord, By successive bisections of arcs and chords, By offsets from the tangents, By deflections distances, Rankin's method of tangential angles, Two theodolite method, Tachometric method. Transition curves(Brief).

UNIT -III

Areas and Volumes: Areas - General methods of determining areas, Areas computed by sub division into triangles, Areas from offsets to a base line, Area by double meridian distances, Area by coordinates, Area by plan meter. Volumes - Measurements from cross- sections, the prismoidal formula, The trapezoidal formula (Average and area method), Volumes from spot levels, Volumes from contours.

UNIT -IV

Mine Plans & Theory of Errors: Various methods of plotting survey, Survey office, Storage of survey instruments, Scales and its classifications, Kinds of errors, Definitions, Laws of accidental errors, Probability Curve, Probable errors of an average, Probable error of sum, Most probable value, Mean square error, Average error, General Principle of Least squares, Law of weights, Determination of probable errors, Distribution of error of the field measurement, Determination of most probable values.

UNIT -V

Correlation & Stope Survey: Definition, purpose & classification of Correlation Survey, Correlation of surface and U/G surveys, Direct traversing through adits or inclined shafts/ drifts, Direct transference of azimuth down the shaft, Correlation by plumb wires in two shafts, Correlation by plumb wires in single shaft, Co-Planation or Exact Alignment method, Weisbach Triangle or Approximate Alignment method, Weiss Quadrilateral method. Stope Surveying: Purpose of stope surveying, Classification of stope surveying methods, Tape triangulation method, Ray method.

Text books:

1. Surveying Vol I - B. C. Punmia, Laxmi Publication, 1999 16TH edition.
2. Surveying Vol II - B. C. Punmia, Laxmi Publication, 1999 15TH edition

Reference Books:

1. Surveying Vol I - S. K. Duggal, Tata McGraw Hill Publications, New Delhi, 2000
2. Elementary plane and mine surveying - V. Borshch, KomPowets, BFederar M. Kolesnikova, Mir Publications, Moscow, 1986
3. Mine Surveying Vol I, II&III – S. Ghatak, Coal Field Publishers, 2008, 7th edition

Web Links:

1. http://www.dmp.wa.gov.au/Documents/Safety/MSH_COP_MineSurvey.pdf

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	-	-	-	-	-	1	1	3	-
CO2	3	-	2	-	-	-	-	-	1	1	3	-
CO3	3	-	2	-	-	-	-	-	1	1	3	-
CO4	3	-	3	2	-	-	-	-	1	1	3	-
CO5	2	-	-	-	3	-	-	-	-	-	2	-

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4 th Semester)			
Course Code	SURFACE MINING				
Teaching	Total Contact hours–45.	L	T	P	C
Prerequisite(s): Mining Geology, Mine surveying, Drilling & Blasting.		3	-	-	3

Course Objectives:

1. It introduces surface mining methods along with the associated activities such as drilling, blasting for mines.
2. Opening-up of deposits with Box cut, excavation for transportation, heavy earth moving machinery in the surface mines.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Learn different systems of surface mining and their applications.
CO2:	Opening of deposits under various conditions and haul road design.
CO3:	Understand the viability of surface mining and its design aspects.
CO4:	Mining of deposits under various conditions using various equipment combination.
CO5:	Problem solving of mine design covering – development, production & equipment capacity.

Syllabus:

UNIT -I

Basic concept of Surface Mining - Status of surface mining in India. Selection between surface mining and underground mining, Preliminary evaluation of surface mining prospects; stripping ratio – concepts and significance, mine life.

UNIT -II

Opening-up of deposits with Box Cut - Factors affecting selection of site of box-cut, Production benches–formation parameters and factors affecting their selection. Preparation for Excavation: Working principle of ripper and Scraper—their cycle of operation, application and limitation. Drilling, types of blast hole drills, performance parameters of drills, estimation of number of drills for a given mine production. Problems associated with drilling and blasting.

UNIT -III

Excavation and Transportation- Cyclic methods - Shovel-dumper -Applicability and limitations of electric shovel, hydraulic excavators and dumpers; Cycle time and productivity calculation for shovel and dumper. Dragline operation: Applicability and limitations, different modes of operation; Side cast diagram and calculation of reach; Cycle time and productivity calculation. Continuous methods - Bucket wheel excavator,

continuous surface miner, conveyors. Principle and operation of these machines, their advantages and limitations capacity calculations. Scrapers: Applicability and limitations, various types; Method and cycle of operation; Pusher dozer and push-pull operation. Dozers: Applicability and limitations; Types and classification; Types of blade and corresponding merits and demerits; Method and cycle of operation. Front-end-loaders: Applicability and limitations; Method and cycle of operation.

UNIT -IV

HEMM, Design and organization- Dozer, Grader, Loader, Crusher, Conveyors: Shiftable and high angle conveyors; Mode of operation, applicability and limitations; Merits and demerits of conveyor as a system of transportation. Different in-pit crushing and conveying methods and their respective applicability & limitations. Basic design principle of large opencast mines and their organizational structure.

UNIT -V

Slopes in Surface mines - Types of mine slope – highwall and waste dumps; Common modes of slope failure; Factors influencing stability of slopes; Slope stability assessment techniques; Waste dumps - types and formation methods; Slope protection, stabilization and monitoring.

Textbooks:

1. “Surface Mining Technology”, T.N Singh, Lovely Prakashan, 2015.
2. “Surface Mining Technology”, S.K. Das, Lovely Prakashan, Dhanbad, 1994.
3. “Surface mining”, G.B. Mishra, Dhanbad Publishers, Dhanbad, 1978.

Reference Books:

1. “Latest Development of Heavy Earth Moving Machinery”, Amithosh De, Annapurna Publishers, Dhanbad, 1995.
2. “Fundamentals of Open Pit Mine Planning & Design”, Hustrulid, W. and Kuchta, M.
3. “Surface Mining” Kennedy, B.A., 2nd Edition, SME, New York, 1990.
4. “Opencast Mining”, R.T. Deshmukh, Lovely Prakashan, Dhanbad, 1994.

Web Links:

1. <http://en.wikipedia.org/wiki/Mining>
2. <http://www.mining-journal.com/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	3	1	2	1	2	3
CO2	3	3	2	2	2	2	3	2	1	3	2	2
CO3	3	3	3	3	2	3	1	1	2	3	3	3
CO4	3	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	2	3	2	3	3	3

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4 semester)			
Course Code	UNDERGROUND COAL MINING				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite(s):	NIL	3	-	-	3

Course Objective:

1. To understand coal growth in India and all over the world and different terminology used in coal mining.
2. To study the development of panels and extraction of coal in Bord and Pillar method.
3. To study the Long wall advancing and retreating methods.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Comprehend the factors influencing choice of mining methods and possible entries
CO2:	Comprehend and analyze development and depillaring operations in Bord and pillar mining method
CO3:	Comprehend and analyze development and extraction using Longwall mining method
CO4:	Comprehend different risks associated with thick seam mining
CO5:	Comprehend the extract of coal using modern mining methods

Syllabus:

UNIT –I

Introduction: Present situation and future growth of coal mining industry in India and abroad. Factors affecting selection of different possibilities of entry: Adit, shaft, incline etc. Different terminologies used in coal mining, mine development and process, Different coal mining methods, factors influencing choice of coal mining methods.

UNIT –II

Bord and Pillar Mining: applicability, limitations, advantages and disadvantages of Bord and pillar mining method, development and depillaring sequence of operations in Bord and Pillar mining, and local fall, main fall, air blast. Problems associated with Bord & Pillar method and precautions. Case study with layouts and its related calculations; Manpower; machinery; production & output per man-shift.

UNIT –III

Long-wall Mining: Applicability, limitations, merits and demerits, different long wall mining methods; advancing , retreating , factors influencing selection of long wall method, method of development and extraction of panels; Case study with layouts and its related calculations; Manpower; machinery; production & output per man-shift.

UNIT –IV

Thick Seam and deep seam Mining: Problems associated with thick and deep seam Mining, selection of mining method, caving and stowing methods, limitations and applicability: different slicing methods-(Inclined Slicing, Horizontal Slicing, Diagonal Slicing; Factors to be considered for Slicing methods, and Caving methods; Blasting Gallery Method, Descending Shield Method of Mining; Layouts of inclined slicing methods; descending order with caving.

UNIT –V

Modern coal mining methods: applicability, limitations, merits and demerits of Horizon Mining, Hydraulic Mining, method of extraction of contiguous seam; working underneath surface features, extraction of multi seams, problems and issues: Surface/Underground arrangements for stowing.

Text books:

1. Principles and Practices of Modern Coal Mining: R. D. Singh, New Age International, 1997.
2. Modern Coal Mining Technology: S. K. Das, 2nd edition, Lovely Prakashan Publishers, 1994.
3. Elements of Mining Technology: Vol-I; D.J. Deshmukh
4. Singh T.N., Dhar, B.B. Thick Seam Mining, Problems and Issues, Oxford & IBH Publishers, 1992.

Reference Books:

1. Underground Coal Mining Methods: J. G. Singh, Braj Kalpa Publishers, Varanasi, 2000.
2. Coal Mining – I.C.F. Statham, Vol. I, II, III & Vol IV. The Caxton Publishing Company Ltd. Inc. 1958.
3. Winning and working coal: R. T. Deshmukh
4. Underground winning of coal: T.N Singh

Web Links:

1. <http://www.undergroundcoal.com.au/fundamentals/default.aspx>
2. <https://scienceandtech.cmpdi.co.in/PDF%20Files/Mining%20Methods.pdf>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	2	2	2	3	1	2	2	1
CO2	3	2	3	3	2	2	2	3	1	2	2	3
CO3	3	2	3	3	2	2	2	3	1	2	2	2
CO4	3	2	3	3	2	2	2	3	1	2	2	2
CO5	3	2	2	3	2	2	1	3	1	2	2	3

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4 th semester)			
Course Code	MINING GEOLOGY				
Teaching	Total contact hours-	L	T	P	C
Prerequisite(s): Basic knowledge of Physics, and chemistry		3	-	-	3

Course Objective:

1. To educate among the concepts and approaches in the design and construction of underground openings. It also introduces the main tools and methods of geology and problems (directly and indirectly) that can create the geological conditions in the mining field.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Have knowledge of design and construction procedures required to safely control rock behavior in underground openings.
CO2:	Able to analyze the processes responsible for the formation economic minerals
CO3:	Able to distinguish between the different ore forming minerals
CO4:	Have knowledge of the basic geotechnical parameters need to estimate and evaluate ground behaviour in the mining area.
CO5:	Able to explore the minerals in the surface and sub-surface areas of the earth

Syllabus:

UNIT –I

Structural Geology : Stratified rocks and their structures - Attitude of beds; Strike and Dip; Thickness of beds; Folds; genesis, classification, identification in field, impact on-landscape, mineral deposits and mining ; Unconformities: Types, importance and identification ; Faults : Definition, mechanism of faulting, classification, impact of faulting on topography, significance of faults in mining ; Joints: definition and characteristics, classification, occurrence of joints in igneous, sedimentary and metamorphic rocks; Differences between joints and faults.

UNIT –II

Economic Geology: Ore minerals and gangue minerals; Syngenetic and epigenetic deposits; Processes of ore formation: Magmatic concentration, Sublimation, Contact metasomatism, hydrothermal processes, Sedimentation, Evaporation, Residual and mechanical concentration; oxidation and supergene enrichment, Metamorphism.

UNIT –III

Economic Mineral deposits: Origin, Occurrence, distribution & uses of minerals of Iron, Manganese, Chromites, Gold, Lead, Zinc, Copper, Beach sands, Bauxite, Uranium & Coal.

UNIT –IV

Mineral economics: Introduction to Estimation of Ore reserves-Definition, classification and importance: Introduction to Sampling: Definition, types- Mineral wealth of India: Mineral wealth of Andhra Pradesh; Industrial uses of different minerals.

UNIT –V

Mineral exploration: Introduction to different methods of prospecting for mineral deposits- geological, geophysical, gravity, magnetic, seismic, electrical, geochemical, aerial photography and remote sensing, GIS.

Text books:

1. Principles of Engineering Geology- ParbinSingh
2. Principles of Engineering Geology- K.M.Bangar
3. A text book of Geology-G.B.Mahapathra

Reference Books:

1. Courses in Mining Geology - R.N.P. Arogyaswamy
2. Textbook of engineering geology – By N. Chenna Kesavulu

Web Links:

1. <http://geologylearn.blogspot.com>
2. <https://blog.geolsoc.org.uk>
3. <https://www.reddit.com/r/geology>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	2	3	-	2	-	1	-	3
CO2	2	3	1	2	1	3	-	1	-	-	-	1
CO3	2	3	1	1	1	2	-	-	-	1	-	2
CO4	3	3	3	3	2	2	-	-	-	1	-	2
CO5	3	1	2	2	3	2	-	-	-	1	-	1

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4 semester)			
Course Code	ROBOTICS				
Teaching	Total contact hours – 42	L	T	P	C
Prerequisite(s): Kinematics of machines /Dynamics of machines /Mathematics: Matrices, Differential Equations		3	-	-	3

Course Objective:

1. To acquire the knowledge on advanced algebraic tools for the description of motion.
2. To develop the ability to analyze and design the motion for articulated systems.
3. To develop an ability to use software tools for analysis and design of robotic systems.

Course Outcomes: At the end of the course, the student will be able to

On Completion of the course, the students will be able to-	
CO1:	Identify various robot configuration and components. (PO4)
CO2:	Select appropriate actuators and sensors for a robot based on specific application. (PO6)
CO3:	Solve kinematic and dynamic problems for simple serial kinematic chains. (PO7)
CO4:	Plan trajectory for a manipulator for avoiding obstacles. (PO5)

Syllabus:

UNIT –I

INTRODUCTION: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – Present and future applications – Classification by coordinate system and control system. Robot applications in manufacturing

UNIT –II

COMPONENTS OF THE INDUSTRIAL ROBOTICS: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT –III

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation – problems. **MANIPULATOR KINEMATICS:** Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

UNIT –IV

Differential transformation and manipulators, Jacobians – problems, Dynamics: Lagrange – Euler and Newton – Euler formulations – Problems.

UNIT –V

General considerations in path description and generation. Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion – Robot programming, languages and software packages-description of paths with a robot programming language.

ROBOT ACTUATORS AND FEED BACK COMPONENTS: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors.

Text books:

1. “Industrial Robotics”, Groover M P, Mitchell Weiss, Roger N. Nagel, Tata McGraw-Hill, India, edition- 3, 2008 / Pearson Education.
2. “Robotics and Control” R K & Nagrath I J / Tata McGraw-Hill, India, edition, 2003.

Reference Books:

1. “Robotics” K.S. Fu, R.C. Gonzalez, C.S.G. Lee, Tata McGraw-Hill, India, edition-2, 2008.
2. “Robotic engineering: an integrated approach”, Richard David Klafter, Thomas A. Chmielewski, Michael Negin, Prentice Hall, 1989

Description	Subject Teaching Methodology	L	T	P	C
Course Code	INTERNET OF THINGS - OPEN ELECTIVE	3	1	0	3
Teaching	Total contact hours – 60				
Prerequisite (s)	Knowledge of Logic Gates, Relays, Registers, Counter, Microcontroller, Microprocessor, Sensors Interfacing, Digital Communication basic operations and Internet Basics.				

COURSE OBJECTIVES: The student will

1. Understand the Concepts of IoT Development Infrastructure.
2. Understand the principles of wired and wireless communication protocols
3. Understand the Threats and Securities issues in the development of IoT.
4. Understand the types of measurement errors and sensors.
5. Understand design and development of IoT Platform.

UNIT-1

FUNDAMENTAL OF IoT: Internet of things definition, IoT Functional view Internet of things today, Internet of things tomorrow, potential success factors, internet of things vision, future communication challenges-5G scenario, fundamental characteristics of IoT, IOT Layered Architecture, detailed IoT layered architecture, IoT Enabling technologies, IoT Smart Environment and smart space creation. IoT Applications and use case scenarios. Resource management for IoT,.

UNIT-2

COMMUNICATION PROTOCOLS FOR IOT WIRED COMMUNICATION PROTOCOLS:

I2C, SPI, One Wire, RS232, Ethernet, RS 485, UART, USART, USB,

WIRELESS COMMUNICATION PROTOCOLS:

Blue tooth, ZigBee, Z-Wave, LoWPAN, WiFi-ah, NFC, RFID), Application Protocols MQTT, CoAP, HTTP.

UNIT-3

THREATS, SECURITY, PRIVACY AND IoT

CLOUD IoT AS INTERCONNECTION OF

THREATS:

Phase attack, Attack as per Architecture, Attack based on Components.

SECURITY ENGINEERING FOR IoT DEVELOPMENT:

Building Security into design and development, Secure Design: Safety and Security Design, Processes and Agreements, Technology Selection.

MITIGATING TO PRIVACY CONCERN:

Privacy Challenges introduced by IoT, Guide to perform PIA, PbD Principles, Privacy Engineering Recommendations

IOT CLOUD:

Concepts of Cloud, Your Organization and Cloud Computing, Cloud Computing Services (IaaS, PaaS, SaaS).

CASE STUDY: ThingSpeak Cloud, Blynk Cloud, MQTT Cloud

UNIT-4**MEASUREMENT ERRORS AND****SENSORS MEASUREMENT ERRORS:**

Gross Error, Systemic error, Absolute Error, Relative Error, Accuracy, Precision, Resolution, Significant Figure, Measurement Error Combinations, Basics of Statistical Analysis.

SENSORS AND TRANSDUCERS:

Passive and Active Sensors, Resistive Sensors, Capacitive Sensors and Inductive Sensors, Temperature Sensor, Humidity Sensor, Ultra-Sonic Sensor, IR Sensor, PIR Sensor, Vibration Sensor, Gas Sensor, Hall Effect Sensor.

UNIT-5**DEVELOPMENT PLATFORM: HARDWARE, SOFTWARE, PROGRAMMING****LANGUAGE HARDWARE:**

Arduino Uno Board, NodeMCU Board

SOFTWARE TOOLS:

Arduino IDE, Compilers, Cross-Compilers, Linkers, Libraries, Debuggers, Simulators, Emulators, Serial Monitor, Intel Hex File and Motorola Hex File Format.

PROGRAMMING LANGUAGE:

Arduino Programming Structure, Data Types, Operators, Control Statements (IF, IF-ELSE, WHILE, DO-WHILE, FOR, SWITCH-CASE, SWITCH-CASE-BREAK, SWITCH-CASE-CONTINUE) and Precompiled Functions.

CASE STUDIES:

Home Automation, Agriculture 3.0, Health Care, Industry 4.0

TEXT BOOKS:

1. O.Vermesan, P.Friess, "Internet of Things-From Research and Innovation to Market Deployment", River Publishers, 2014.
2. B. Russell and D.VanDuren, "PracticalInternetofThingsSecurity", - PacktPublishing, 2016.
3. A. T. Velte, T. J. Velte, R.Elsenpeter, "Cloud Computing – A Practical Approach" Mg-Graw Hill, 2010.
4. R. B. Northrop, "Introduction to Instrumentation and Measurement" Second Edition, CRC Taylor and Francis 2005.
5. J.Balye, "C Programming for Arduino" Packt Publication, 2013.
6. K.V. Shibu, "Introduction to Embedded Systems", Tata Mg-Graw Hill, First Edition, 2009.

Web Links:

1. <https://thingspeak.com>
2. <https://www.blynk.cc/getting-started>
3. <https://www.arduino.cc>
4. <https://mqtt.org>
5. <https://coap.technology>

COURSE OUTCOMES:

C01.Learn about the IOT Development cycles, Challenges and Requirements.

CO2. Learn about the Wired and Wireless Communication Protocols

implementation. **CO3.** Learn about Privacy, Threats and Security challenges present in IOT and IoT Clouds.

CO4. Learn about types of measurement errors and its impact on measurement and various sensor operation and construction mechanism.

C05.Learn about Development platform “ Arduino IDE”, Sensors Libraries and Programming.

Course Code :INTERNET OF THINGS													
Course Designed by			Department of Electronics and Communication										
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓	✓			✓	✓	✓					
	CO 2	✓		✓	✓							✓	✓
	CO 3	✓		✓			✓			✓	✓	✓	
	CO 4	✓			✓	✓	✓	✓					✓
	CO 5	✓	✓						✓				✓
Category		General Humanities		Basic Sciences		Engineering Sciences And Technical			Professional Subjects				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech 2 nd Sem (4 semester)			
Course Code XXXXX	OPEN ELECTIVE BASIC AUTOMOBILE ENGINEERING				
Teaching	Total contact hours- 50	L	T	P	C
Prerequisite(s): principles		3	-	-	3

Course Objectives:

To make the student able to

1. Compare different types of automobiles and their components.
2. Differentiate working principles of different types of automobile engines.
3. Illustrate working of different transmission elements and control systems.
4. Distinguish the functions of auxiliary systems.
5. Implement different types of safety systems.
6. Judge effective pollution reduction methods.

Course Outcomes:

On completion of the course, the students will be able to-	
CO1:	Compare different types of automobiles and their components.
CO2:	Differentiate working principles of different types of automobile engines.
CO3:	Illustrate working of different transmission elements and control systems.
CO4:	Implement different types of safety systems.
CO5:	Judge effective pollution reduction methods.

Syllabus

UNIT-I

Introduction to Automobiles & Engines: Functions and characteristics of different types of automobiles and their power sources. Specifications, Performance Parameters, Quality standards, Trends in automobile design. Engine Specifications with regard to power, speed, torque, no. of cylinders and arrangement, lubrication and cooling etc. Reciprocating Engines, Rotary Engines.

Engine Lubrication systems, splash and pressure lubrication systems, oil filters, oil pumps, Engine cooling system, Engine fuel systems, Engine intake & exhaust systems.

UNIT-II

Transmission Systems: Clutches, principle of operations, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel-gear boxes, types, sliding mesh, constant mesh, synchro-mesh gear boxes, over drive, torque converter. propeller shaft, Torque tube drive, universal joint & slip joint, Hotch-kiss drive, differential rear axles-types-wheels and tyres.

UNIT-III

Control Systems: Steering geometry-camber, castor, king pin rake, combined angle toe-in, center point steering. types of steering mechanism-Ackerman steering mechanism, steering gears-types, steering linkages. Mechanical, hydraulic, pneumatic & vacuum brakes-brief description, anti lock brake system (ABS) and electromagnetic retarder. Telescopic suspension, Rigid axle suspension and independent suspension, Shock absorbers, Torsion bar, Stabilizer, Different types of springs used in automobile suspension.

UNIT-IV

Auxiliary Systems: Electrical and electronic systems, voltage regulators, bendix drive mechanism solenoid switch, lighting system, horn, wiper, fuel gauge, Heating, Ventilation, and Air Conditioning (HVAC) systems, Vehicle Thermal Management System and Vehicle body design features, Tipping Systems(lifting).

UNIT-V

Vehicle Safety Systems & Eco Friendly Systems and Vehicles: Safety: Introduction to safety systems, seat belt, air bags, bumper, wind shield, suspension sensors, traction control, mirrors, central locking and electric windows, speed control. Different pollutants, formation, Effects of pollution on environment, human. Regulations, Emission standards, Pollution control methods. Electric Vehicles and Hybrid Vehicles.

Text Books:

1. Automotive Mechanics, William H Crouse and Donald L Anglin, Tata McGraw – Hill Publishing Co. Ltd. 2004, 10th Edition.
2. Automobile Engineering – R.B. Gupta.
3. Automobile Engineering (Vol. 1) – Dr. Kirpal Singh
4. Automobile Engineering (Vol. 2) – Dr. Kirpal Singh

Reference Books:

1. Automobile Engineering --- G.B.S. Narang.
2. IC Engines – V.Ganeshan/TMH
3. IC Engines – ML Mathur & RP Shurma
4. IC Engines – Domkundvar
5. BP Obert IC Engines & Air Pollution – Harper & Row pub.
6. Bosch Gasoline Engines Management – Bosch Pub.
7. Bosch Diesel Engine Management – Bosch Pub.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], 4 : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3				1						
CO2	3	2				1						
CO3	3	2				1						
CO4	3	2							2		1	1
CO5	2	2					3					

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4 semester)			
Course Code	ELEMENTS OF MINING TECHNOLOGY				
Teaching	Total contact hours-	L	T	P	C
Prerequisite(s):	NIL	3	-	-	3

Course Objective:

1. To introduce the concept of different methods of mining.
2. To impart the knowledge of classification of coal seams.
3. To explain the concepts of drilling methods.
4. To impart the knowledge of different explosives used in mining.
5. To elaborate the concept of blasting techniques and drill bits used.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Know the various Elements of Mining and stages/phases in Mining
CO2:	Know the concepts of Mining Methods.
CO3:	Know the Drilling methods.
CO4:	Understand the explosives.
CO5:	Blasting practice in mines.

Syllabus:

UNIT –I

Introduction and stages of Mining - Contribution of Mining activities of civilization- Definitions of terms –Mining Industries in the state and in the country.– Pre mining, mining and post-mining – ancillary mining operations, Types of entries to mineral deposits – Shaft, Incline, Adit – applicable conditions- limitations, compare shaft vs incline.

UNIT –II

Concepts and Definition of terms commonly used in coal and non-coal mining
Classification of the mineral deposits basing on various factors, shallow, deep, very deep, steeply inclined, moderately inclined, inclined vein, massive deposits. Classification of coal seams - Thick, moderately thick, thin seams, I, II, III degree gassy seams. Classification of methods of working coal-opencast, underground- Bord and Pillar/ longwall-Advancing and retreating.

UNIT –III

Drilling methods Use of boreholes – (Classification) methods – applicable conditions – tools used for drilling – successive and rotary, feed mechanism – Screw feed and hydraulic feed mechanism – mud flushing – sludge and core, core recovery methods of core recovery – reasons for deviation of bore holes. Single tube, double tube and wire line core barrel.

UNIT –IV

Explosives - Uses of explosives in mining industry, characteristics classification basing on strength, speed and application, low and high explosives, their composition, properties – explosives used in underground in opencast workings including LOX, slurries, boosters, primer – their composition application permitted explosives – tools, applicability, examples with their composition. Selection of explosives – factors, Initiation of explosives – fuses – safety fuse, cortex fuse. Detonators – types, composition, constructional details and applications.

UNIT –V

Blasting practice in mines - Solid blasting - rules and provisions related - induced blasting - different types of blasting practice - different types of drill bits - Drill ware – Reconditioning - Dangers and precaution measures of blasting, fuse and electric blasting and misfire dealing.

Text books:

1. Elements of Mining Technology: Vol-I; D.J. Deshmukh
2. Explosives and Blasting practice; G.K. Pradhan

Reference Books:

1. Elements of Mining Technology Vol-II; D.J. Deshmukh
2. Principles and Practices of Modern Coal Mining: R. D. Singh, New Age International, 1997.
3. Modern Coal Mining Technology: S. K. Das, 2nd edition, Lovely Prakashan Publishers, 1994.

Web Links:

1. https://www.slideshare.net/umer_1/elements-of-mining
2. https://en.wikipedia.org/wiki/Drilling_and_blasting
3. http://www.maden.org.tr/resimler/ekler/e04e05f4e48920b_ek.pdf
4. <https://www.cdc.gov/niosh/mining/userfiles/works/pdfs/acobo.pdf>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	2	3	3	2	3	-	2	2	2
CO2	2	1	-	2	3	3	2	3	-	2	2	2
CO3	3	2	2	3	3	3	2	3	-	2	1	2
CO4	-	2	2	3	2	3	2	2	-	3	1	2
CO5	3	2	2	3	3	3	2	3	-	2	1	2

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. I Sem (4 th semester)			
Course Code	ADVANCED MINE SURVEYING LAB				
Teaching	Total contact hours-	L	T	P	C
Prerequisite(s): Basic knowledge of various advanced mine surveying instruments and their working methods by practically.		3	-	-	3

Course Objective:

1. To familiarize the students with the basic concepts of Mine surveying lab.
2. To train the students on how to handle the instruments in field.
3. To demonstrate the digital and instrumental methods of analysis.
4. To expose the students in practical aspects by using various advanced surveying instruments.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understanding the field knowledge measurements of areas, by the surveying instruments.
CO2:	Identifying the parts of surveying instruments and calculation of horizontal and Vertical angles
CO3:	Measuring reduced levels and contour intervals.
CO4:	Understanding the of surveying techniques above and below the surface of the earth.
CO5:	The students will be able to use advanced surveying techniques of total station.

LIST OF EXPERIMENTS

1. Determination of multiplying constant & additive constant of the Theodolite.
2. Setting out curves by long chord method.
3. Correlation survey by Weiss Quadrilateral method.
4. Determine the Contour of an Area by Grid Method
5. Setting out curves by rankines method.
6. Plane table Survey; finding the area of a given boundary by Radiation method.
7. Correlation survey by Weisbach Triangle method.
8. Plane table Survey; finding the area of a given boundary by Intersection method.
9. Determination of horizontal distance between two inaccessible points using compass survey.
10. Setting out curve by perpendicular offsets.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	-	-	-	-	-	1	1	3	-
CO2	3	-	2	-	-	-	-	-	1	1	3	-
CO3	3	-	2	-	-	-	-	-	1	1	3	-
CO4	3	-	2	-	-	-	-	-	1	1	3	-
CO5	2	-	-	-	3	-	-	-	-	-	2	-

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4 semester)			
Course Code XXXXX	MINING GEOLOGY LABORATORY				
Teaching	Total contact hours 45	L	T	P	C
Prerequisite(s): Knowledge of introductory geology and mining geology		0	0	3	1.5

Course Objective:

1. To familiarize the students with the basic concepts of Mining Geology lab.
2. To train the students on how to handle the instruments.
3. To demonstrate the digital and instrumental methods of analysis.
4. To expose the students in practical aspects of the theoretical concepts.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Observe and analyse the geomorphology of a particular area
CO2:	Identify the geological disturbances in an area and can draw the cross-sections
CO3:	Identify the rocks present in the mining area which help to choose the mining method or plan
CO4:	Identify the minerals present in an area
CO5:	Apply the skills wherever required in the mining field

LIST OF EXPERIMENTS

1. Study of Important geomorphological models
2. Finding of attitude of beds by using clinometers/ Brunton compass
3. Identification of different types of folds and faults from block models
4. Simple geometrical problems on strike and dip
5. Study of Physical properties of rock forming minerals
6. Study of Physical properties of ore forming minerals
7. Megascopic studies of Igneous rocks
8. Megascopic studies of sedimentary rocks
9. Megascopic studies of metamorphic rocks
10. Study of Geological cross sections and geological maps

ADDITIONAL EXPERIMENTS

1. Geological cross sections and study of geological maps
2. Problems on water bearing properties
3. Problems on ore reserve estimation
4. Microscopic studies of common rock forming minerals

5. Microscopic studies of common ore forming minerals
6. Microscopic studies of igneous rocks
7. Microscopic studies of sedimentary rocks
8. Microscopic studies of metamorphic rocks
9. Study of fossils
10. Demonstration of crystal models

Text books:

1. A text book of Geology by G.B.Mahapatra
2. Principles of engineering geology by K.M.Bangar

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	3	3	1	-	-	3	1	2
CO2	3	3	3	2	3	2	1	-	-	3	1	3
CO3	2	2	2	3	2	3	1	-	-	3	1	2
CO4	2	3	2	3	2	2	1	-	-	3	1	3
CO5	3	2	3	2	2	2	1	2	-	3	1	2

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5 th Semester)			
Course Code 19160501	Mine Systems Engineering				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites: Mathematics-III		2	1	0	3

Course Objectives

1. To introduce the concept of operational research models and allocation.
2. To discuss transportation, assignment, sequencing and replacement concepts.
3. To elaborate the concept of games, waiting lines.
4. To impart the knowledge on inventory and break-even analysis.
5. To introduce the concepts of dynamic programming and simulation.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Solve the real-life problems on Linear programming and allocation
CO2:	Comprehend the transportation, assignment, sequencing and replacement concepts.
CO3:	Comprehend the concept of games, waiting lines.
CO4:	Comprehend and analyze inventory and break-even analysis.
CO5:	Solve dynamic programming problems and understand the concept of simulation.

Syllabus

UNIT - I

Introduction

Development, Definition, Characteristics and phases, Types of operation research models, Applications.

Linear Programming Problem

Linear programming problem formulation - Graphical solution - Simplex method - Artificial variables techniques - Two-phase method - Big-M method - Special cases: degeneracy, multiple optimal solution, infeasibility and unbounded solution, duality principle.

UNIT - II

Transportation Problems

Formulation - Initial and optimal solutions for balanced and unbalanced transportation problems - Degeneracy in transportation problems.

Assignment Problems

Formulation - Optimal solution - Variants of assignment problem - Traveling salesman problem.

Sequencing

Introduction, flow - Shop sequencing, n jobs through two machines, n jobs through three machines - Job shop sequencing, two jobs through 'm' machines.

UNIT - III

Replacement

Introduction - Replacement of items that deteriorate with time, when money value is not counted and counted, replacement of items that fail completely, group replacement.

Theory of Games

Introduction – Mini. max (max. mini) – Criterion and optimal strategy, solution of games with saddle points, rectangular games without saddle points, 2 x 2 games, dominance principle, m x 2 & 2 x n games, graphical method.

UNIT-IV**Waiting Lines**

Introduction - Single channel, Poisson arrivals, exponential service times, with infinite population and finite population models, multichannel, Poisson arrivals, Exponential service times with infinite population single channel Poisson arrivals.

Inventory Models

Introduction, Deterministic inventory models – Static economic order quantity models, Dynamic economic order quantity models - Probabilistic Inventory Models - Continuous review models, single period models and multi period models, P-System, Q-System.

UNIT -V**Dynamic Programming**

Introduction - Bellman's principle of optimality, applications of dynamic programming, capital budgeting problem, shortest path problem, linear programming problem.

Simulation

Definition, types of simulation models, phases of simulation, applications of simulation, inventory and queuing problems, advantages and disadvantages, simulation languages, problems on inventory and queuing models.

Text books

1. Operations Research, S. D. Sharma, Kedarnath, Ramnath & Co, 5th edition, 2008.
2. Operations Research -An Introduction, H.A. Taha., PHI, 8th edition, 2008.

Reference Books

1. Operations Research Theory & Applications, J. K. Sharma, Macmillan, 6th edition, 2013.
2. Operations Research, A.M. Natarajan, P. Balasubramani, A. Tamilarasi, Pearson Education, 2nd edition, 2014
3. Operations Research, Methods & Problems, Maurice Saseini, Arhur Yaspan & Lawrence Friedman, 1st edition, 1959
4. Operations Research, R. Pannerselvam, PHI Publications, 2nd edition, 2009.
5. Operations Research, S Kalavathy, Vikas Publishers, 4th edition, 2013.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5 th Semester)			
Course Code 19160502	Underground Metal Mining				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites: Development of Mineral Deposits		3	0	0	3

Course Objectives

1. To impart the knowledge on the terminology used in underground metal mining.
2. To elaborate about the development of a metal mine.
3. To discuss various raising methods used in underground metal mining
4. To expound different stoping methods and their applications.
5. To demonstrate the special stoping methods and their applications.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Comprehend the terminology used in underground metal mining, their scope and limitations.
CO2:	Analyze the mine development works in underground metal mine.
CO3:	Summarize the raising methods used in underground metal mining.
CO4:	Assess different stoping methods, their applicability with limitations.
CO5:	Discuss different special stoping methods, their applicability with limitations.

Syllabus

UNIT -I

Introduction to Metal Mining

Metal mining terminologies; Applicability; Scope and limitations of underground metal mining; Indian metal mining industry; Opening up of underground deposits.

UNIT -II

Metal Mine Development

Selection of a suitable mode of entry of deposit, different types of entry, factors effecting choice of mode of entry; Selection of level intervals, factors effecting it; Winzes; Haulage drifts; Cross-cuts drifts; Ore bin; Ore chute; Ore pass; Shaft station and their positions relative to ore body; Use of modern drilling and loading equipment in drifting.

UNIT -III

Raising Methods

Steps involved in –open raising by drilling, blasting, and mucking; Two and three compartmental raising, Jora raising, long hole drilling, Alimak raise climber, raise borers, applications and limitations.

UNIT -IV

Stoping Methods

Classification of stoping methods; Factors affecting selection of stoping methods; Stopping without supports: Open stopping, overhand, underhand, breast stoping; Sublevel stoping, room and pillar- their applicability, limitations, merits and demerits.

UNIT -V

Special Stoping Methods

Shrinkage stoping; Cut and fill stoping; Square set stoping; Long-hole stoping; V.C.R Stoping; Top slicing, sublevel caving and block caving- their applicability, limitations, merits and demerits.

Text books

1. D. J. Deshmukh, Elements of Mining Technology, Volume-II, Dennett & Co., 9th Edition, 2016.
2. Y. P. Chacharkar, A study of Metalliferous Mining methods, Lovely Prakashan, 1994.

Reference Books

1. Edited by Peter Darling, SME Mining Engineering Handbook Volume I & II, Published by Society for Mining, Metallurgy, and Exploration (U.S.), 2011.
2. Edited by Richard C. Bullock, Richard L. Bullock, W. A. Hustrulid, William A. Hustrulid, Underground Mining Methods Engineering Fundamentals and International Case Studies, Published by Society for Mining, Metallurgy, and Exploration, 2001.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5 th Semester)			
Course Code 19160503	Mine Ventilation				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite: Underground Coal Mining		2	1	0	3

Course Objectives

1. To elaborate underground mine atmosphere, its monitoring and control.
2. To familiarize about various mine heat sources and cooling systems.
3. To discuss about the types of natural and mechanical ventilation systems.
4. To inculcate about mine ventilation survey.
5. To impart the knowledge on the factors influencing mine ventilation.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Comprehend the mine atmosphere, monitoring and its control.
CO2:	Evaluate the various mine heat sources and cooling system in mines.
CO3:	Compare different types of natural and mechanical ventilation systems.
CO4:	Interpret and perform the mine ventilation survey.
CO5:	Predict the factors affecting mine ventilation and role of computers in mine ventilation.

Syllabus

UNIT - I

Mine Gases

Atmospheric air composition; Mine air composition and comparison; Mine gases-origin, occurrence, physiological effects, detection, monitoring and control, limitations and various damp; Methane layering; Degasification of coal seams; Sampling and testing of different gases using different detectors.

UNIT - II

Psychrometry

Mine heat load sources, heat stress and heat stress indices, design of mine cooling system.

Underground Dust

Generation, control, diseases, standards, instruments.

UNIT - III

Natural and Mechanical Ventilation

Production of natural Ventilation; Motive Column; Computation of NVP from air density; Centrifugal and axial flow fans- Construction, pressure developed, characteristic curves, series and parallel operation; Fan laws; Selection of mine fans; Evasee; Auxiliary ventilation; Booster fans.

UNIT - IV

Ventilation

Survey

Importance of ventilation survey; Air quantity survey; Van Anemometer; Standard of ventilation and permissible air velocities; Location of air measuring stations; Pressure quantity survey by U-tube manometer and inclined manometer.

UNIT-V

Mine Ventilation Planning

Factors influencing the mine ventilation; Location & size of ventilation shafts; Calculation of roadway resistance and pressure losses; Size of main fan; Computer assisted mine ventilation.

Text Books

1. D. J. Deshmukh, Elements of Mining Technology, Vol II, Denett & Co, 9th Edition, 2016.
2. G. B. Mishra, Mine Environment and Ventilation, Oxford University Press, 1986.

References Books

1. Howard L. Hartman, Mine ventilation and air conditioning, Wiley, 2012.
2. Vutukuri & Lama, Environmental Engineering in Mines, Cambridge University Press, Cambridge, 1986.
3. S. Ghatak, Mine Ventilation, Vol. – II, Coalfield Publishers, 1993.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IIIB. Tech. I Sem. (5 th Semester)			
Course Code 19160504	Mine Planning & Design				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites: Surface Mining, Development of Mineral Deposits		3	0	0	3

Course Objectives

1. To discuss the process of mine planning and stages of planning new mines.
2. To impart the knowledge of preparation of plan reports.
3. To elaborate the ventilation and infrastructure planning.
4. To familiarize with the concept of open-pit design.
5. To discuss about mine reclamation and corporate social responsibility in mining.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Comprehend and plan different stages in new mines.
C02:	Analyse and prepare different plan reports.
C03:	Interpret the design, planning of ventilation and infrastructure in mines.
C04:	Analyse the concept of open-pit design.
C05:	Comprehend the process of mine reclamation, rehabilitation and corporate social responsibility.

Syllabus

UNIT-I

Introduction to Mine Planning

Classification of industries; Process of planning; Cautions and essentials in planning; Mining industry in comparison to other industries; Planning adjusting to mineral policy; Selection of method of mining; mine site and entries; Stages of planning of new mines.

UNIT-II

Preparation of Plan Reports and Considerations in Planning

Different types of plans- long range, short range, intermediate and conceptual; Feasibility Report; Detailed project report; Conceptual plan report; Bankable feasibility report; Technical considerations, socio-economic considerations, restructuring planning, issues, challenges and future considerations in planning.

UNIT-III

Infrastructure Planning

Planning sequence; Mineral development process; Geological aspects; Division of mine lease area into mining units; Development of open cast and underground mines- Surface layouts, pit bottom layout; Planning of mineral handling plant; Introduction to ventilation planning.

UNIT-IV

Open pit Design

Concepts of mineral inventory: Block economic modeling; Concept of ultimate pit design: 2-Dimensional moving cone algorithm, Lerchs- Grossmann Algorithm.

UNIT-V

Mine Reclamation & Corporate Social Responsibility

Introduction to corporate social responsibility; Project Affected People (PAP); Reclamation & Rehabilitation; Socio-Economic Impact of Mining; Suggest ways and means for improving the Living Standard of locals; Corporate Social Responsibility (CSR), Initiatives & ways to improve corporate image in the mining sector.

Text books

1. J. Bhattacharya, Principles of Mine Planning, Allied Publishers Private Limited, 2016.
2. R D Singh, Principles and Practices of Modern Coal Mining, New Age Publishing, 2005.

Reference Books

1. S. P. Mathur, Mine Planning for Coal, M. G. Consultants, 1993.
2. W. Hustrulid and M. Kuchta, Open Pit Mine Planning and Design, CRC Press, 2013.
3. H. L. Hartman, SME Mining Engineering Handbook, Vol. I & II, Society for Mining, Metallurgy, and Exploration, 1992.
4. Rzhovsky, Open Cast Mining Unit Operations, Mir publishers, 1985.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IIIB. Tech. I Sem. (5 th Semester)			
Course Code 19160565A	Mine Transportation (Professional Elective-1)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite(s): Surface Mining, Underground Coal Mining, Underground Metal Mining		2	1	0	3

Course Objectives

1. To discuss the principles, operations and application of conveyors.
2. To illustrate about rope haulage and its application in mines.
3. To impart the knowledge in various locomotive haulage system and its applications.
4. To elaborate various winding systems and its applications in mines.
5. To expound skip and koepe winding systems in mines.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Assess the principles, operations and application of conveyors.
CO2:	Demonstrate different types of rope haulage and its applications.
CO3:	Identify various locomotive haulage systems.
CO4:	Demonstrate various types of winding systems in mine.
CO5:	Comprehend skip and koepe winding in mines.

Syllabus

UNIT -I

Conveyors

Different types of conveyors-shaker conveyor, belt conveyor, scraper chain conveyor & armored flexible conveyor and their principles of operation, application, merits and demerits; Capacity calculation; Recent developments- High Angle conveyors.

UNIT -II

Rope Haulage

Different types of rope haulage - description with suitability of these haulages and their applications & limitations, merits and demerits; Different types of safety devices on rope haulages including jazz rail, back catch, spring catch, drop warrick, inter-coupled stop block & runway switch, drags, tub retarder; Different types of rope clips, tub couplings; Size of rail sleepers & rail fastening, fish plates, ballast, Jim crow; Super elevation; Diamond crossing.

UNIT -III

Locomotive haulage

Types of locomotive; Battery diesel electric compressed air driven locomotives; Construction, limitation, operational features; Hazards and their prevention; Locomotive haulage calculation; Different types of locomotive haulage systems their application merits and demerits; Safety devices of diesel locomotives including flame trap and exhaust conditioner box.

UNIT -IV

Winding system

Function of headgear- height of headgear - different factors, design of headgear, headgear pulley, constructional features and angle of fleet.

Cage

Constructional features, cage suspension gear, detaching hook and its function, safety catches at head gear; Keps-props & guides used in mine shafts; Rigid and flexible guides, guide shoes, guide rope suspension & tensioning arrangement; Guide rope & winding rope changing.

UNIT -V**Skip & Koepe Winding**

Skip types & construction, pit top & pit bottom arrangements, advantages and disadvantages; Types of Koepe Winder, Koepe wheel; Two winders working in the same shaft; Different profile of winding drum- merits & demerits, attachment of winding rope to drum; Winding brakes - mechanical-post and calliper brake; Various safety devices on winding system including automatic contrivances for over wind.

Text books

6. N.T. Karelin, Mine transport. Orient Longmans, 1967.
7. D.J. Deshmukh, Elements of Mining Technology, Volume – III, Dennett & Co., 9th Edition, 2016.
8. S. Ghatak, Mine Pumps Haulage and Winding. Coalfield Publishers Skylark, 1995.

Reference Books

9. S. K. Das, Modern coal mining Technology
10. R. S Khurmi & J.K Gupta, Theory of Machines, Eurasia Publishing House, 2008.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5 th Semester)			
Course Code 19160565B	Mine Valuation (Professional Elective-1)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites: Development of Mineral Deposits, Surface mining		2	1	0	3

Course Objectives

1. To elaborate the economic importance of mineral industry.
2. To demonstrate various methods of mine valuation.
3. To impart the knowledge on economic feasibility of a mining project.
4. To discuss the methods of project evaluation.
5. To elaborate various sources of mine fund and cost control methods.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Appraise the economic importance of mineral industry.
CO2:	Distinguish the various methods of mine valuation.
CO3:	Evaluate the economic feasibility of a mining project.
CO4:	Summarize the methods of project evaluation.
CO5:	Infer various sources of mine fund and cost control methods.

Syllabus

UNIT -I

Introduction

Economic importance of mineral industry; Risky nature of the mining industry; Demand and Supply analysis; National mineral policy.

Mineral price and pricing

International monetary system; Factors affecting mineral price; Kinds of price quotation; Mineral price index; Mineral prices.

UNIT -II

Mine Economics

Time value of money; Annuity; Redemption of capital, Net present value; Depletion allowance; depreciation; Inflation; Escalation; Rates of return; Hoskold's two rate method.

UNIT -III

Mining Costs

Capital and operating costs; Factors affecting operating cost; Methods of estimating future costs; Standard cost and forecast; Budget and budgetary control.

UNIT -IV

Project Evaluation

Methods of project evaluation - payback, annual value, benefit/cost ratio, ERR and IRR; Evaluation of exploratory mining areas and operating mines; Mine project financing, its risks and constraints; Mine taxation; Critical impact of depreciation; Depletion; Type of funding; Reserves; Life on mine profitability.

UNIT -V

Mine Finance

Sources of mine funds - shares, debentures, fixed deposit, sinking fund, capital gearing, P & L account, balance sheet; Typical case studies of mine feasibility; Cost estimation of individual mining operations and overall mining cost; Cost control methods.

Text Books

1. R.T. Deshmukh, Mineral and Mine Economics, Myra Publications, Nagpur, 1986.
2. N. L. Sharma and Sinha, Mineral Economics, Oxford and IBH, 1992.

Reference Books

1. O.P. Khanna, Industrial Management, Dhanpat Rai and Sons, 1999.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5 th Semester)			
Course Code 19160565C	Rock Excavation Engineering (Professional Elective-1)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite: Drilling and Blasting		2	1	0	3

Course Objectives

1. To elaborate the concept of theory of rock breaking.
2. To discuss the rock properties related to rock excavation.
3. To impart the knowledge on rock cutting technology.
4. To demonstrate various rock cutting tools and their applications.
5. To educate about different rock excavation machines and their working.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Comprehend the rock breaking theory.
C02:	Summarize rock properties related to rock excavation.
C03:	Appraise the technology used in rock cutting.
C04:	Classify various rock cutting tools and their applications.
C05:	Compare various rock excavating machines.

Syllabus

UNIT -I

Introduction

Concept; Historical developments in rock excavation systems; Factors affecting the rock fragmentation; Mechanism of rock breakage and fracture, their application to rock fragmentation methods- explosive action, cutting, ripping and impacts.

UNIT -II

Rock properties

Rock properties related to excavation process; Application of compressive, tensile and tri- axial strengths; Index tests and abrasivity, anisotropy, elasticity, porosity; Laminations, bedding and jointing in rock fragmentation process.

UNIT -III

Rock cutting technology

Mechanism of drilling - rotary, percussive, rotary percussive; Mechanics of rock cutting, theory of single tool rock cutting; Crack initiation and propagation; Breakage pattern; Rock excavation by cutting action - picks, discs, roller cutters, water jet cutting; Methods of evaluation of drillability and cutability index of rocks.

UNIT -IV

Rock cutting tools

Rock cutting tool materials, different types, relative applications and their choice; Tool shape and size, specific energy consumption, tool wear; Effect of operational parameters on tool performance, maintenance and replacement of cutting tools of excavating machines.

UNIT -V

Rock excavating machines

Excavating machines, principles, operation, applicability and technical indices of road headers; TBM'S coalface machines and bucket wheel excavators.

Text books

1. Clark, G.B., Principles of Rock Fragmentation, John Wiley and Sons, New York, 1987.
2. Jimeno & Jimeno, Drilling & Blasting of rocks, CRC Press, 1995.

Reference Books

1. Hartman, H.L., Introductory Mining Engineering, John Wiley and Sons, New York, 1987
2. Chugh, C.P., Diamond Drilling, Oxford-IBH, 1984.
3. B.V. Ghokhle, Rotary, Drilling and Blasting in Large Surface Mines, CRC Press, 2010.
4. M. Rao, K.U., B.Mishra Principles of Rock Drilling, Oxford & IBH, New-Delhi, 1999.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5 th Semester)			
Course Code 19160565D	Advanced Coal Mining (Professional Elective-1)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite: Development of Mineral Deposits, Underground Coal Mining		2	1	0	3

Course Objectives

1. To elaborate the concept of coal face mechanization.
2. To discuss thick seam mining.
3. To impart the knowledge on hydraulic mining technology.
4. To demonstrate variants in longwall mining and their applications.
5. To educate about underground coal gasification.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Comprehend the coal face mechanization.
C02:	Summarize the problems associated with thick seam mining.
C03:	Appraise the technology used in hydraulic mining.
C04:	Classify various longwall mining methods and their applications.
C05:	Comprehend underground coal gasification.

Syllabus

UNIT -I

Coal Face Mechanization

Recent Trends, mechanized bord and pillar mining, case studies.

UNIT -II

Mining of Thick Seams

Problems; Past experiences in India; Current methods; Mining of thick, contiguous, and steep seams.

UNIT -III

Hydraulic Mining

Applicability, operating parameters, equipment, layouts, Indian experience; Computer applications such as remote control and environmental monitoring in hydraulic mining.

UNIT -IV

Longwall Mining

Powered supports, development of powered supports, their types and designs, selection for different conditions, last drivages for longwall paneling, remotely operated powered support and longwall faces, Indian experiments, salvaging in longwall.

UNIT -V

Underground Coal Gasification

Scope, application, methods of gasification, design of gasification plants, coal bed methane; Environmental monitoring techniques and computer applications in coal gasification techniques.

Text books

1. Das S.K., Modern Coal Mining Technology, Lovely Prakashan, Dhanbad, 1994.

2. Singh, T.N., and Dhar, B.B. Thick Seam Mining, Problems and Issues, Oxford & IBH Publishers, 1992.

Reference Books

1. Mathur, S.P., Mining Planning for Coal, M G Consultants, Bilaspur, 1993.
2. Peng S.S. and Chiang, H.S., Longwall Mining, John Willey and Sons, New York, 1992.
3. T.N. Singh, Underground Winning of Coal, Oxford IBH Publishers, 1999.
4. R.D. Singh, Principles and Practices of Modern Coal Mining, New Age International, 1997.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5 th Semester)			
Course Code 19160565E	Environmental Pollution and Control in Mines (Professional Elective-1)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite(s): Environmental studies		2	1	0	3

Course Objectives

1. To discuss about the air pollution in mines
2. To enlighten about water pollution in mines.
3. To elaborate about noise pollution in mines.
4. To impart the knowledge on the biological land reclamation.
5. To inculcate about the environmental administration in India.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Assess air pollution in mines.
CO2:	Comprehend water pollution in mines.
CO3:	Appraise the importance of noise pollution in mines.
CO4:	Perform the biological land reclamation
CO5:	Perceive the basic information required for the preparation of environmental impact assessment and environmental management plan.

Syllabus

UNIT-I

Air Pollution

Definition; Atmospheric consideration; Basic of metrology; Ozone layer and greenhouse effect; Contaminant dispersion; Sources of air pollution in mines; Effect of air pollution; Preventive measures of air pollution in mines.

UNIT II

Water Pollution

Sources of water pollutants; Effect of water pollution; Water pollution modeling-Surface water; Biological oxygen demand modeling; Oxygen demanding waste in streams; Chemical oxygen demand; Ground water and its contamination; Acid mine drainage; Waste water treatment.

UNIT III

Noise Pollution

Sources of noise pollution in mines; Effect of noise pollution; Measurement of noise; Noise standard and guidelines; Control measures of noise pollution; Noise induced hearing loss; Sound pressure and sound pressure level; Noise dose.

UNIT IV

Land Degradation

Causes of land degradation; Impact of mining activities on land; Land reclamation method-rehabilitation, reclamation, restoration; Factor affecting the land restoration; Land reclamation planning.

UNIT V

Socio Economics Impact

Impact on society; Case studies on socio economics impact; Legislation relating to environmental protection; Visual impact due to mining; Environmental impact assessment.

Text Books

1. C.G. Down., J. Stock, Environmental Impact of Mining, Applied Science Publishers Ltd. London, Second Edition, 1980.
2. B. B. Dhar, Mining and Environment, Ashish Publishing House, New Delhi, 1986.

Reference Books

1. R. Rajagopalan, Environmental Studies, OUP, India, Third Edition, 2011.
2. Lawrence D.P., Environmental Impact Assessment - Practical solutions to recurrent problems, Wiley - Interscience, New Jersey, 2003.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	II B.Tech. II Sem (4 th semester)			
Course Code	Robotics (Open Elective-I)				
Teaching	Total contact hours-52	L	T	P	C
Prerequisite(s): Kinematics of machines /Dynamics of machines /Mathematics: Matrices, Differential Equations		3	0	0	3

Course Objectives:

- To acquire the knowledge on advanced algebraic tools for the description of motion.
- To develop the ability to analyze and design the motion for articulated systems.
- To develop an ability to use software tools for analysis and design of robotic systems.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Identify various robot configuration and components.
CO2:	Select appropriate actuators and sensors for a robot based on specific application.
CO3:	Solve kinematic and dynamic problems for simple serial kinematic chains.
CO4:	Plan trajectory for a manipulator for avoiding obstacles.
CO5:	Develop programming principles and languages for a robot control system

Syllabus:**UNIT-I**

INTRODUCTION: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – Present and future applications – Classification by coordinate system and control system. Robot applications in manufacturing

UNIT-II

COMPONENTS OF THE INDUSTRIAL ROBOTICS: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT-III

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation – problems. **MANIPULATOR KINEMATICS:** Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

UNIT-IV

Differential transformation and manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formulations – Problems.

UNIT-V

General considerations in path description and generation, Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion – Robot programming, languages and software packages-description of paths with a robot programming language.

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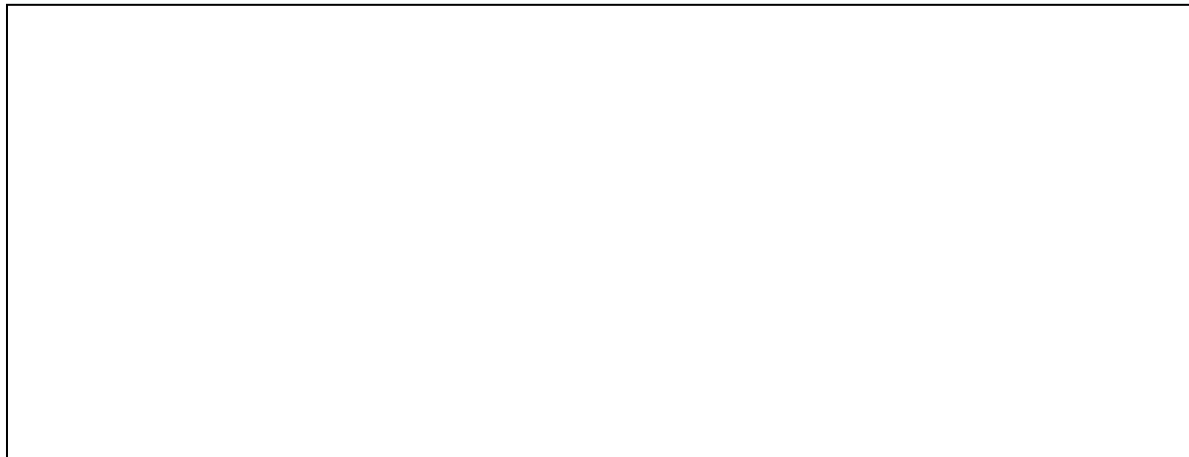
ROBOT ACTUATORS AND FEED BACK COMPONENTS: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors.

Text Books:

1. Industrial Robotics, Groover M P, Mitchell Weiss, Roger N. Nagel, Tata McGraw-Hill, India, edition-3, 2008 / Pearson Education.
2. Introduction to Robotics, SK Saha, Tata McGraw-Hill, India

References:

1. Robotics K .S. Fu, R.C. Gonzalez, C.S.G. Lee , Tata McGraw-Hill, India, edition-2, 2008.
2. Robotic engineering: an integrated approach, Richard David Klafter, Thomas A. Chmielewski, Michael Negin, Prentice Hall, 1989.
3. Robotics and Control R K & Nagrath I J / Tata McGraw-Hill, India, edition, 2003.



Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5 th Semester)			
Course Code 19163566a	Information Security (Open Elective-2)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Basic Concepts of Computer Science and Security Systems		3	0	0	3

Course Objectives

1. Confidentiality, integrity, and availability and these are the three main objectives of information security
2. Principal concepts, major issues, technologies, and basic approaches in information security.
3. Foundation for understanding the key issues associated with protecting Computer Systems & Information Assets.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Evaluate vulnerability of an information system and establish a plan for risk management.
CO2:	Demonstrate basic principles of Web application security
CO3:	Evaluate the authentication and encryption needs of an information system.
CO4:	Demonstrate how to secure a network and Evaluate a company's security policies and procedures

Syllabus

UNIT - I

Introduction to Information Security

Introduction to Information Security, Need for Security - Threats to security & Attacks, Computer System Security and Access Controls - System access and data access.

UNIT -II

Communication Security

Introduction to cryptography, cryptosystems, Encryption & Decryption Techniques - classical encryption techniques, communication channel used in cryptographic system, various types of ciphers, Cryptanalysis, Hash function and Data integrity, Security of Hashing function.

UNIT-III

Network

Introduction to Network Security, Email Security, IP Security, Web Security, Kerberos, X.509 techniques.

UNIT-IV

Scanning & Enumeration Technology

Malicious software's, Firewalls, Honey pots, Intrusion Detection system, Intrusion Prevention system

UNIT-V

Ethics in Information Security

Implementing Information Security, Legal Ethical & Professional issues in Information Security.

Text Books

1. Matt Bishop, "Computer Security: Art and Science", Addison-Wesley Professional, First Edition, 2003. ISBN: 0201440997.
2. William Stallings, "Cryptography and Network Security", Pearson Education, Fourth Edition, 2006. ISBN: 8177587749

References

1. Michael E. Whitman, Herbert J. Mattord, "Principles of Information Security" Cengage Learning, Fourth Edition, 2010, ISBN: 1111138214
2. Charlie Kaufman, Radia Perlman, Mike Speciner, "Network security: private communication in a public world", Second Edition, ISBN: 0130460192.
3. Dieter Gollmann, "Computer Security", Third Edition, ISBN: 0470741155.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5 th Semester)			
Course Code 19163566a	Energy Management (Open Elective-2)				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisite(s): MEFA, Mathematics		3	0	0	3

Course Objectives

1. To provide students with a general awareness on the importance of energy and its conservation.
2. To provide students on its impact on society, various energy sources.
3. To provide students on energy conversion processes, energy management.
4. To provide energy audit and energy conservation measures.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	The students shall have an understanding of the impact of energy on society.
CO2:	The need for sustainable energy, global and Indian energy policies.
CO3:	They would have gained knowledge on various techniques of energy management and conservation.
CO4:	They would also have gained the basic ideas of conducting an energy audit.

Syllabus

UNIT-I

Energy Resources: Energy conversion processes and devices Energy conversion plants - Conventional - Thermal, Hydro, and Non - conventional - Solar, Wind Biomass, Fuel cells, Energy from waste.

UNIT-II

Energy storage and Distribution - Electrical energy route - Load curves - Energy conversion plants for Baseload, Intermediate load, Peak load and Energy displacement - Energy storage plants. Energy Scenario - Global and Indian - Impact of Energy on economy, development and environment, Energy policies, Energy strategy for future.

UNIT-III

Energy Management - Definitions and significance - objectives - Characterising of energy usage - Energy Management program - Energy strategies and energy planning Energy Audit - Types and Procedure - Optimum performance of existing facilities - Energy management control systems - Computer applications in Energy management

UNIT-IV

Energy conservation - Principles - Energy economics - Energy conservation technologies - cogeneration - Waste heat recovery - Combined cycle power generation - Heat Recuperators - Heat regenerators - Heat pipes - Heat pumps - Pinch Technology.

UNIT-V

Energy Conservation Opportunities - Electrical ECOs - Thermodynamic ECOs in chemical process industry - ECOs in residential and commercial buildings - Energy Conservation Measures.

Text Books

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online)
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-3, Electrical Utilities (available online)
3. S. C. Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1991. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

Reference Books

1. Amlan Chakrabarti, Energy Engineering and Management, Prentice Hall India, 2011.
2. Eastop T. D. and D. R. Croft, Energy Efficiency for Engineers & Technologists, Longman, 1990.
3. Albert Thumann P. E. and W. J. Younger, Handbook of Energy Audits, Fairmont Press, 2008.
4. Doty S. and W. C. Turner, Energy Management Handbook, 7/e, Fairmont Press, 2009.
5. Rao S. and B. B. Parulekar, Energy Technology, Khanna Publishers, 2005.
6. Rai G. D., Non-conventional Energy Sources, Khanna Publishers, 2011.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 th Semester)			
Course Code	DIGITAL IMAGE PROCESSING (Open Elective-II)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites: Knowledge of Signals and Systems, Digital Signal Processing		3	-	-	3

Course Objectives:

1. To understand the fundamental concepts and applications of Image Processing.
2. To understand the concepts of Intensity Transformations and Spatial Filtering.
3. To understand Image Restoration and Reconstruction.
4. To understand the concepts of Color image processing.

On Completion of the course, students will be able to	
CO1:	Understand the fundamental steps in digital image processing.
CO2:	Examine various types of images, intensity transformations and spatial filtering.
CO3:	Develop Fourier transform for image processing in frequency domain.
CO4:	Evaluate the methodologies for image restoration and segmentation.
CO5:	Understand color image processing models

UNIT-1 Digital Image Fundamentals

Fundamental steps in DIP, Components of digital image processing, Elements of visual perception, Structure of the human eye, Image formation in the eye, Brightness adaptation and discrimination, Image sensing and acquisition, Sampling and quantization of images, Representation of digital image, Spatial and gray level resolution, zooming and shrinking, some basic relationships between pixels.

UNIT-2 Image Enhancement in the Spatial Domain

Gray Level Transformations, Piecewise linear transformation, Histogram Processing, Enhancement Using Arithmetic/Logic Operations. Basics of Spatial Filtering, Smoothing and Sharpening Spatial Filters, Use of first order and second order derivative in enhancement.

UNIT-3 Image Enhancement in the Frequency Domain

Two-dimensional Fourier Transform, some properties of the 2-D Discrete Fourier transform,



correspondence between filtering in spatial and frequency domain, Smoothing and Sharpening frequency domain filters, Homomorphic Filtering.

UNIT-4 Image Restoration

A model of the image Degradation/Restoration process, Noise models, Restoration in the presence of noise only - Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear Position Invariant Degradations, Estimation of the degradation function, Inverse filtering, Minimum mean square error(Wiener) filtering.

UNIT-5 Color Image Processing

Color Fundamentals, Color Models, Pseudo color Image Processing.

Text Books:

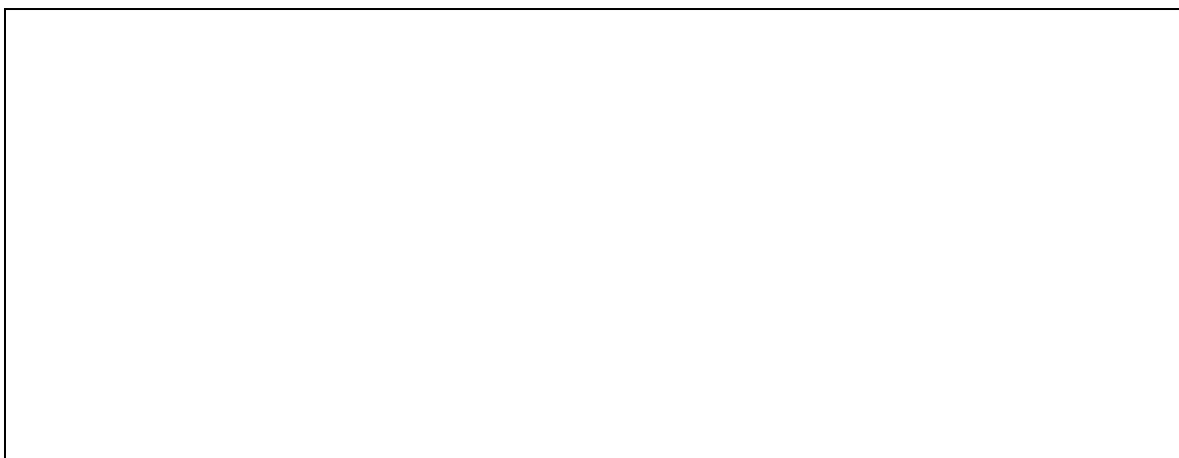
1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Anil K.Jain, "Fundamentals of Digital Image Processing". Prentice Hall of India, 9th Edition, Indian Reprint, 2002.

Reference Books:

1. B. Chanda and D. Dutta Majumdar, "Digital Image Processing and Analysis" PHI, 2003.
2. R. C. Gonzalez, R. E. Woods and Steven L. Eddins, Digital Image Processing Using MATLAB, 2nd edition, Prentice Hall, 2009.
3. Jayaraman, S. Esakkirajan, and T. Veerakumar, Digital Image Processing, Tata McGraw-Hill Education, 2011.

Web Links:

1. NPTEL online courses.
2. MOOCS online courses by JNTUK.



Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 semester)			
Course Code 19110661	SOLID WASTE MANAGEMENT (OPEN ELECTIVE-II)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Basics of Waste and Environmental Engineering		3	0	0	3

Course Objective:

- To impart the knowledge the methods of collection and optimization of collection routing of municipal solid waste.*
- To acquire the principles of treatment of municipal solid waste*
- To know the impact of solid waste on the health of the living beings*
- To learn the criterion for selection of landfill and its design*
- To plan the methods of processing such as composting the municipal organic waste.*

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Understand the Objects of Solid waste management
CO2	Understand the elements of Solid waste management
CO3	Design the Transportation facility in Solid waste management
CO4	Characterise the solid waste and design a composting facility
CO5	Know the criteria for selection of landfill

Syllabus:**Unit – I**

Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste - Factors Influencing generation of solid waste - sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities.

Unit – II

Basic Elements in Solid Waste Management: Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste

Collection of Solid Waste: Type and methods of waste collection systems, analysis of collection system - optimization of collection routes– alternative techniques for collection system.

Unit – III

Transfer and Transport: Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements.

Separation and Transformation of Solid Waste: unit operations used for separation and transformation: shredding - materials separation and recovery, source reduction and waste minimization.

Unit – IV

Processing and Treatment: Processing of solid waste – Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

Unit – V

Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

Text Books:

1. George Tchobanoglous “Integrated Solid Waste Management”, McGraw Hill Publication, 1993.

References:

1. Vesilind, P.A., Worrell, W., Reinhart, D. “Solid Waste Engineering”, Cenage learning, New Delhi, 2004
 2. Charles A. Wentz; “Hazardous Waste Management”, McGraw Hill Publication, 1995.
- Web-Resources: www.nptel.com

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5 th Semester)			
Course Code	HYBRID AND ELECTRIC VEHICLES (Open Elective-II)				
Teaching	Total contact hours- 48	L	T	P	C
Prerequisite(s): Basic Automobile Engineering, Automotive Engines		3	0	0	3

COURSE OBJECTIVES

1. Analyzing various aspects of hybrid and electric drive trains such as their configuration, types of electric machines that can be used, energy storage devices, etc.
2. Get exposed to research and development challenges involved in various types of fuel cells.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Operate of fuel cell technology
CO2:	Identification of fuel based vehicles
CO3:	Determination of hybrid electric technology and electronic drive trains
CO4:	Construction of hybrid electric vehicles
CO5:	Construction of hybrid vehicle technology

Syllabus:

UNIT I

ELECTRIC DRIVETRAINS: Basic concept of electric traction, introduction to various electric drive-train topologies. Electric Propulsion unit: Introduction to electric components used in electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives.

UNIT II

HYBRID ELECTRIC TECHNOLOGY: Impact of modern drive-trains on energy supplies. Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT III

HYBRID VEHICLE TECHNOLOGY: Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, supporting subsystems. Energy



Management Strategies in hybrid and electric vehicles, Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

UNIT IV

HYBRID ELECTRIC VEHICLES: Principles of Hybrid Electric Drive trains, Architectures – Electrical distribution, Hybrid control Strategies – Parallel Hybrid, Series Hybrid - Practical Models – Toyota Prius, Honda Insight. Heavy Vehicles Hybrid Electric Heavy Duty Vehicles.

UNIT V

FUELCELL TECHNOLOGY : Structures, Operations and properties of Fuel cells – (Phosphoric Acid Fuel cell, Proton Exchange membrane Fuel cell, Direct Methanol fuel cell Alkaline Fuel Cells, Solid Oxide Fuel Cell, Molten Carbonate Fuel Cell)

FUEL CELL BASED VEHICLES STRUCTURE: PEMFC: Operating principle, DMFC: Operating principle

TEXT BOOKS

1. Basu .S, "*Recent Trends in Fuel cell Science and Technology*", Anamaya Publishers, New Delhi.,2007.
2. Viswanathan, B. and AuliceScibioh, M., "*Fuel Cells Principles and Applications*", Universities Press (India) Pvt. Ltd., Hyderabad, 2006.

REFERENCES

1. Larminie, J. and Dicks, A., "*Fuel Cell Systems Explained*" John Wiley & Sons, Ltd., New York, 2001.
2. Ali Emadi, MehrdadEhsani, John M. Muller, "*Vehicular Electric Power Systems*", Marcel Dekker, Inc., 2004.



Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5 th Semester)			
Course Code 19163566a	Disaster Management in Mining (Open Elective-2)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites: Nil		3	0	0	3

Course Objectives

1. To elaborate the concepts of hazard and disaster.
2. To impart the knowledge on classification of hazards and their consequences.
3. To discuss the approaches and measures in disaster management.
4. To elaborate different disaster management techniques.
5. To impart the knowledge on disaster management in India.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Comprehend the concepts of hazard and disaster management.
CO2:	Assess the types of hazards and their consequences.
CO3:	Comprehend the approaches and measures in disaster management.
CO4:	Distinguish various techniques in disaster management.
CO5:	Comprehend the statutory provisions related to disaster management in India.

Syllabus

UNIT I

Concept of Hazards and Disasters

Concept of environmental hazards, environmental disasters; Different approaches & relation with human ecology - landscape, ecosystem and perception approach, human ecology & its application in geographical researches; Natural hazards and disasters - Man induced hazards & disasters - Natural hazards- Planetary hazards/ disasters- Endogenous hazards - Exogenous hazards.

UNIT II

Classification of Hazards

Volcanoes- volcanic hazards/ disasters, causes and distribution of volcanoes, hazardous effects of volcanic eruptions, environmental impacts of volcanic eruptions; Earthquake Hazards/ disasters, causes of earthquakes, distribution of earthquakes, hazardous effects of earthquakes, earthquake hazards in India, human adjustment, perception & mitigation of earthquakes; Landslides- causes and impacts; Avalanches-causes and impacts; Infrequent events: Cyclones- Lightning- Hailstorms, cyclones: Tropical cyclones & Local storms- Destruction by tropical cyclones & local storms-causes, distribution human adjustment, perception & mitigation; Floods, droughts and their impacts.

UNIT III

Approaches and Measures in Disaster Management

Emerging approaches; Pre- disaster stage-preparedness, emergency stage, post disaster stage-Rehabilitation provision of immediate relief measures to disaster affected people; Prediction of hazards & disasters; Measures of adjustment to natural hazards.

UNIT IV**Disaster Management**

Meteorological observatory; Seismological observatory; Hydrology laboratory; Industrial safety inspectorate; Institution of urban & regional planners; Chambers of architects; Engineering council; National standards committee; Integrated planning- Contingency management; Preparedness - Education on disasters; Community involvement; Adjustment of human population to natural hazards & disasters; Role of media monitoring management- Discuss the programme of disaster research & mitigation of disaster by different organizations.

UNIT V**Disaster Management in India**

Ecological planning for sustainability & sustainable development in India; Sustainable rural development: A remedy to disasters; Role of panchayats in disaster mitigations; Environmental policies & programmes in India; Institutions & National centers for natural disaster reduction, NDRF, NDMA and other related organizations; Environmental Legislations in India, awareness, conservation movement, education & training; Recent disasters in India.

Text books

1. Jagbirsingh, Disaster management – Future challenges and opportunities, I.K. International publishing house, 1st edition, 2005.
2. Coppala P Damon, Introduction to International Disaster management, ABD publishers, 2007.

Reference Books

1. R. B. Singh, Environmental Geography, Heritage Publishers, New Delhi, 1st edition, 1990.
2. Kates, B.I& White. G.F, The Environment as Hazards, Oxford publishers, 5th edition, New York, 1978.
3. R.B. Singh, Disaster Management, Rawat Publication, New Delhi, 1st edition, 2000.

GRBT19	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech.			
CourseCode	CONSTITUTION OF INDIA (Common To All Branches)				
Teaching	Totalcontacthours-48	L	T	P	C
		3	0	0	0

Course Objectives:

1. To Enable the student to understand the importance of constitution
2. To understand the structure of executive, legislature and judiciary
3. To understand philosophy of fundamental rights and duties
4. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
4. To understand the central and state relation financial and administrative.

Course outcomes:

On Completion of the course, the students will be able to-	
CO1:	Understand historical background of the constitution making and its importance for building a democratic India.
CO2:	Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
CO3:	Understand the value of the fundamental rights and duties for becoming good citizen of India.
CO4:	Analyze the decentralization of power between central, state and local self-government.
CO5:	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions .

UNIT III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions



UNIT VI

Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Panchayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT V

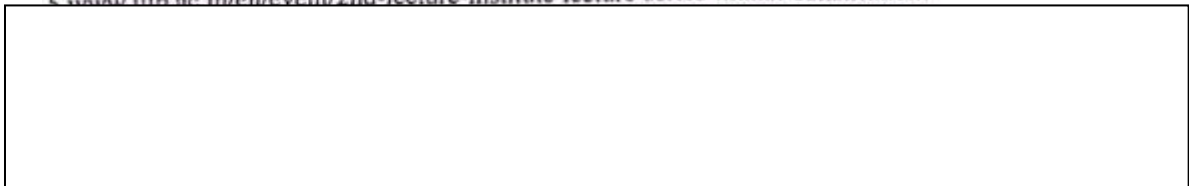
Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission; Functions of Commissions for the welfare of SC/ST/OBC and women.

References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd., New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M. Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd., New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

Web Links:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution



Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5 th Semester)			
Course Code 19160511	Mine Ventilation Laboratory				
Teaching	Total contact hours - 36	L	T	P	C
Prerequisites: Mine Ventilation, Underground Coal Mining		0	0	3	1.5

Course Objectives

1. To elaborate underground mine atmosphere, its monitoring and control.
2. To familiarize about various mine heat sources and cooling systems.
3. To discuss about the mine ventilation systems.
4. To demonstrate about mine ventilation survey.
5. To impart the knowledge on the various flame safety lamps.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Comprehend the mine atmosphere, monitoring and its control.
CO2:	Evaluate the various mine heat sources and cooling system in mines.
CO3:	Compare different types of natural and mechanical ventilation systems.
CO4:	Interpret and perform the mine ventilation survey.
CO5:	Perform the tests using various flame safety lamps.

List of Experiments

1. Study of multi gas detector for measuring mine gasses.
2. Detection of Carbon monoxide (CO) by CO detector.
3. Detection of Methane (CH₄) by Methanometer.
4. Study of flame safety lamp.
5. Detection of Methane by flame safety lamp.
6. Detection of Carbon dioxide (CO₂) by flame safety lamp.
7. Determination of cooling power by Kata thermometer.
8. Study of ventilation control devices.
9. Determination of relative humidity of mine air by Whirling hygrometer.
10. Determination of air quantity by vane anemometer.
11. Determination of air pressure (mine & duct) by inclined manometer.
12. Determination of air pressure (mine & duct) by pitot tube.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5 th Semester)			
Course Code 19160512	Mine Planning & Design Laboratory				
Teaching	Total contact hours - 39	L	T	P	C
Prerequisites: Surface Mining, Development of Mineral Deposits		0	0	3	1.5

Course Objectives

1. To discuss the process of mine planning and stages of planning new mines.
2. To impart the knowledge of preparation of plan reports.
3. To elaborate the ventilation and infrastructure planning.
4. To familiarize with the concept of open-pit design.
5. To discuss about the production calculations of different machinery used in mines.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Comprehend and plan different stages in new mines.
C02:	Analyse and prepare different plan reports.
C03:	Interpret the design, planning of ventilation and infrastructure in mines.
C04:	Analyse the concept of open-pit design.
C05:	Calculate the production obtained by using various machinery in mines.

List of Experiments

1. Assessment of stripping ratio in mines.
2. Estimation of powder factor in an underground mine.
3. Estimation of powder factor in an open cast mine.
4. Production calculation of an opencast mine using shovel-dumper combination.
5. Production calculation of an opencast mine using a Dragline.
6. Study of production operations of LHD & SDL in UG mines.
7. Study of production operations of a surface miner in OC mines.
8. Assessment of production operations of continuous miner in UG mines.
9. Study of pillar load and factor of safety.
10. Study of ventilation systems for Board & Pillar method.
11. Preparation of different feasibility reports.
12. Design of pit angle for OC mine.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IIIB. Tech. I Sem. (5 th Semester)			
Course Code 19160521	Mini Project-1/Study Project/Internship				
Teaching	Total contact hours - Nil	L	T	P	C
Prerequisite:		0	0	0	2

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IIIB. Tech. II Sem. (6 th Semester)			
Course Code 19160601	Rock Mechanics				
Teaching	Total contact hours - 55	L	T	P	C
Prerequisites: Underground Coal Mining, Surface mining		2	1	0	3

Course Objectives

1. To discuss the importance of rock mechanics and physio-mechanical properties of rock.
2. To expound various stresses and strains in rocks.
3. To illustrate the different insitu stress measurement techniques and geophysical investigation methods.
4. To impart the knowledge on different rock mass classification and rock failure criterion.
5. To inculcate about various slope failures and their stabilization techniques.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Appraise the importance of rock mechanics and physio-mechanical properties of rock.
CO2:	Analyse the stress-strain in rocks.
CO3:	Outline insitu stress measurement techniques and geophysical investigation methods.
CO4:	Differentiate among various rock mass classifications and rock failure criterion.
CO5:	Analyse the various modes of slope failure and its stabilization techniques.

Syllabus

UNIT -I

Introduction

Definition, importance and application of rock mechanics in mining; Classification of rock; Defects in rock mass.

Physio-Mechanical Properties of Rock

Determination of physio-mechanical properties of rock as per ISRM standard testing procedures; Strength indices and their importance.

UNIT -II

Analysis of Stress and Strain

Analysis of stress and strain in two & three dimensions, principal stresses and strain, stress ellipsoid and stress director's surface; principal stress strain invariants; Determination of maximum shear stress; Octahedral stresses; Differential equilibrium equations; Compatibility equation of stress and strains; Stress concentration around underground openings.

UNIT -III

In-situ stress measurement

In-situ stress- various methods of stress measurement, hydro-fracturing technique, flat jack technique; Field shear test; Deformability tests in rock mass.

Geophysical Investigation

Electric resistivity method, seismic refraction method; Subsidence and its importance; Dynamic properties of rocks; Anisotropy and creep; Rheological models.

UNIT -IV**Rock Mass Classification**

Classification of rock mass, importance of rock mass classification, parameters of rock mass classification; RQD, Q-system and Bieniaswsky's Geo-mechanics classification of rock mass; Rock Mass Rating (RMR), Laubscher's- MRMR, Rock Structure Rating (RSR) system; Terzaghi Rock load theory, Hoek's-GSI.

Theories of Rock Failure

Coulomb, Mohr and Griffith criteria, empirical formula.

UNIT -V**Influence of water on rock**

Influence of water on rock, permeability of rocks, measurement of permeability.

Slope Stability

Mode of slope failure- plane failure, wedge failure, toppling failure, circular failure and stabilization and protection methods.

Text books

1. Dr. B.P. Verma, Rock Mechanics for Engineers, Khanna Publishers, 4th Edition, 1998.
2. Debasis Deb, Abhiram Kumar Verma, Fundamentals and Application of Rock Mechanics, Prentice Hall India Private Ltd, 2016.

Reference Books

1. J.C. Jeager and N.G.W. Cook, Fundamentals of rock mechanics, Chapman and Hall, 1979.
2. R.E Goodman, introduction to rock mechanics, John Wiley and sons, 2006.
3. V.S Vutukuri and K. Katsuyama, Introduction to rock mechanics, Industrial publishing & Consulting Inc, Tokyo, 1994.
4. B.H. G Brady and E. T. Brown, Rock mechanics for underground mining, George Allen And Unwin Ltd, 1979.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IIIB. Tech. IISem. (6 th Semester)			
Course Code 19160602	Mineral Processing				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites: Chemistry, Geology		2	1	0	3

Course Objectives

1. To impart the knowledge on various sampling methods.
2. To discuss about the settlement of solids.
3. To expound the beneficiation operations and its applications.
4. To impart the knowledge on unit operations.
5. To illustrate about the efficiency of operations in mineral processing industries.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Comprehend various sampling methods.
CO2:	Classify and explain the settling of solids.
CO3:	Appraise the beneficiation process and its applications.
CO4:	Distinguish the various unit operations.
CO5:	Comprehend and analyze the efficiency of operations in mineral processing industries.

Syllabus

UNIT - I

Introduction to Mineral Engineering

Sampling and sampling methods; Particle size determination - Test sieves, laboratory sizing methods, graphical representation, sub sieve Sizing; Industrial screening, screen surfaces, types of industrial screens; Dry and wet screening, factors effecting rate of screening; screen efficiency; Liberation; Comminution - Laws of comminution; Reduction ratio; Classification of crushers, description and characteristics; Grinding - Ball, rod, tube mills; Methods of feeding and discharge; Theory of ball mill, critical speed; Open and closed circuit grinding; Circulating load; Wet and dry grinding.

UNIT-II

Settling of Solids

Density - Pulp density, percentage of solids, dilution ratio, settling of solids in fluids, stoke's and newton's laws, terminal velocity, free and hindered settling, equal settling particles Settling ratio; Principles of Classification - Sizing and sorting classifiers; Hydro cyclone Construction and operation, d50 - Design and operating variables; Classification as a means of concentration.

UNIT - III

Beneficiation Operations

Gravity concentration, concentration criterion, float and sink, HMS, heavy media cyclone; Jigging, principles and methods, types of Jigs, applications, flowing film concentration; Basic principles of tabling, shaking tables, operation and applications; Flotation, natural and acquired

floatability, frothers, collectors, modifying agents and their action in flotation; Froth flotation and its mechanism, factors effecting the flotation, flotation applications.

UNIT - IV

Unit Operations

Magnetic separation, types of separators, dry and wet, low and high intensity magnetic separators, HGMS, applications; Electrical separation; Electrostatic and high-tension separators; Separation of solids from fluids, flocculation; Thickening, industrial thickeners; Filtration and its mechanism, types of filters, dust control.

UNIT - V

Metallurgical Efficiency

Materials handling operations, Storage; Ore testing; Role of ore microscope in mineral processing, processing flow sheets for common minerals; Ratio of concentration; Ratio of enrichment; Recovery, rejection losses; Efficiency of a concentrating operation, metallurgical efficiency.

Text Books

1. Dr. D. V. Subba Rao, Mineral Beneficiation - A Concise Basic Course, Taylor & Francis, 2011.
2. B. A. Wills and D.W. Hopkins, Mineral Processing Technology, Elsevier Science, 3rd Edition, 2013.

Reference Books

1. Dr. D. V. Subba Rao, T. Gouricharan, Coal Processing and Utilization, CRC Press, 2016.
2. O. P. Gupta, Elements of Fuels, Furnaces & Refractoriness, Khanna Publishers, 1997.
3. V. V. Ramana Murthy, Operational Hand book of Mineral Processing, Denett & Co. Publication, 2nd Edition, 2014.
4. Barry A. Wills and James Finch, Mineral Processing Technology, Elsevier Science, 8th Edition, 2015.
5. M. R. Pryor, Mineral Processing, Elsevier applied science publishers, 3rd Edition, 2012.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. II Sem. (6 th Semester)			
Course Code 19160603	Mineral Economics				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites: Underground Coal Mining, Underground Metal Mining, Surface Mining		2	1	0	3

Course Objectives

1. To impart the knowledge on National Mineral Policy and mineral conservation.
1. To educate on the mineral taxation laws and pricing mechanism of minerals.
2. To discuss about various sampling methods.
3. To elaborate the different methods of mineral resource estimation.
4. To enlighten about different parameters to be considered in mine finance.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Summarize the various policies, acts and conservation rules on minerals.
CO2:	Analyze the mineral taxation laws and pricing mechanism of minerals.
CO3:	Interpret various sampling methods.
CO4:	Estimate the reserves using various estimation methods.
CO5:	Analyze the mine finance and model optimum size of mine.

Syllabus

UNIT-I

Mineral resources and policies

Classification of mineral resources: indicated, inferred, proved; various mineral classification systems National mineral resources; National mineral policy; Strategies for a development of mining industry; resource conservation;

UNIT-II

Trade and taxation on minerals

Mineral taxation, District Mineral Fund (DMF), royalty and subsidies; Mineral imports & Exports; Supply-demand of minerals; Pricing mechanism of minerals.

UNIT-III

Mine Sampling

Theory of sampling, method of sampling employed in different cases, precaution to be taken, errors that occur during sampling; numerical problems on sampling; Sampling procedure and precaution during sampling of alluvial deposits and dumps, estimation of reserves.

UNIT-IV

Mineral Resource Estimation

Introduction to Resource estimation; Methods of resource estimation: Distance weighing methods- Inverse distance, Inverse distance square; Area of influence methods- polygonal method, triangular method; application of computers in mineral resource estimation;

UNIT-V**Mine Finance**

Depreciation - concepts; methods of depreciation; financial and tax implications; preparation of cash flow statements; Discounted cash flow (DCF); Internal Rate of Return; Time value of money; Net Present Value (NPV); determination of optimum size of mine; Mine life.

Text Books

1. R.T. Deshmukh, Mineral and Mine Economics, Myra Publications, Nagpur, 1986.
2. N. L. Sharma and R. K Sinha, Mineral Economics, Oxford and IBH, 1992.
3. I. N. Sinha and Subhash C. Ray, Mine & Mineral Economics, PHI Learning, 2016.

Reference Books

1. O.P. Khanna, Industrial Management, Dhanpat Rai and Sons, 1999.
2. R. N. P. Arogyaswamy, Courses in Mining Geology, Oxford and IBH Pub., 2017.
3. P. K. Jain, Financial management, Tata McGraw Hill, 1981.
4. S. Krishnaswamy, India's Mineral Resources, Oxford & IBH pub., 2nd Ed., 1972.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IIIB. Tech. II Sem. (6 th Semester)			
Course Code 19160664A	Planning of Surface Mines (Professional Elective-2)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite: Surface Mining		2	1	0	3

Course Objectives

1. To elaborate the stages of mine planning along with the planning essentials.
2. To discuss about the ore reserve estimation and stripping ratio.
3. To educate on the geometrical considerations of bench and pit.
4. To illustrate about design of dump slope and optimum mine size.
5. To inculcate the concept of design of haul roads.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Comprehend the stages of mine planning and planning inputs.
CO2:	Estimate ore reserve and stripping ratio.
CO3:	Outline the geometrical considerations of bench and pit.
CO4:	Assess the design parameters of dump slope and determine optimum mine size.
CO5:	Plan and design haul roads in mines.

Syllabus

UNIT I

Planning requisites

Planning Inputs, prospecting, exploration, planning process; Planning essentials; Stages of planning; Types of Mine Plans; Feasibility Report.

UNIT II

Ore reserve estimation

Compositing, objectives and principles of ore reserve estimation; Estimation of grades at unknown point; Methods of ore reserve estimation - vertical cross section method, horizontal cross section method, 3-D geological block model method; Classification of ore reserve.

Stripping ratios

Concept of stripping ratios, types of stripping ratios and their significance; Choice between underground and surface mining.

UNIT III

Geometrical Consideration

Basic bench geometry, pit layouts.

Pit Planning

Development of economic block models; Pit cutoff grade and its estimation; Ultimate pit configuration and its determination - hand method, floating cone technique, Lerches - Grossmann algorithm.

UNIT IV

Production Planning

Determination of optimum mine size and Taylor's mine life rule; sequencing by nested pit; cash flow calculation; mine and mill plant sizing; Lanes algorithm for estimation of optimum mill cut-off grade; Introduction to production scheduling.

Analysis and Design of Dump Slope

Pit slope geometry; slope stability analysis and design methodology for dumps.

UNIT V

Design of Haul Roads

Addition of haul roads in pit plan, design of road construction, design of road width, curves and gradient, haul road safety features and their design.

Closure of Surface Mines

Reclamation of mines.

Text Books

1. S. K. Das, Surface Mining Technology, Lovely Prakashan, Dhanbad, 1st Edition, 1994
2. J. Bhattacharya, Principles of Mine Planning, Allied Publishers Private Limited, 2016.

Reference Books

1. V. V. Rzhnevsky, Open Cast Mining Unit Operations, Mir Publishers, 1978.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IIIB. Tech. II Sem. (6 th Semester)			
Course Code 19160664B	Enterprise Resource Planning (Professional Elective-2)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite: Nil		2	1	0	3

Course Objectives

1. To introduce ERP and related technologies with their applications.
2. To product life cycle, Implementation, evaluation and selection of ERP systems.
3. To introduce different types of ERP modules.
4. To impart knowledge of ERP post implementation Scenario.
5. To introduce the emerging future trends in ERP.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Infer ERP and related technologies with applications
CO2:	Explain Product life cycle, ERP implementation, evaluation and selection.
CO3:	Outline different ERP business modules.
CO4:	Explain the ERP post implementation effects in Business environments.
CO5:	Comprehend the emerging future trends in ERP systems.

Syllabus

UNIT 1

Introduction to ERP

Overview and Benefits of ERP, ERP Related Technologies; Business Process Reengineering (BPR); Online Analytical Processing (OLAP); Supply chain Management (SCM); Applications of ERP.

UNIT -II

ERP Implementation

Implementation and Product Lifecycle, Implementation Methodology, Planning Evaluation and selection of ERP systems; Organizing the Project Management and Monitoring; Case Study on Manufacturing.

UNIT-III

ERP Business Modules

Business modules in an ERP Package; Manufacturing; Human Resources; Plant Maintenance; Materials Management; Data Warehousing; Data Mining; Quality Management; Sales and Distribution; Case Study in Banking Sector.

UNIT-IV

Post Implementation of ERP

Overview of ERP software solution. Maintenance of ERP- Organizational and Industrial impact; Success and Failure factors of ERP Implementation. Case Study of Success Story and Failure of Processing Sector.

UNIT V

Emerging Trends in ERP

Extended ERP system; ERP Add-ons – Customer Relations Management (CRM), Customer satisfaction (CS), Business analytics etc.; Future trends in ERP systems-web enabled, Wireless technologies; Case Study in Service Sector.

Text Books

1. Jagan Nathan Vaman, ERP in Practice, Tata McGraw-Hill, 2008.
2. Alexis Leon, ERP Demystified, Tata McGraw Hill, New Delhi, 2000.
3. Mahadeo Jaiswal and Ganesh Vanapalli, ERP Macmillan India, 2009.

Reference Books

1. Alexis Leon, Enterprise Resource Planning, second edition, Tata McGraw-Hill, 2008.
2. Vinod Kumar Grag and N.K. Venkitakrishnan, ERP- Concepts and Practice, Prentice Hall
3. of India, Second edition, 2006.
4. Joseph A Brady, Ellen F Monk, Bret Wagner, Concepts in Enterprise Resource
5. Planning, Thompson Course Technology, USA, 2001.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. II Sem. (6 th Semester)			
Course Code 19160664C	Mine Strata Control (Professional Elective-2)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite(s): Underground Coal Mining, Underground Metal Mining		2	1	0	3

Course Objectives

1. To impart knowledge on the pre and post mining stresses and strata behaviour in mines.
2. To introduce different support systems in underground mines.
3. To discuss different methods of stowing in development and depillaring operations.
4. To elaborate the theories of ground movement
5. To discuss the mechanism of subsidence and its preventions.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Assess the pre and post mining stresses, strata behaviour in mines.
CO2:	Classify the various support systems in underground mines.
CO3:	Distinguish the different methods of stowing in development and depillaring operations.
CO4:	Relate the theories of ground movement.
CO5:	Comprehend the mechanism of subsidence and its preventions.

Syllabus

UNIT -I

Introduction

Definition and concept of ground control in mines; Constraints on ground control; Characteristics of coal measures strata; Pre and Post mining stresses in the rock; Effect of mining parameter on strata control.

UNIT -II

Types of Supports

Timber & steel supports, Roof bolting, roof stitching, Powered Support; Examination of roof; Method of supporting roadways-Supporting under different conditions -widened areas, crossing, junctions, faulted area, long wall faces, depillaring areas and stoping areas; SSR; Withdrawal of supports.

UNIT -III

Concept of stowing

Types of stowing- hand packing, caving, hydraulic, pneumatic and mechanical; Hydraulic profile and H/L ratio; Wear in pipes; Underground stowing arrangements and operations pipe; Rate of stowing; Pipe jams; Depillaring with stowing.

UNIT -IV

Theories of ground movement

Arch or Dome theory; Beam or Plate theory; Soil mechanics theory; Pseudo plastic theory; Dynamic rock pressure theory; Modern concept of strata pressure redistribution-long wall workings and bord & pillar workings; Manifestation of strata pressure.

UNIT -V

Subsidence

Theories of subsidence; Engineering parameters of subsidence- angle of draw and angle of fracture; Magnitude of subsidence; Prediction of subsidence; Subsidence damage; Prevention of subsidence.

Text Books

1. R.D. Singh, Principle and practices of modern coal mining, New Age International Publishers, 2005.
2. Debasis Deb, Finite Element methods: Concepts and Applications in Geomechanics, PHI Learning Pvt. Ltd, New Delhi, 2010.

Reference Books

1. Peng, S.S. Ground Control, Wiley Publications, New York, 1987.
2. Brady, B.H.G. and Brown, S.T. Rock Mechanics for Underground Mining, Chapman and Hall, 1993.
3. Hoek, E. and Brown, S.T. Underground Excavations in Rocks, Institute of Mining Metallurgy, London, 1980.
4. D.J. Deshmukh, Element of Mining Technology, Vol-1, Denett & Co., 2010.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IIIB. Tech. IISem. (6 th Semester)			
Course Code 19160664D	Innovative Mining Systems (Professional Elective-2)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite(s): Nil		2	1	0	3

Course Objectives

1. To discuss the technological innovations in mine operations.
2. To illustrate the systematic concepts for innovative mining.
3. To familiarize about the new developments in mine operations.
4. To impart the knowledge on the new frontiers of mining.
5. To untangle the concept of automation and robotics in mining.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Comprehend and analyze the technological life cycle of mine operations.
C02:	Appraise the basics of system dynamics involved in innovative mine systems.
C03:	Comprehend the new developments in mine operations.
C04:	Apprehend the new frontiers of mining in real world.
C05:	Design and introduce automation and robotics in mine operation.

Syllabus

UNIT -I

Technological innovations

Technology, invention, innovation, research and development – basic types, technology life cycle.

UNIT -II

System concepts

System concepts for innovative mining, methods for stimulating creativity in an organization and current technological needs; Basics of system dynamics, value engineering and Just In Time (JIT) – possible applications.

UNIT -III

Innovations in mining operations

Innovations in unit operations in surface and underground mining including high speed shaft sinking method; Developments in hard rock mining; New developments in long-wall mining and Developments in mine ventilation systems.

UNIT -IV

New frontiers of mining

Mining in deep sea, outer space and Antarctica; Oil mining; Extraction of coal bed methane; Remote monitoring of long-wall support performance using tele-monitoring device.

UNIT -V

Automation and robotics in mining

Development of various robotic systems and their possible contributions.

Text Books

1. Ehrenburger, V and Fajkos, A., Mining modeling, Elsevier, 1995.

Reference Books

1. Bawden, W. F., and Archibald., J. F., Innovative Mine Design for the 21st century Elsevier, 1993

Weblinks

1. <https://eos.org/features/underground-robots-how-robotics-is-changing-the-mining-industry>
2. <https://www.robotics.org/blog-article.cfm/How-are-Autonomous-Mobile-Robots-Used-to-Inspect-Mines/211>
3. https://en.wikipedia.org/wiki/Automated_mining

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. II Sem. (6 th Semester)			
Course Code 19160664E	Environmental Impact Assessment in Mines (Professional Elective-2)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite: Environmental Studies		2	1	0	3

Course Objectives

1. To discuss the concept of environmental impact assessment.
2. To elaborate the types and limitations of environmental impact assessment.
3. To impart the knowledge on the components of environmental impact assessment.
4. To educate on the impacts of environmental impact assessment.
5. To expound the statutory requirement for mine environment management.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Comprehend the concept of environmental impact assessment.
CO2:	Assess the types and limitations of environmental impact assessment.
CO3:	Identify the components of environmental impact assessment.
CO4:	Predict the impacts of environmental impact assessment.
CO5:	Appraise the statutory requirement for mine environment management.

Syllabus

UNIT -I

Introduction

Environmental Impact Assessment (EIA); Environmental Impact Statement; EIA in Project Circle; Legal and regulatory aspect in India according to Ministry of Environment and Forests.

UNIT -II

Types and limitations of EIA

Issues and terms of reference in EIA; Participation of Public and Non - Governmental Organizations in environmental decision making.

UNIT -III

Components of EIA

Components of EIA - Processes, Screening, Scoping, Setting, Analysis and mitigation; Matrices; Networks; Checklists; Connections and combination of processes; Cost benefit analysis; Analysis of alternatives; Software packages for EIA; Expert systems in EIA.

UNIT -IV

Prediction and assessment of impacts

Prediction tools for EIA - Mathematical modeling for impact prediction; Assessment of impacts - Air - Water - soil - noise - biological - socio - cultural environments; Case Studies on Infrastructure - Mining - Industrial - Thermal Power - River valley and Hydroelectric - Nuclear Power.

UNIT -V

Environmental Management

Plan preparation, implementation and review; Mitigation and rehabilitation plans; Policy and guidelines for planning and monitoring programmers; Post project audit; Ethical and quality aspects of Environmental Impact Assessment.

Text Books

1. Lawrence D.P., Environmental Impact Assessment - Practical solutions to recurrent problems, Wiley - Interscience, New Jersey, 2003.
2. Petts J., Hand book of Environmental Impact Assessment, Vol - I and II, Blackwell Science London, 1999.

Reference Books

1. N. S. Raman, A. R. Gajbhiye, S. R. Khandeshwar, Environmental Impact Assessment Paperback – Import, 2014.
2. R. Rajagopalan, Environmental Studies, OUP, India, Third Edition, 2011.
3. Gurudas Nulkar, Ecology, Equity and the Economy, Ecological society, First edition, 2018.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	Nano Technology (Open Elective-III)				
Teaching	Total contact hours-53	L	T	P	C
Prerequisite(s): Metallurgy and Material Science		3	0	0	3

Course Objectives:

- To study the applications of nano materials.
- To understand the mechanical, electrical, thermal and physical properties of nano materials.
- To learn the synthesis and fabrication techniques of nano particles.
- To gain the knowledge on characterization techniques like SEM, TEM and XRD.
- To impart the knowledge on the synthesis methods.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Discuss the applications of nano materials in engineering and few other fields.
CO2:	Describe the mechanical, electrical, thermal and physical properties of nano materials.
CO3:	Explain the synthesis and fabrication techniques of nano particles.
CO4:	Discuss the uses of characterization techniques such as spectroscopy, SEM, TEM and XRD.
CO5:	Describe carbon nano technology and its various applications.

Syllabus**UNIT-I**

INTRODUCTION: History of nano science- definition of nano meter, nano materials, nano technology-Classification of nano materials-Crystal symmetries, crystal directions, crystal planes-Band structure-Applications in material science, biology and medicine, surface science, energy and environment-Applications of nano structured thin films, applications of quantum dots.

UNIT-II

PROPERTIES OF MATERIALS: Mechanical properties, electrical properties, dielectric properties, thermal properties, magnetic properties, opto electronic properties. Effect of size reduction on properties, electronic structure of nano materials.

UNIT-III

SYNTHESIS AND FABRICATION: Synthesis of bulk polycrystalline samples, growth of single crystals. Synthesis techniques for preparation of nano particle – Bottom Up Approach – sol gel synthesis, hydro thermal growth, thin film growth, PVD and CVD. Top Down Approach – Ball milling, micro fabrication, lithography. Requirements for realizing semiconductor nano structures, growth techniques for nano structures.

UNIT-IV

CHARACTERIZATION TECHNIQUES: X-Ray diffraction and Scherrer method, scanning electron microscopy, transmission electron microscopy, scanning probe microscopy, atomic force microscopy, piezo response microscopy, X-ray photo electron spectroscopy, XANES and XAFS, angle resolved photoemission spectroscopy, diffuse reflectance spectra, photo luminescence spectra, Raman spectroscopy.

UNIT-V

CARBON NANO TECHNOLOGY: Characterization of carbon allotropes, synthesis of diamond – nucleation of diamond, growth and morphology. Applications of nano crystalline diamond films, graphene, applications of carbon nano tubes.

Text Books:

1. Nano science and nano technology by M.S RamachandraRao, Shubra Singh, Wiley publishers.
2. Introduction to Nanoscience and Nanotechnology by k.k chattopadhyay/A.N Banerjee/PHI.

References:

1. Introduction to Nano Technology by Charles P. Poole, Jr., Frank J.Owens, Wiley publishers.
2. Nanotechnology by Jermy J Ramsden, Elsevier publishers.
3. Nano Materials- A.K.Bandyopadhyay/ New Age International.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IIIB. Tech. IISem. (6 th Semester)			
Course Code 19167665a	Human Computer Interaction (Open Elective-3)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Fundamentals of Programming		3	0	0	3

Course Objective(s)

1. How to design and evaluate interactive technologies.

Course Outcomes

After successful completion of this course, a student will be able to-

1. Explain the capabilities of both humans and computers from the viewpoint of human information processing.
2. Describe typical human-computer interaction (HCI) models, styles, and various historic HCI paradigms.
3. Apply an interactive design process and universal design principles to designing HCI systems.

UNIT -I**Introduction**

Usability of Interactive Systems- introduction, usability goals and measures, usability motivations, universal usability, goals for our profession Managing

Design Processes

Introduction, Organizational design to support usability, Four pillars of design, development methodologies, Ethnographic observation, Participatory design, Scenario Development, Social impact statement for early design review, legal issues, Usability Testing and Laboratories

UNIT -II**Menu Selection, Form Fill-In and Dialog Boxes**

Introduction, Task- Related Menu Organization, Single menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data entry with Menus: Form Fill-in, dialog Boxes, and alternatives, Audio Menus and menus for Small Displays

UNIT -III**Command and Natural Languages**

Introduction, Command organization Functionality, Strategies and Structure, Naming and Abbreviations, Natural Language in

Computing Interaction Devices

Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory Interfaces, Displays- Small and large

Quality of Service

Introduction, Models of Response-Time impacts, Expectations and attitudes, User Productivity, Variability in Response Time, Frustrating Experiences

UNIT -IV**Balancing Function and Fashion**

Introduction, Error Messages, Non-anthropomorphic Design, Display Design, Web Page Design, Window Design, Color.

User Documentation and Online Help

Introduction, Online Vs Paper Documentation, Reading from paper Vs from Displays, Shaping the content of the Documentation, Accessing the Documentation, Online tutorials and animated documentation, Online communities for User Assistance, The Development Process

UNIT -V**Information Search**

Introduction, Searching in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Searching Interfaces

Information Visualization:

Introduction, Data Type by Task Taxonomy, Challenges for Information Visualization

Text books

1. Designing the User Interface, Strategies for Effective Human Computer Interaction, 5ed, Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven M Jacobs, Pearson
2. The Essential guide to user interface design, 2/e, Wilbert O Galitz, Wiley DreamaTech.

Reference Books

1. Human Computer, Interaction Dan R. Olsan, Cengage, 2010
2. Designing the user interface. 4/e, Ben Shneidermann, PEA.
3. User Interface Design, Soren Lauesen , PEA
4. Interaction Design PRECE, ROGERS, SHARPS, Wiley.

Web Links

1. <https://nptel.ac.in/courses/106/103/106103115/>

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IIIB. Tech. IISem. (6 th Semester)			
Course Code 19167665a	Renewable Energy Resources (Open Elective-3)				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisites: Power Systems		3	0	0	3

Course Objectives

The objectives of the course are to make the student learn about

1. To understand the various forms of conventional energy resources.
2. Learn the present energy scenario and the need for energy conservation
3. Explain the concept of various forms of renewable energy
4. Outline division aspects and utilization of renewable energy sources for both domestic and industrial application

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Analyze solar radiation data, extra-terrestrial radiation, radiation on earth's surface.
CO2:	Design solar thermal collections.
CO3:	Develop maximum power point techniques in solar PV and wind
CO4:	Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations

Syllabus

UNIT-I

Fundamentals of Solar Energy Systems

Energy conservation principle - Energy scenario (world and India) - Solar radiation: Outside earth's atmosphere - Earth surface - Analysis of solar radiation data - Geometry - Radiation on tilted surfaces - Numerical problems.

UNIT-II

Solar Photovoltaic Systems Balance of systems - IV characteristics - System design: storage sizing - PV system sizing - Maximum power point techniques: Perturb and observe (P&O) technique - Hill climbing technique, Incremental conductance method. Solar Thermal Systems: Liquid flat plate collections: Performance analysis - Transmissivity - Absorptivity product, collector efficiency factor - Collector heat removal factor - Numerical problems. Introduction to solar air heaters - Concentrating collectors and solar pond.

UNIT-III

Wind Energy

Wind patterns - Types of turbines - Kinetic energy of wind - Betz coefficient - Tip-speed ratio - Efficiency - Power output of wind turbine - Selection of generator (synchronous, induction) - Maximum power point tracking.

UNIT-IV**Hydro and Tidal Power Systems: Hydro systems**

Basic working principle – Large, small, micro – measurement of head and flow – Energy equation
- Types of turbines - Numerical problems. Tidal power - Basics - Kinetic energy equation - Numerical problems - Wave power - Basics - Kinetic energy equation.

UNIT-V**Biomass, Fuel Cells and Geothermal Systems**

Biomass Energy: Fuel classification - Pyrolysis - Direct combustion of heat- Different digesters and sizing. Fuel cell: Classification - Efficiency - VI characteristics.

Geothermal

Classification – Dry rock and aquifer – Energy analysis.

Text Books

1. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition.
2. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis -second edition, 2013.
3. Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford

Reference Books

1. Renewable Energy- Edited by Godfrey Boyle-oxford university, press, 3rd edition, 2013.
2. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore.
3. Renewable Energy Technologies /Ramesh & Kumar /Narosa.
4. Renewable energy technologies - A practical guide for beginners - Chetong Singh Solanki, PHI. Non-conventional energy source – B.H. Khan- TMH-2nd edition.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th Semester)			
Course Code	DATA COMMUNICATION (Open Elective)				
Teaching	Total Contact Hours - 50	L	T	P	C
Prerequisites Electronic Devices & Circuits, Switching Theory and Logic, Electronic Circuit Analysis.		3	-	-	3

Course Objectives:

1. To comprehend the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.
2. To explain the basics of data communication and various types of computer networks.
3. To illustrate TCP/IP protocol suite and switching criteria.
4. To demonstrate Medium Access Control protocols for reliable and noisy channels.
5. To expose wireless and wired LANs along with IP version.

On Completion of the course, students will be able to	
CO1:	Understand and explain Data Communications System and its components.
CO2:	Enumerate the layers of the OSI model and TCP/IP and explain function(s) of each layer.
CO3:	Apply error detection and correction techniques to determine the error rate.
CO4:	Identify the different types of network topologies and protocols.
CO5:	Familiarity with the basic wireless networks, and how they can be used to assist in network design and implementation.

Unit-I

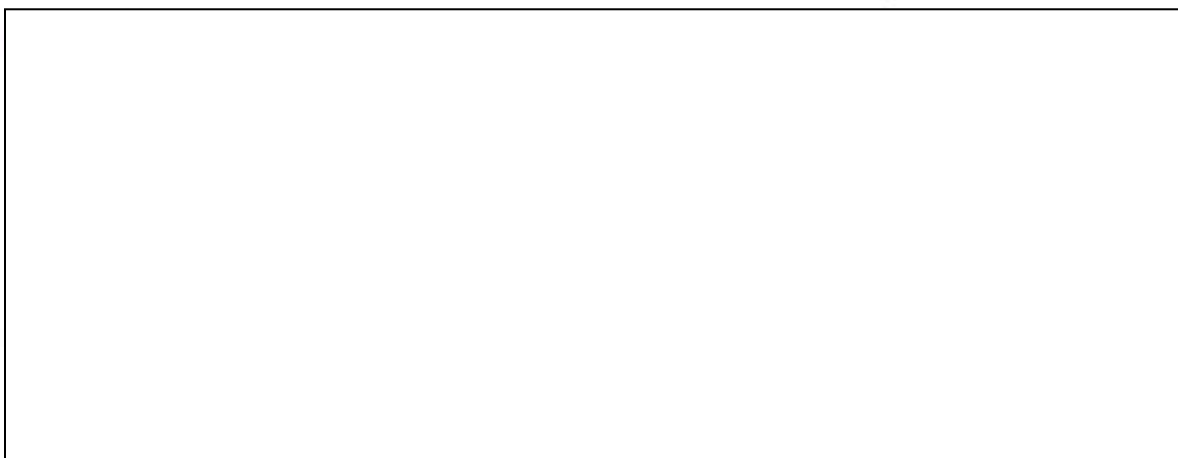
Introduction: Data Communications Circuits, Serial and parallel Data Transmission, Data communications Networks, Alternate Protocol Suites.

Signals, Noise, Modulation, And Demodulation: Signal Analysis, Electrical Noise and Signal-to-Noise Ratio, Analog Modulation Systems, Information Capacity, Bits, Bit Rate, Baud, and *M*-ary Encoding, Digital Modulation.

Unit-II

Metallic Cable Transmission Media: Metallic Transmission Lines, Transverse Electromagnetic Waves, Characteristics of Electromagnetic Waves

Optical Fiber Transmission Media: Advantages of Optical Fiber cables, Disadvantages of Optical Fiber Cables, Electromagnetic spectrum, Optical Fiber Communications System Block Diagram, Optical Fiber construction, Propagation of Light Through an Optical fiber Cable, Optical Fiber



Modes and Classifications, Optical Fiber Comparison, Losses in Optical Fiber Cables, Light sources, Light Detectors, Lasers.

Unit-III

Digital Transmission: Pulse Modulation, Pulse code Modulation, Dynamic Range, Signal Voltage –to- Quantization Noise Voltage Ratio, PCM Line Speed, PCM and Differential PCM.

Data Communications Codes, Error Control and Data Formats: Data Communications Character Codes, Bar Codes, Error Control, Error Detection and Correction, Character Synchronization

Unit-IV

Wireless Communications Systems: Electromagnetic Polarization, Electromagnetic Radiation, Optical Properties of Radio Waves, Terrestrial Propagation of Electromagnetic Waves, Skip Distance, Free-Space Path Loss, Microwave Communications Systems, Satellite Communications Systems.

Unit-V

Telephone Instruments and Signals: The Subscriber Loop, Standard Telephone Set, Basic Telephone Call Procedures, Call Progress Tones and Signals, Cordless Telephones, Caller ID, Electronic Telephones, Paging systems.

Cellular Telephone Systems: First- Generation Analog Cellular Telephone, Personal Communications system, Second-Generation Cellular Telephone Systems, N-AMPS, Digital Cellular Telephone, Interim Standard, Global system for Mobile Communications.

Text Books:

1. Data Communications and Networking - Behrouz A. Forouzan, 5th Edition, Tata McGraw-Hill, 2013.
2. Data and Computer Communication - William Stallings, 8th Edition, Pearson Education, 2007.

Reference Books:

1. Communication Networks - Fundamental Concepts and Key architectures, Alberto Leon-Garcia and Indra Widjaja, 2nd Edition, Tata McGraw-Hill, 2004.
2. Computer Networks – A Systems Approach, Larry L. Peterson and Bruce S. Davie, 4th Edition, Elsevier, 2007.
3. Computer and Communication Networks, Nader F. Mir, Pearson Education, 2007.



Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th semester)			
CourseCode 19116761	GLOBAL ENVIRONMENT PROBLEMS & POLICIES (OPEN ELECTIVE III)				
Teaching	Totalcontacthours-48	L	T	P	C
Prerequisite(s): Basics of Environmental science		3	0	0	3

Course Objectives:

- To study the explain the scientific basis of the global environmental issues.*
- To discuss social, psychological, economic and political issues surrounding each of the global environmental issues.*
- Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.*
- Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.*
- Appreciate the concern of environmental agreement.*

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To Understand core concepts and methods from ecological and physical sciences and their application in environmental problem-solving.
CO2	To Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
CO3	To Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
CO4	To know environmental laws and grasp the concept of environmental legislation and its application in international environmental agreement.
CO5	To appreciate the concern of environmental agreement.

Syllabus:**Unit – I****Unit-I: Environmental problems and protection:**

Environmental pollution and its consequences – Air pollution, water pollution, land pollution, nuclear pollution, Ozone depletions – Urbanization and its impacts on environment – Deforestation and its impacts on environment – Ways of protecting, Management of Environment, Preserving and Restoring of environment.

Unit – II**India and Environmental Issues and Policies:**

Environmental Awareness – Environmental problems of India - Environmental ethics - Nature conservation education movement – Social forestry scheme. Conservation of biodiversity :Meanings and need conservation of natural resources – soil, forest, water and wildlife In-situ conservation -National parks and sanctuaries – Biosphere Reserves –Man and Biosphere programme (MAP) –Ex –situ conservation, in –situ conservation, IUCN Red list categories, hot spots

Unit – III**Human population and environment:**

Population growth, Indian population situations population explosion – family welfare programme – Environment and Human health.-Factors affecting environment-Acid rain, green house effect-Extinction

of species-soil erosion and energy crisis.

Unit – IV

International Efforts for Environmental Protection:

The Stockholm conference 1972 – Brundtland commission 1983 – Nairobi conference 1982 – The Rio Summit 1992 – the Rio Declaration at the earth charter – Major achievement of the Rio Summit – Main features of the Rio Declaration – Kyoto conference and part on Global Warming 1997 – present developments.

Unit – V

Environmental laws in India:

Environmental Legislation, Acts, Rules, Notifications and Amendments. International Environmental Agreements. Role of mass media and technology in developing awareness about environmental problems and its prevention; Role of NGO's and Government organization in developing Environmental education. Environmental Movements and Developments: Environmental movements in India: Silent Valley movement, Chipko movement, Narmada Bachao, Andolan, National Test Range at Balipal, Orissa. - Conditions for achieving the goals of sustainable development Strategies for sustainable development in India.

Text books:

1. Agarwal s.k. (1997). Environmental Issues themes New Delhi: APH Publishing Corporation.
2. C.E.E (1994) Essential Learning in Environmental Education. Ahmadabad. C.E.E. Publication
3. Garg, B. & Tiwana. (1995) Environmental Pollution and Protection, Deep & Deep publication, New Delhi.

References:

1. Karpagam M. (1991) Environmental Economics – A text book. New Delhi. Sterling Publishers.
2. Kelu.P (2000) Environmental Education – A conceptual Analysis Calicut: Calicut University
3. Nanda V.K. Environmental Education, New Delhi: Anmol Publications PVT LTD.

Web references:

1. <http://www.bdu.ac.in/cde/docs/ebooks/B-d/II/ENVIRONMENTAL%20EDUCATION.pdf>
2. https://www.terisas.ac.in/uploads/1551863268_980872_NRE%20155.pdf
3. <http://moef.gov.in/>.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. II Sem (6 th semester)			
Course Code	MODERN VEHICLE TECHNOLOGY Open Elective – III				
Teaching	Total contact hours-48	L	T	P	C
Prerequisite(s): Basic Automobile Engineering		3	0	0	3

Course Objectives:

1. To make the student to design and develop modern vehicles
2. To make the student to analyze and control the exhaust emissions and noise
3. To make the student to analyze the vehicle operation and incorporate and develop the electronic control systems
4. To make the student to distinguish and choose the fuel injection system

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1:	Design and develop modern vehicles
CO2:	Analyze and control the exhaust emissions and noise
CO3:	Analyze the vehicle operation and incorporate and develop the electronic control systems
CO4:	Distinguish and choose the fuel injection system
CO5:	Classify the design analysis of injection systems

Syllabus:**UNIT-I**

Trends in Automotive Power Plants: Hybrid Vehicles - Stratified charged / lean burn engines -Hydrogen Engines-Electric vehicles-Magnetic track vehicles solar powered vehicle Combined power source vehicle, types of hybrid drives, Toyota hybrid system.

UNIT-II

Suspension: Interconnected air and liquid suspensions, Hydrolastic suspension system, Hydra gas suspension.

Braking systems and safety: Modern rear wheel brake, indirect floating caliper disc brake, self energizing disc brake, brake limiting device, anti-slide system, Ford Escort and Orion anti-lock system, Clutch, Transmission, Differential, Steering, Suspension, Braking System.

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UNIT-III

Emission and Noise Pollution Control: Introduction, Engine emissions, types of catalytic conversion, open loop and closed loop operation to the oxidizing catalytic converter, Evaporative emissions, Internal and External Noise, Identification of Noise sources, Noise Control Techniques. SCR, DPF and DOC.

UNIT-IV

Vehicle Operation and Control: Fundamentals of Automotive Electronics - sensors, actuators, Processors, Computer Control for pollution, noise and for fuel economy - Electronic Fuel Injection and Ignition system.

UNIT-V

Fuel Injection Systems: SPFI, MPFI, DI, Pilot Injection, Unit Injection. CRDI; Two Wheeler Technology: DTS- i, DTS - Fi, DTS - Si; Four Wheeler Technology: WT, Cam less Engine, GDI.

TEXT BOOKS:

1. Crouse/Anglin "Automotive Mechanics"
2. K.Newton, W.Steeds "The Motor Vechicle"

REFERENCES

1. K.K. Ramalingam, "Automobile Engineering", Scitech Publications Pvt. Ltd., 2005
2. Dr. N.K. Giri, "Automobile Mechanic", Khanna Publishers, 2006
3. Heinz Heisler "Advanced Vehicle Technology" ELSEVIER

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IIIB. Tech. IISem. (6 th Semester)			
Course Code 19167665a	Remote Sensing & GIS in Mining (Open Elective-3)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites: Basic computer knowledge and Basic physics, Mine surveying		3	0	0	3

Course Objectives

1. To discuss the basic principles of Remote Sensing.
2. To elaborate the concepts of visual and digital image analysis.
3. To illustrate the concepts of GIS.
4. To impart the knowledge on the concept of spatial analysis.
5. To communicate the applications of remote sensing and GIS.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Outline the basic principles of Remote Sensing.
CO2:	Develop the concepts of visual and digital image analysis.
CO3:	Summarize the basic concepts of GIS.
CO4:	Perform spatial analysis.
CO5:	Apply knowledge of remote sensing and GIS in various fields.

Syllabus

UNIT -I

Introduction to remote sensing

Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere; energy interaction with the earth surfaces characteristics of remote sensing systems.

Sensors and platforms

Introduction, types of sensors; airborne remote sensing, space borne remote sensing; image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential; IRS, LANDSAT, SPOT, Advanced sensors and its applications.

UNIT -II

Image analysis

Introduction, elements of visual interpretations, digital image processing- image pre-processing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT -III

Geographic Information System

Introduction, key components, application areas of GIS, map projections.

Data entry and preparation

Spatial data input, raster data models, vector data models.

UNIT -IV**Spatial data analysis**

Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing.

UNIT -V**Applications of Remote sensing and GIS**

Land cover and land use pattern, forestry, geology, geomorphology and mining operations.

Text books

1. Bhatta B, Remote sensing and GIS, Oxford University Press, 2008.
2. Narayan LRA, Remote Sensing and its Applications, Universities Press, 2012.

Reference Books

1. Lilles and, T.M, R.W. Kiefer and J.W. Chipman, Remote Sensing and Image Interpretation, Wiley India Pvt. Ltd., New Delhi, 2013.
2. Chor Pang Lo and A K W Yeung, Concepts and Techniques of Geographical Information System, Prentice Hall (India), 2006.
3. Kand Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Higher Education, 2009.
4. George Joseph, Fundamentals of Remote Sensing, Universities Press, 2013.
5. Demers, M.N, Fundamentals of Geographic Information Systems, Wiley India Pvt. Ltd, 2013.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. II Sem. (6 th Semester)			
Course Code 19160611	Rock Mechanics Laboratory				
Teaching	Total contact hours - 36	L	T	P	C
Prerequisites: Rock Mechanics		0	0	3	1.5

Course Objectives

1. To impart the knowledge on preparation of rock sample.
2. To impart knowledge on physio-mechanical properties of rock.
3. To illustrate various methods to determine rock properties.
4. To impart the knowledge on various weathering effects on rocks.
5. To elaborate the drill-ability of rock.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Prepare rock samples for testing.
CO2:	Comprehend the Physico-Mechanical properties of rock.
CO3:	Determine the methods to measure the different strength parameters of rock
CO4:	Estimate the weathering effects on rock.
CO5:	Estimate the drill-ability index of rocks.

List of Experiments

1. Preparation of rock specimen.
2. Determination of density (wet and dry) of given rock specimen.
3. Determination of uniaxial compressive strength by uniaxial compressive testing machine.
4. Determination of cohesive strength & angle of internal friction by Tri-axial testing.
5. Determination of tensile strength of given rock specimen by Brazilian method.
6. Determination of shear strength of given rock specimen.
7. Determination of point load index of the given rock specimen.
8. Determination of Protodyakonov strength index of given rock specimen.
9. Determination of slake durability index of the give specimen.
10. Determination of Impact Strength Index (ISI) of given rock specimen.
11. Determination of drill-ability index of a given rock specimen.
12. Determination of hardness of a given rock specimen by rebound hammer test.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. II Sem. (6 th Semester)			
Course Code 19160612	Mineral Processing Laboratory				
Teaching	Total contact hours - 36	L	T	P	C
Prerequisites: Mineral Processing		0	0	3	1.5

Course Objectives

1. To impart knowledge on selection of mineral samples.
2. To communicate the separation of mineral particles by different methods.
3. To elaborate determination of size distribution of mineral particles.
4. To impart the knowledge on the verification of Comminution laws.
5. To find the critical speed of the ball mill.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Comprehend the selection of mineral samples by different methods.
C02:	Identify and comprehend the process of separation of mineral particles.
C03:	Determine the size distribution of mineral particles using various techniques.
C04:	Comprehend and verify the comminution laws.
C05:	Determine the critical speed of the ball mill.

List of Experiments

1. Selection of sample through coning & quartering.
2. Crushing of iron ore using primary jaw crusher
3. Verification of comminution laws for jaw crusher.
4. Study the effect of grinding with grinding time in ball mill.
5. To find critical speed of ball mill.
6. To determine size distribution using sieve analysis.
7. To determine size distribution using vibratory sieve shaker.
8. Separation of iron ore using electromagnetic separation.
9. Separation of particles using tabling equipment.
10. To study separation performance of cyclone Separator.
11. Determination of size distribution of iron ore using sieve analysis.
12. Verification of comminution laws for roll crusher.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem. (7 th Semester)			
Course Code 19160701	Mine Legislation and General safety				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite: Constitution of India		3	0	0	3

Course Objectives

1. To discuss the history of mining legislation in India, MMDR Act 2015, and IR Code, 2020.
2. To elaborate CMR 2017, MMR 1961, the MVT rules 1966 and MRR 1985.
3. To familiarize about the Occupational Safety, Health and Working Conditions 2020, Mine rules 1955, and Pit Head Bath Rules 1946.
4. To communicate the Code of Social Security 2020, Code on Wage 2019 and CMPFMP Act 1948.
5. To discuss about the general safety aspects in mining.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Outline the history of mining legislation in India, MMDR Act 2015 and IR Code 2020
CO2:	Summarize the CMR 2017, MMR 1961, MVT rules 1966 and MRR 1985.
CO3:	Illustrate the Occupational Safety, Health and working conditions, 2020, Mine rules 1955, and Pit head bath Rules, 1946.
CO4:	Summarize the Code of social security, 2020; The Code on Wage, 2019; CMPFMP Act, 1948.
CO5:	Outline the general safety aspects in mining.

Syllabus

UNIT -I

General principles of mining laws; History and development of mine legislation in India; Mines & Minerals (Development & Regulation) Act 2015; Industrial Relations Code 2020.

UNIT -II

Coal Mine Regulation 2017; Metalliferous Mines Regulation 1961; Mines Vocational Training Rules 1966; The Mines Rescue Rules 1985.

UNIT -III

Occupational Safety, Health and working conditions 2020; Mines Act 1952; The Mines Rules 1955; Pit Head Bath Rules 1946.

UNIT -IV

The Code of social security 2020; The Code on Wage 2019; Coal Mines Provident Fund and Miscellaneous Provisions Act 1948.

UNIT -V

Accident in mines- causes and prevention; Various types of injuries; Preventive medical examinations; Creating and maintaining safety awareness; Safety meeting and committee; Need for mine safety; Recommendations of inquiry committee carried out for safety and health issues in India; Introduction to risk management.

Text Books

1. R.T. Deshmukh, Mineral and Mine Economics, Myra Publications, Nagpur, 1986.
2. Bare Act, The Mines Rules 1955 and the Mines Rescue Rules 1985, Universal Law Publishing.
3. G. N. Raju, The Coal Mines Regulations 2017, Planet Publishing House, 1st Edition, 2017.
4. L. C. Kaku, The Metalliferous Mines Regulations 1961, Lovely Prakashan, 2016.
5. Samir Kumar Das, Mine Safety and Legislation, Lovely Prakashan, 1st Edition, 2002.

Reference Books

1. Prasad & Rakesh, Legislation in Indian Mines - Critical Appraisal, Tara Book Agency, 1999
2. L. C. Kaku, The Coal Mine Regulations, 2017, Lovely Prakashan, 2018.
3. Mines & Minerals (Regulation & Development), Act 1957; Mineral conservation and Development rules; Mineral concession rules- Govt. of India Publication.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B. Tech. I Sem. (7 th Semester)			
Course Code 19160702	Mining Machinery				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite(s): Surface Mining, Mine Transportation, Underground Coal Mining		2	1	0	3

Course Objectives

1. To introduce the principles, operations and application of wire ropes.
2. To discuss the principles, operations and application of mine pumps.
3. To elaborate the electrical and telecommunication systems used in mines.
4. To impart the knowledge on surface mining machinery systems and their applications.
5. To educate on the underground mining machinery systems and their applications.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Comprehend the operations and application of conveyors.
C02:	Plan and design the pumping system of a mine.
C03:	Comprehend and plan the electrical and telecommunication systems in mines.
C04:	Identify the operations and application of surface mining equipment.
C05:	Assess the operations and application of machinery in underground mines.

Syllabus

UNIT-I

Wire Ropes

Construction of wire ropes; various types of rope used in mining; factor of safety (FOS) of rope; care and maintenance of rope in use and also in storage; splicing of haulage rope; calculation of size of winding rope; examination of rope; life of rope and norms for discarding a rope; Rope capel and recapping.

UNIT-II

Mine Pumps

Sources of mine water; Classification of mine pumps; Basic definition of head, suction, lift, suction head, discharge head; Friction of water in pipes; Location and size of Mine Sumps; Constructional features; Working principles; Single stage and multistage pumps; Application & uses of centrifugal and reciprocating pumps; Series and parallel arrangement of pumps, arrangement of different valves and other components in centrifugal & reciprocating pumps; Pump design calculations - numerical problems, special types of pumps used in mines.

UNIT-III

Electrical and Telecommunication System in mines

Mining cables -classification, constructional features and use of each type - armored, pliable armored and trailing cable; Installation of cable in shaft & in roadways; General working principles of gate end box, drill panels; Safety & protective devices - function of pilot core protection & earth leakage protection; Flame proof & intrinsically safe apparatus- application, features & safety aspects.

Underground signaling arrangement

Haulage signals, shaft signals and use of telephone systems in underground; latest developments in mine communications.

UNIT-IV

Surface Mining Machinery

Basic constructional features, working principles, applicability, capacity (maximum & most common) and limitations of - blast hole drills, shovel (hydraulic and rope), dozer, front end loader, dumper, scraper, grader, bucket wheel excavator, dragline, continuous surface miner, stacker & spreader.

UNIT-V

Underground Mining Machinery

Basic constructional features, specifications, working principle & applicability of - drills (handheld coal drills, jackhammer & jumbo drill), mucking equipment (LHD, SDL, Shuttle Car), continuous excavators (continuous miner, DERD shearer) & powered supports in longwall method of mining.

Text books

1. S. Ghatak, Mine pumps haulage and winding, Coalfield Publishers Skylark, 1995.
2. R. S. Khurmi, J. K. Gupta, Theory of Machines, Eurasia Publishing House, 2008.

Reference Books

1. D. J. Deshmukh, Elements of Mining Technology Vol. 3, Denett & Company, 8th Edition, 2009.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. I Sem. (7 th Semester)			
Course Code 19160703	Computer Applications in Mining				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite(s): Underground Coal Mining, Underground Metal Mining, Surface Mining		3	0	0	3

Course Objectives

1. To discuss the usage of computers and software in exploration, blasting, ground vibration, subsidence.
2. To elaborate various numerical methods and their applications in mining.
3. To introduce different techniques like LIDAR and communication systems used mines.
4. To expound different numerical modeling methods used in mining.
5. To educate the application of computers in ventilation and strata monitoring.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Identify use of computers and software in exploration, blasting, ground vibration, subsidence etc.
CO2:	Summarize various numerical methods and their applications in mining.
CO3:	Outline different tools and techniques like LIDAR and communication systems used in mines.
CO4:	Comprehend various numerical modeling methods used in mining.
CO5:	Relate computer applications in ventilation and strata monitoring.

Syllabus

UNIT -I

Introduction

Introduction to the standard applications of software (FLAC, SURPAC, MINEX); MS-Office, File handling; Introduction to CAD; Algorithms; Flow charts for mining activities; Computer application in field exploration, blasting, ground vibration, GPS.

UNIT -II

Numerical methods

Finite Element Method (FEM); Finite Difference Method (FDM); Boundary Element Method (BEM); Discrete Element Method (DEM); Their applications in mining.

Simulation

Introduction to simulation and basics of simulation methods.

UNIT-III

Tools & Techniques

Un-manned Aerial Vehicles; drones; LIDAR systems; Slope Stability Radar (SSR); Communication systems in mines.

UNIT-IV

Numerical modeling in mining

Bord & Pillar Mining method; Long wall mining method; Continuous Mining method; Open-Pit slopes; Dumpslopes.

UNIT-V

Applications in Ventilation and strata monitoring

Subsidence analysis; Subsidence prediction in Bord & Pillar Mining method, Long wall mining method; Computer applications in ventilation and strata monitoring.

Text books

1. Debasis Deb, Finite Element Methods-Concepts and Applications in Geo-mechanics, PHI Learning Pvt. Ltd., New Delhi, 2006.
2. R.V. Ramani, Application of computer methods in the mineral industry, Society of Mining Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, 1977.

Reference Books

1. Vibhuti N. Misra, Computer Applications in Mineral Industry, Allied Publishers, 2003.
2. Edited by Roussos Dimitrakopoulos, Advances in Applied Strategic Mine Planning, Springer International Publishing, 1st Edition, 2018.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. I Sem. (7 th Semester)			
Course Code 19160764A	Mine Construction Engineering (Professional Elective-3)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite(s): Development of Mineral Deposits		2	1	0	3

Course Objectives

1. To expound the geological investigations in mine.
2. To discuss the laying out of shaft lining.
3. To impart knowledge on the design and construction of insets.
4. To familiarize with the underground mechanization.
5. To impart knowledge on the construction of surface infrastructure.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Outline the geological investigations in mine.
CO2:	Comprehend the laying out of shaft lining.
CO3:	Appraise the design and construction of insets.
CO4:	Comprehend the mechanization of underground operations.
CO5:	Appraise the design and construction of surface infrastructure.

Syllabus

UNIT I

Geological investigations in mines

Size of mine; Environment and ecology; Selection criteria for site of the openings geological investigations, Mine shaft, shaft sinking methods through alluvium, soft and hard rock.

UNIT II

Shaft lining

Mechanization; Consolidation of loose ground shaft lining; Ground pressure; thickness of lining, design and procedure of laying the lining; Construction of shaft collar heap stead.

UNIT III

Construction of insets

Design and construction of insets; Shaft bottom, excavation for mechanized decking of cages; Skip loading, pit bottom lay outs, installation of main haulages; Main sump size; Construction of underground substation; First aid room and office.

UNIT IV

Underground mechanization

Surface inclines, drivage through soft and hard rock, construction of portals and lining of inclines, lateral and vertical pressures; Underground developments, drivage of roads in stone and coal, mechanization support systems opening of faces; Surface layouts pit top circuits and coal handling and coal preparation plant, railway siding and weigh bridges, surface and underground coal bunkers winding house substation, lamp room.

UNIT V

Construction of surface infrastructure

Pit head bath, crèche dispensary: office, work-shop; material handling. Stowing installation, bunkers, water tanks, mixing chamber.

Text Books

1. Pazdziora J., Design of Underground hard coal mine, Elsevier Science, 1998.
2. Popov, Working of Mineral Deposits, International Law & Taxation, 2001.

Reference Books

1. Gurucharan Singh, Building Construction and Materials, Standard Book House, 17th Edition, 2018.
2. Handy book of Construction Professionals & Services Hyderabad, Add Contact Publishers; 9th edition, 2018.
3. Rzhevsky, Unit operations in open cast mines, Mir Publisher, 1983.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B. Tech. I Sem. (7 th Semester)			
Course Code 19160764B	Geostatistics (Professional Elective-3)				
Teaching	Total contact hours - 55	L	T	P	C
Prerequisites: Development of Mineral Deposits, Surface mining, Mathematics		2	1	0	3

Course Objectives

1. To discuss the schools of Geostatistics, estimation models for mine evaluation.
2. To elaborate semi-variogram and co-variogram.
3. To educate on extension variance and estimation variance.
4. To impart the knowledge on integrated geological-geostatistical system.
5. To communicate the geostatistical applications.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Comprehend the schools of Geostatistics, estimation models for mine evaluation.
C02:	Interpret semi-variogram and co-variogram.
C03:	Comprehend the extension variance and estimation variance.
C04:	Analyze the integrated geological-geostatistical system.
C05:	Identify the geostatistical applications.

Syllabus

UNIT-I

Introduction to Geostatistics

Definition, schools of Geostatistics, estimation models for mine evaluation- average method, polygonal or triangular method, deterministic mathematical model, independent random model, trend with random noise, correlated random model and trend with correlated random residuals.

UNIT-II

Semi-variogram and Co-variogram

Definitions, characteristics and computation in one, two, and three dimensions; Mathematical models; Associated difficulties i.e. anisotropy, non-stationeries, regularization, presence of nugget effect.

UNIT-III

Extension variance and estimation variance

Calculation of estimation variance, the nugget effect and estimation variance, auxiliary function and their examples.

Kriging

kriging and optimal valuation, kriging equations in general cases.

UNIT -IV

The Integrated geological-geostatistical system

Statistical analysis, comparative statistical analysis, geostatistical structural analysis, trend analysis; Point kriging; Cross validation; Block kriging; Mineral inventory; Tonnage relations.

UNIT -V

Geostatistical applications

Optimization of exploration drilling; Calculation of mineral inventory; Establishment of grade-tonnage relations; Misclassified tonnage; Grade control plan.

Text Books

1. Issacks and Srivastava, An Introduction to Applied Geostatistics, Oxford, JBH, 1990.

Reference Books

1. Rendu J.M John Wiley and Sons, An Introduction to Geostatistical methods of Mineral Exploration, 1981.
2. David & Michel, Geostatistical Ore Reserve Estimation, Mc Graw Hill, 1977.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IV B. Tech. I Sem. (7 th Semester)			
Course Code 19160764C	Rock Slope Engineering (Professional Elective-3)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite(s): Rock Mechanics		2	1	0	3

Course Objectives

1. To introduce the basic mechanics of rock slope failures
2. To elaborate the types of slope failure and its influencing parameters
3. To discuss the influence of water on stability of slopes
4. To expound the monitoring and stabilization techniques to prevent slope failure.
5. To impart the knowledge on numerical analysis of slope stability.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Comprehend and analyze the parameters affecting slope stability.
CO2:	Comprehend and analyze the mechanism of different types of slope failure
CO3:	Appraise the influence of water on stability of slopes
CO4:	Identify the monitoring and stabilization methods to prevent slope failure.
CO5:	Demonstrate the numerical modeling of slope stability

Syllabus

UNIT -I

Introduction

Rock slope economics; Factors affecting slope stability; Geological investigation; Factor of safety of slopes; Data interpretation for slope stability analysis.

UNIT -II

Types of slope failure

Basic mechanisms of slope failure and its analysis- planar, wedge, rotational shear, toppling.

UNIT -III

Determination of shear strength

Determination of shear strength of discontinuities; Direct shear test; Tri-axial test.

Influence of ground water

Influence of ground water on slope and techniques of depressurization; Field measurement of permeability.

UNIT -IV

Monitoring of rock slopes

Monitoring and instrumentation techniques of rock slopes; Slope stabilization methods.

UNIT -V

Numerical Modeling

Basic numerical modeling concepts: Continuum and Dis-continuum approach- Limit Equilibrium Method, Finite Element Method, Finite Difference Method, Discrete Element Method; Use of Slide, FLAC software.

Text Books

1. Duncan C. Wyllie, Chris Mah, Rock Slope Engineering, Spon Press, 4th Edition, 2004.
2. E. Hoek and J. Bray, Rock Slope Engineering, The Institute of Mining & Metallurgy, London, 1981.

Reference Books

1. R. N. Chowdury, Slope Analysis, Elsevier, 1978.
2. Debasis Deb, Finite Element methods: Concepts and Applications in Geo mechanics, PHI Learning Pvt Ltd, New Delhi, 2006.
3. Goodman, R.E., Rock Mechanics, John Wiley and Sons, 1989.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech.ISem. (7 th Semester)			
Course Code 19160764D	Tunneling Engineering (Professional Elective-3)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites: Drilling & Blasting, Underground Metal Mining		2	1	0	3

Course Objectives

1. To discuss the importance of tunnel engineering technology in underground openings.
2. To expound the mechanism involved during tunneling engineering.
3. To communicate different drilling and blasting methods used in tunnel engineering.
4. To familiarize different equipment used in tunnel engineering.
5. To impart the knowledge on various support systems used in tunnel engineering.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Appraise tunneling engineering in underground openings.
CO2:	Comprehend and analyze the mechanism of tunneling engineering.
CO3:	Identify various drilling and blasting methods used in tunnel engineering.
CO4:	Identify different equipment used in tunnel engineering.
CO5:	Design the support systems in tunnel engineering.

Syllabus

UNIT-I

Introduction

Scope and application; historical developments; art of tunneling, tunnel engineering; future tunneling considerations; types of underground excavations: Tunnel, adit, decline, shaft; parameters influencing location, shape and size; geological aspects; planning and site investigations.

UNIT-II

Tunneling Methods

Types and purpose of tunnels; factors affecting choice of excavation technique; Methods - soft ground tunneling, hard rock tunneling, shallow tunneling, deep tunneling; Shallow tunnels - cut and cover, cover and cut, pipe jacking, jacked box excavation techniques; methods of muck disposal; Supporting; Problems encountered and remedial measures.

UNIT-III

Drilling and Blasting

Part A: Drilling - drilling principles; Drilling equipment; Drill selection; Specific drilling; Rock drillability factors; Blasting - explosives, initiators, blasting mechanics.

Part B: Types of cuts- fan, wedge and others; Blast design, tunnel blast performance-powder factor, parameters influencing, models for prediction; Mucking and transportation equipment selection.

UNIT -IV

Mechanization

Tunneling by Road headers and Impact Hammers: Cutting principles, method of excavation, selection, performance, limitations and problems; Tunneling by Tunnel Boring Machines: Boring

principles, method of excavation, selection, performance, limitations and problems; Tunnel Boring Machine applications.

UNIT -V

Tunnel supports & services

Supports in tunnels: Principal types of supports and applicability; Ground treatment in Tunneling: Adverse ground conditions and its effect on tunneling; Excavation of large and deep tunnels, caverns; Tunnel services: Ventilation, drainage and pumping; Tunneling hazards.

Text Books

1. Thomas R. Kuesel, Eley H. King, Tunnel Engineering - Hand book, Kluwer academic publishers, Second edition, 1996.
2. R. Srinivasan, Harbor, Dock and Tunnel Engineering, Charotar publishing house, 2009.

Reference Books

1. Debasis Deb, Finite Element methods: Concepts and Applications in Geomechanics, PHI Learning Pvt. Ltd, New Delhi, 2012.
2. Bernhard Maidl and Markus Thewes, Handbook of Tunnel Engineering: Structures and Methods, Wiley publishers, 2013.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. I Sem. (7 th Semester)			
Course Code 19160764E	Mine Safety Engineering (Professional Elective-3)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites: Mine Legislation and General Safety, Surface Mining		2	1	0	3

Course Objectives

1. To discuss the typical accidents prone to occur in mines.
2. To elaborate the accidents associated with different mining activities.
3. To impart the knowledge on statutory safety requirements in mines.
4. To expound safety and risk management practices in mines.
5. To inculcate about miner's health and occupational diseases and their prevention.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Outline typical accidents prone to occur in mines.
CO2:	Analyse various accidents associated with mining works.
CO3:	Comprehend about statutory safety requirements in mines.
CO4:	Summarize safety and risk management practices in mines.
CO5:	Infer typical miners' health issues, occupational diseases and their prevention.

Syllabus

UNIT -I

Introduction

Accident in mines- different types; Accident investigations; Accident analysis; Accident prevention and corrective action, accident proneness; Creating and maintaining safety awareness; ZAP and MAP; Safety meeting and committee; Need for mine safety.

UNIT -II

Accidents

Accidents due to explosives, Common causes and measures for prevention; Accidents due to electricity: Common causes and measures for prevention; Inundations: Dangers from surface and underground water.

UNIT -III

Health and Mine Safety

Definition of health and safety, management's role - function; Evolution of management involvement, management's training, responsibility, cost of health and safety; Role of labour organizations - union impact and involvement; Role of government - statutory controls and directions, spot and regular inspections, enforcement of standards, penalties for violations, collection and distribution of statistical data.

UNIT -IV

Risk Management

System engineering approach to safety, techniques used in safety analysis, generic approach to loss control with in mining operations; Safety management and organization; Risk management, risk identification, risk estimation and evaluation, risk minimization techniques in mines, risk analysis using FTA, HAZOP, and ETA etc.,

UNIT -V

Miners Health and Occupational Diseases

Preventive medical examinations; Various types of injuries; Compensable diseases; Medical attention and removable of causative factors in the mines; Occupational diseases; Recommendations of inquiry committee carried out for safety and health issues in India.

Text books

1. B.K. Kejriwal, Safety in Mines, Lovely Prakashan, 2002.
2. Samir Kumar Das, Mine Safety and Legislation, Lovely Prakashan, 1st Edition, 2002.

Reference Books

1. Ridley, J & Channing, J.; Safety at Work; Butterworth-Heinemann, Oxford, 2001.
2. N.J. Bahr, Taylor and Francis, System Safety Engineering and Risk Assessment: A Practical Approach, NY, 1997.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech.			
Course Code	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS Common to all Branches, <i>Open Elective</i>				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Basic knowledge of Economics and accounts		3	-	-	3

Course Objective:

The objective of this course is

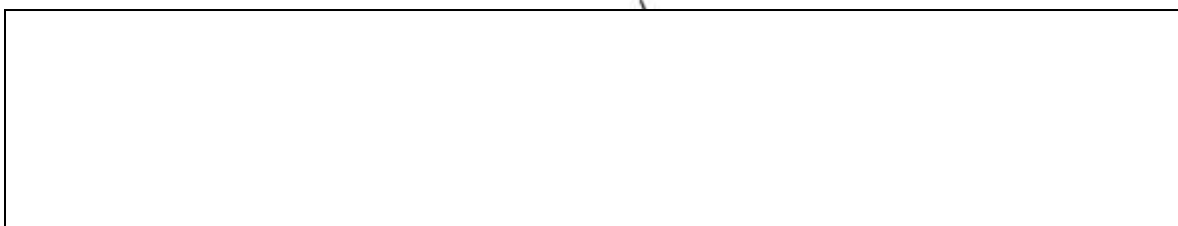
- 1.To acquaint the students regarding various accounting concepts and its application in managerial decision making.
- 2.To enable the students to analyze a company's financial statements and come to a reasoned conclusion about the financial situation of the company.
- 3.To introduce prospective managers of new ventures to prepare and analyse financial statements.
- 4.To enable the students understand how organizations make important investment and financing decisions

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Analyze the scope of managerial economics
CO2	Analyze various aspects of managerial economics, production & cost analysis, markets & pricing strategies
CO3	Develop an ability to identify, formulate, and solve engineering problems by applying the subject knowledge of Managerial economics.
CO4	Apply capital budgeting, financial analysis techniques in evaluating various investment opportunities
CO5	Enhance their capabilities in the interpretation of balance sheets are followed in industries, organizations & institutes.

Syllabus:**UNIT -I****Introduction to Managerial Economics and demand Analysis:**

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand-Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting..



UNIT –II**Production and Cost Analyses:**

Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs – Cost –Volume-Profit analysis-Determination of Breakeven point(simple problems)- Managerial significance and limitations of Breakeven point.

UNIT –III**Introduction to Markets, Theories of the Firm & Pricing Policies:**

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features, Introduction to e-commerce – Price and Output Determination – Managerial Theories of firm: Maris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: Flat Rate Pricing, Usage sensitive pricing and Priority Pricing.

UNIT –IV**Types of Business Organization and Business Cycles:**

Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms – Business Cycles : Meaning and Features – Phases of Business Cycle – Capital Budgeting Techniques.(simple problems)

UNIT –V**Introduction to Accounting & Financing Analysis:**

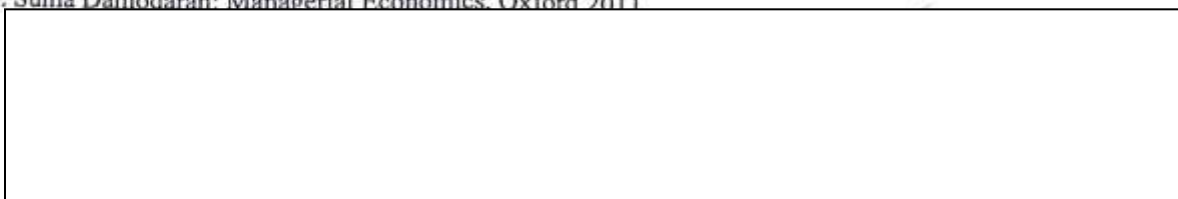
Introduction to Double Entry Systems – Subsidiary books- Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow statements (Simple Problems)

Text books:

1. Dr. N. AppaRao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis',
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. 'Managerial Economics and Financial

Reference Books:

1. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House, 2014.
2. V. Maheswari: Managerial Economics, Sultan Chand. 2014
3. Suma Damodaran: Managerial Economics. Oxford 2011



4. VanithaAgarwal: Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
6. Maheswari: Financial Accounting, Vikas Publications.
7. S. A. Siddiqui& A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012
8. Cengage Publications, New Delhi – 2011
9. Analysis', Ravindra Publication.

GRBT19	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech.			
CourseCode	ENTREPRENEURSHIP SKILLS FOR ENGINEERS (Open Elective)				
Teaching	Totalcontacthours=48	L	T	P	C
		3	-	-	3

Course Objectives:

To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

Course Outcomes:

On Completion of the course, the students	
CO1:	Can know the importance of entrepreneurship in economic developments, ethics and its social responsibility
CO2:	Can understand the business plan its scope, implementation in marketing and Launching.
CO3:	Can able to know the finance resources, motivating, marketing and internet advertising.
CO4:	Can understand the problems related to selection of layout.
CO5:	Can know the production techniques, inventory and quality control in global aspects.

UNIT -I:

Introduction to Entrepreneurship Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Intrapreneur. The Entrepreneurial decision process. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur. Creating and Starting the Venture, Sources of new Ideas, Methods of generating ideas, creating problem solving, product planning and developmentprocess.

UNIT- II:

The Business Plan Nature and scope of Business plan, Writing Business Plan, Evaluating Business plans, Using and implementing business plans. Marketing plan, financial plan and the organizational plan, Launching formalities.



UNIT -III:

Financing and managing the new venture, Sources of capital, venture capital, angel investment, Record keeping, recruitment, motivating and leading teams, and financial controls. Marketing and sales controls. E-commerce and Entrepreneurship, Internet advertising.

UNIT- IV:

New venture Expansion Strategies and Issues, Features and evaluation of joint ventures, acquisitions, merges, franchising. Public issues, rights issues, bonus issues and stock splits. Choosing location and layout, Issues related to Selection of layout.

UNIT V:

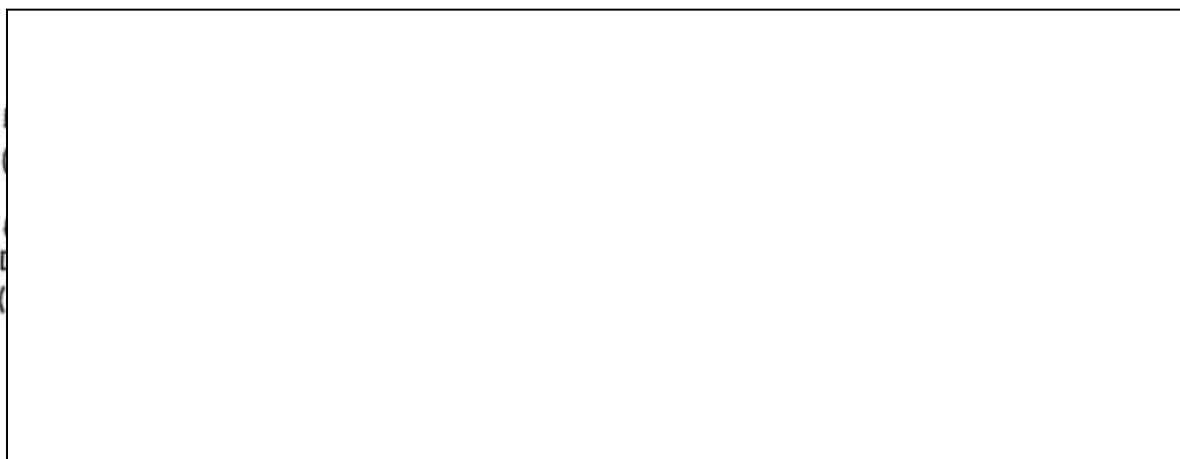
Production and Marketing Management Thrust of production management, Selection of production Techniques, plant utilization and maintenance, Designing the work place, Inventory control, material handling and quality control. Marketing functions, market segmentation, market research and channels of distribution, Sales promotion and product pricing. Global aspects of Entrepreneurship.

Text Books:

2. Robert Hisrich, & Michael Peters: Entrepreneurship, TMH, 5th Edition
3. Dollinger: Entrepreneurship, 4/e, Pearson, 2004.

References:

1. Vasant Desai: Dynamics of Entrepreneurial Development and management, Himalaya Publishing House, 2004.
2. Harvard Business Review on Entrepreneurship. HBR Paper Back, 1999.
3. Robert J. Calvin: Entrepreneurial Management, TMH, 2004.
4. Gurmeet Naroola: The Entrepreneurial Connection, TMH, 2001.
5. Bolton & Thompson: Entrepreneurs- Talent, Temperament, Technique, Butterworth Heinemann, 2001.
6. Agarwal: Indian Economy, WishwaPrakashan 2005.
7. Dutt & Sundaram: Indian Economy. S. Chand, 2005.
8. Srivastava: Industrial Relations & Labour Laws, Vikas, 2005.
9. Aruna Kaulgud: Entrepreneurship Management by. Vikas publishing house, 2003.



Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech.			
Course Code	Principles Of Management (Open Elective)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s):	Knowledge of General Management	4	0	0	4

Course Objectives:

The course is to give a basic perspective of Management. This will form foundation to study other functional areas of management and to provide the students with the conceptual framework and the theories underlying Management.

Course outcomes:

On Completion of the course, the students will be able to-	
CO1	Gain the knowledge of basic concepts, tested principles emerging ideas, evolving theories and latest techniques.
CO2	Understand the importance of critical decisions that ensure growth and sustainability of the organization.
CO3	Understand theoretical aspects and its application to modern management practice
CO4	Demonstrate critical thinking when presented with managerial issues and problems
CO5	Understand the importance of Professional Management for effective utilization of resources in organizations.

UNIT I

Introduction to Management: Nature and scope of Management, Functions of Management Management as a Science, Art and Profession - Management & Administration - Principles of Management- Managerial roles: Mintzberg Model - Contributions of F.W.Taylor and Henry Fayol

UNIT II

Planning: Planning premises, types of plans and Planning process, Decision making meaning and importance- types of decision- steps in decision making, Forecasting techniques.

UNIT III

Organization: Structure, types of organizations, principles of organizing, Authority and span of control, delegation and decentralization, Line and staff relationship.

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UNIT VI

Directing& Controlling: Nature and scope, Leadership- styles of Leadership; Co-ordination- types of interdependence. Controlling: Process of controlling- making controlling effective, -techniques of controlling.

UNIT – V

Contemporary issues – (Brief Study) Quality circle-Total Quality Management - Business Process Reengineering (BPR)- Six sigma.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Harold Koontz, Heinz Weihrich, A.R. Aryasri, Principles of Management, TMH, 2010.
2. Dilip Kumar Battacharya, Principles of Management, Pearson, 2012.
3. Kumar, Rao, Chhaalill "Introduction to Management Science" Cengage Publications, New Delhi
4. V.S.P.Rao, Management Text and Cases, Excel, Second Edition, 2012.
5. K.Anbuvelan, Principles of Management, University Science Press, 2013.
6. K.Aswathappa " Organisational Behaviour-Text, Cases and Games", Himalaya Publishing House, New Delhi, 2008.
7. Steven L Mc Shane, Mary Ann Von Glinow, Radha R Sharma: "Organisational Behaviour", TMH Education, New Delhi, 2008



Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech. Electrical Engineering			
Cours. Code	Financial Management for Engineers (Open Elective)				
Teaching	Total contact hours - 46	L	T	P	C
		4	0	0	4

Course outcomes:

On Completion of the course, the students will be able to-	
CO1:	The students would be able to understand and define basic terminology used in finance and accounts
CO2:	The students would be able to prepare & appraise Financial Statements and evaluate a company in the light of different measurement systems.
CO3:	The students would be able to analyse the risk and return of alternative sources of financing.
CO4:	Estimate cash flows from a project, including operating, net working capital, and capital spending.
CO5:	To estimate the required return on projects of differing risk, to estimate the cash flows from an investment project, calculate the appropriate discount rate, and determine the value added from the project, and make a recommendation to accept or reject the project.

Unit I

Introduction to Financial Accounting. Book keeping & Recording - Meaning, Scope and importance of Financial Accounting. Financial Accounting - concepts and conventions, classification of accounts, Rules and principles governing Double Entry Book-keeping system. Meaning, Preparation of Journal, Ledger, Cash book & Trial balance. (Practical application on tally)

UNIT II

Financial Statement Preparation, analysis & Interpretation- Preparation of financial statement and Profit & Loss Account, Balance Sheet, Ratio Analysis - classification of various ratios. (Calculation on Excel)



GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	H.Tech.			
CourseCode	OPERATIONS MANAGEMENT (Open Elective)				
Teaching	Totalcontacthours-18	L	T	P	C
Prerequisite(s):		3	-	-	3

Course Objective:

Objective: This Course is designed to make student understand the strategic significance of Operation management, to acquaint them with application of discipline to deal with real life business problem.

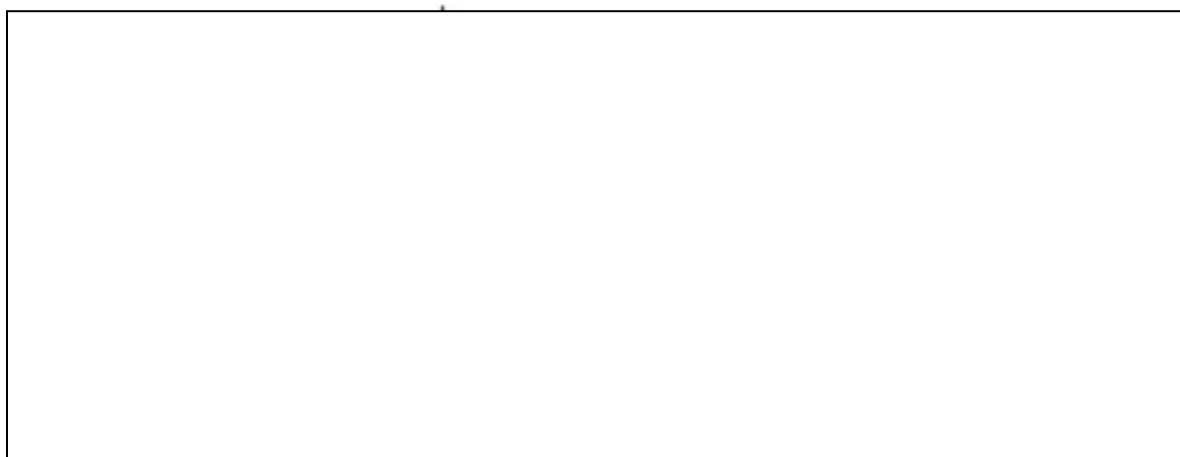
Course Outcomes:

On Completion of the course, the students	
CO1:	Are able to understand the basic concepts in operations and production activities.
CO2:	Can identify factors influencing plant location and plant layout.
CO3:	Can identify the production process and execute the customer order timely.
CO4:	Can manage the materials, manpower effectively by using appropriate inventory and time study techniques.
CO5:	Can improve the productivity by using effective quality control standards and techniques.

Introduction to Operation Management: Nature & Scope of Operation/ Production Management, Relationship with other functional areas, Recent trend in Operation Management, Manufacturing & Theory of Constraint, Types of Production System, Just in Time (JIT) & lean system.

UNIT -II:Product Design & Process Selection: Stages in Product Design process, Value Analysis, Facility location & Layout: Types, Characteristics, Advantages and Disadvantages, Work measurement, Job design.

UNIT- III:Forecasting & Capacity Planning: Methods of Forecasting, Overview of Operation Planning, Aggregate Production Planning, Production strategies, Capacity Requirement Planning, MRP, Scheduling, Supply Chain Management, Purchase Management, Inventory Management. Unit- IV: Productivity: Factors, Affecting Productivity – Job Design – Process Flow Charts – Methods Study – Work Measurement – Engineering and Behavioral Approaches.



UNIT -V:Quality Management: Quality- Definition, Dimension, Cost of Quality, Quality Circles-Continuous improvement (Kaizen), ISO (9000&14000 Series),
Statistical Quality Control: Variable & Attribute, Process Control, Control Charts - Acceptance Sampling Operating Characteristic Curve (AQL, LTPD, Alpha & Beta risk), Total Quality Management (TQM).

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References: 1. Krajewski&Ritzman (2004). Operation Management -Strategy and Analysis. Prentice Hall of India.
2. PannerSelvem, Production and Operation Management, Prentice Hall of India.
3. Chunnawals, Production & Operation Management Himalaya, Mumbai
4. Charry, S.N (2005). Production and Operation Management- Concepts, Methods Strategy. John Willy& Sons Asia Pvt Limited.
5. K Aswathappa& Sridhar Bhatt, Production & Operations Management, Himalaya, Mumbai.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech.			
CourseCode	DIGITAL MARKETING (Open Elective)				
Teaching	Totalcontacthours-63	L	T	P	C
		3	-	-	3

Course Objective:

The objective of this course is to understand the importance of digital marketing and its applications.

Course Outcomes:

On Completion of the course, the students	
CO1:	Would be able to learn about model approach of Marketing.
CO2:	Would be able to learn various methods and channels of digital marketing
CO3:	Would be introduced to Digital Marketing planning execution
CO4:	Get concept of SEO's is introduced for the benefit of students aspiring startups
CO5:	Can learn advertising strategies of Digital Marketing have been introduced

Syllabus:**UNIT - I:**

Understanding Digital Marketing: Concept, Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends.

UNIT - II:

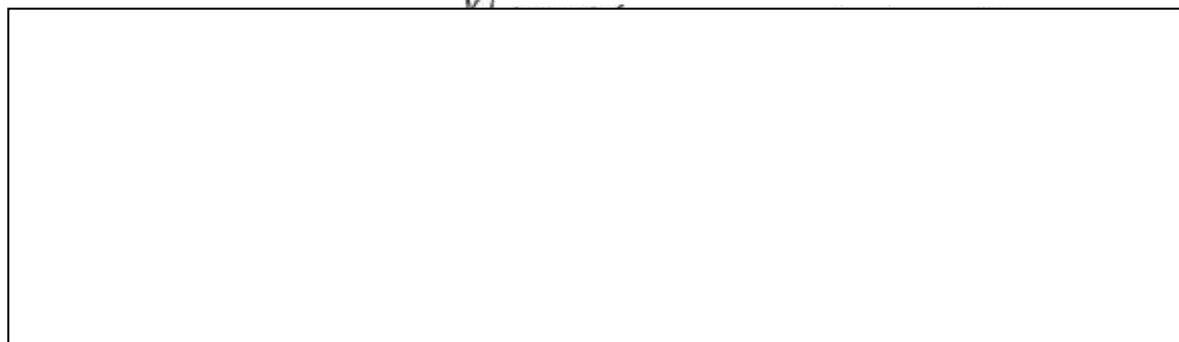
Channels of Digital Marketing: Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Audio, Video and Interactive Marketing, Online Public Relations, Mobile Marketing, Migrating from Traditional Channels to Digital Channels.

UNIT - II:

Marketing in the Digital Era: Segmentation – Importance of Audience Segmentation, How different segments use Digital Media – Organizational Characteristics, Purchasing Characteristics, Using Digital Media to Reach, Acquisition and Retention of new customers, Digital Media for Customer Loyalty.

UNIT - III:

Digital Marketing Plan: Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan – Marketing Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget, Writing the Marketing Plan and Implementing the Plan.



UNIT - IV:

Search Engine Marketing and Online Advertising: Importance of SEM, understanding Web Search – keywords, HTML tags, Inbound Links, Online Advertising vs. Traditional Advertising, Payment Methods of Online Advertising – CPM (Cost-per-Thousand) and CPC (Cost-per-click), Display Ads - choosing a Display Ad Format, Landing Page and its importance.

UNIT - V:

Social Media Marketing: Understanding Social Media, Social Networking with Facebook, LinkedIn, Blogging as a social medium, Microblogging with Twitter, Social Sharing with YouTube, Social Media for Customer Reach, Acquisition and Retention.

Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

Suggested Readings:

1. Michael Miller, B2B Digital Marketing, 1e, Pearson, 2014.
2. Vandana Ahuja, Digital marketing, Oxford University Press 2015
3. Michael R Solomon, Tracy Tuten, Social Media Marketing, Pearson, 1e, 2015.
4. Judy Strauss & Raymond Frost, E-Marketing, Pearson, 2016
5. Richard Gay, Alan Charles worth and Rita Esen, Online marketing – A customer led approach
6. Oxford University Press 2007.
7. Arup Varma, Pawan S. Budhwar, Angelo S. De Nisi, Digital Marketing, Wiley, 2016.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech.			
Course Code	TOTAL QUALITY MANAGEMENT (Open Elective)	—			
Teaching	Total contact hours-64	L	T	P	C
Pre-requisites/Exposure :Exposure of Supply Chain and Operations		4	0	0	4

Course outcomes:

On Completion of the course, the students will be able to-	
CO1:	To realize the importance of significance of quality.
CO2:	Manage quality improvement teams
CO3:	Identify requirements of quality improvement programs
CO4:	Develop a thinking towards Quality systems and Thinking.
CO5:	Acknowledge the strategic value of leading practices and therefore their implementation • Efficiently designing the effective performance measurement system.

OBJECTIVES: To facilitate the understanding of Quality Management principles and process.

UNIT-I

INTRODUCTION: Introduction – Need for quality – Evolution of quality – Definitions of quality – Dimensions of product and service quality – Basic concepts of TQM – TQM Framework – Contributions of Deming, Juran and Crosby – Barriers to TQM – Quality statements – Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention – Costs of quality.

UNIT-II

TQM PRINCIPLES: Leadership – Strategic quality planning, Quality Councils – Employee involvement – Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal – Continuous process improvement – PDCA cycle, 5S, Kaizen – Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT-III

TQM TOOLS AND TECHNIQUES: The seven traditional tools of quality – New management tools – Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT-IV

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UNIT-V

QUALITY SYSTEMS: Need for ISO 9000 – ISO 9001-2008 Quality System – Elements, Documentation, Quality Auditing – QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – TQM Implementation in manufacturing and service sectors., **TOTAL: 45 PERIODS OUTCOMES :** x The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXTBOOK:

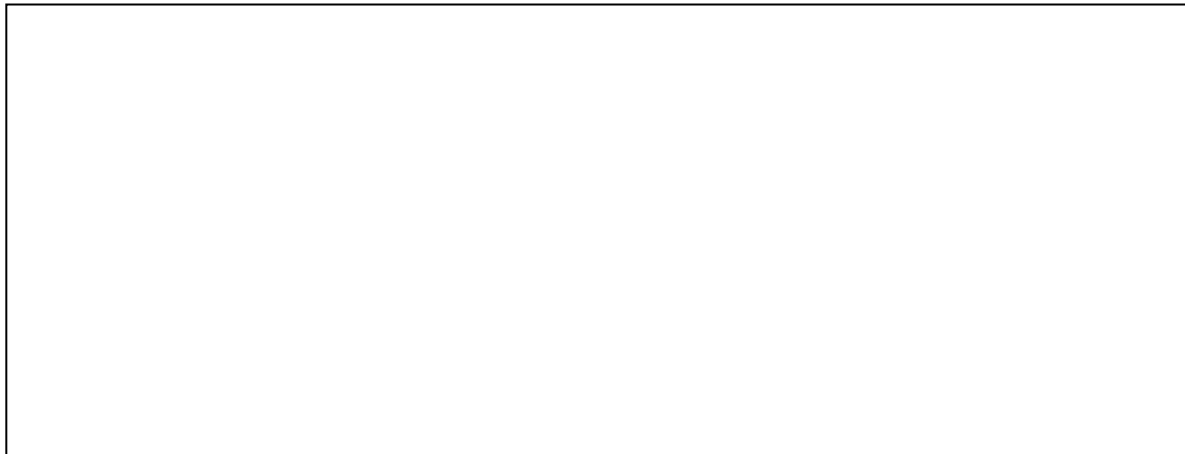
1. Dale H. Besterfield, et al., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint 2006.

REFERENCES:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.

2. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.

3. Janakiraman. B and Gopal .R.K., "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.



Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech.			
CourseCode	ORGANISATIONAL BEHAVIOUR (Open Elective)				
Teaching	Totalcontacthours-48	L	T	P	C
		3	-	-	3

Course Objective:

The main objective of Organizational Behavior is to understand the human interactions in an organization, find what is driving it and influence it for getting better results in attaining business goals.

Course Outcomes:

By studying this course students are able to -	
CO1:	Understand the basic concepts in organizational behavior.
CO2:	Protect the cause and effect relationship of the people in a work place.
CO3:	Understand the group behaviour and its impact on work performance and organization.
CO4:	Understand the managerial strategies in achieving the goals of organizations.
CO5:	Improve the results- performance outcome through human behaviour and organizational behaviour can aid them in their pursuit of the goals.

UNIT-I

Focus and Purpose: Definition, need and importance of organizational behavior – Nature and scope – Frame work – Organizational behavior models.

UNIT-II

Individual Behavior: Personality – types – Factors influencing personality – Theories – Learning – Types of learners – The learning process – Learning theories – Organizational behavior modification. Misbehavior – Types – Management Intervention. Emotions – Emotional Labor – Emotional Intelligence – Theories. Attitudes – Characteristics – Components – Formation – Measurement- Values. Perceptions – Importance – Factors influencing perception – Interpersonal perception- Impression Management. Motivation – importance – Types – Effects on work behavior.

UNIT-III

Group Behavior: Organization structure – Formation – Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms – Group decision making techniques – Team building - Interpersonal relations – Communication – Control.



UNIT-V

Dynamics of Organizational Behavior: Organizational culture and climate – Factors affecting organizational climate – Importance. Job satisfaction – Determinants – Measurements – Influence on behavior. Organizational change – Importance – Stability Vs Change – Proactive Vs Reaction change – the change process – Resistance to change – Managing change. Stress – Work Stressors – Prevention and Management of stress – Balancing work and Life. Organizational development – Characteristics – objectives – Organizational effectiveness.

TEXT BOOKS

1. Stephen P. Robins, Organizational Behavior, PHI Learning / Pearson Education, 11th edition, 2008.
2. Fred Luthans, Organizational Behavior, McGraw Hill, 11th Edition, 2001.

REFERENCES

1. Schermerhorn, Hunt and Osborn, Organizational behavior, John Wiley, 9th Edition, 2008.
2. Udai Pareek, Understanding Organizational Behavior, 2nd Edition, Oxford Higher Education, 2004.
3. Mc Shane & Von Glinov, Organizational Behavior, 4th Edition, Tata Mc Graw Hill, 2007.
4. Hellrigal, Slocum and Woodman, Organizational Behavior, Cengage Learning, 11th Edition 2007.
5. Ivancevich, Konopaske & Maheson, Organizational Behavior & Management, 7th edition, Tata McGraw Hill, 2008.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	✓	-	-	-	✓	-	-	-	✓	-	✓
CO2	-	-	✓	-	-	✓	-	-	✓	-	-	✓
CO3	✓	-	✓	-	✓	✓	-	-	-	-	-	-
CO4	-	-	✓	-	-	✓	-	-	✓	-	-	✓
CO5	-	-	✓	-	✓	-	-	✓	-	-	-	✓

GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech.			
CourseCode	HUMAN RESOURCE MANAGEMENT (Open Elective)				
Teaching	Totalcontacthours-48	L	T	P	C
		3	-	-	3

Course Objective:

To equip the students with basic concepts of Human Resource Management and the various functions of HRM including Industrial Relations in the liberalized, socialism environment.

Course Outcomes:

On Completion of the course, the students	
CO1:	Integrated perspective on role of HRM in modern business. Ability to plan human resources and implement techniques of job design
CO2:	Can conduct job analysis and scientific recruitment and selection process for the higher productivity
CO3:	Can get competency to recruit, train, and appraise the performance of employees
CO4:	Can learn rational design of compensation and salary administration
CO5:	Are able to handle employee issues and evaluate the new trends in HRM

UNIT -I

HRM: Significance - Definition and Functions – evolution of HRM- Principles - Ethical Aspects of HRM- - HR policies, Strategies to increase firm performance - Role and position of HR department –aligning HR strategy with organizational strategy - HRM –changing , global perspective challenges, environment – crosscultural problems – emerging trends in HRM.

UNIT -II

Investment perspectives of HRM: HR Planning – Demand and Supply forecasting - Recruitment and Selection- Sources of recruitment - Tests and Interview Techniques - Training and Development – Methods and techniques– Job design , evaluation and Analysis - Management development - HRD concepts.

UNIT -III

Performance Appraisal: Importance – Methods – Traditional and Modern methods – Latest trends in performance appraisal - Career Development and Counseling- Compensation - Concepts and Principles Influencing Factors- Current Trends in Compensation- Methods of Payments in detail - Incentives rewards compensation mechanisms.



UNIT -IV

Wage and Salary Administration: Concept- Wage Structure- Wage and Salary Policies- Legal Frame Work- Determinants of Payment of Wages- Wage Differentials - Incentive Payment Systems. **Welfare management:** Nature and concepts – statutory and non-statutory welfare measures.

UNIT -V

Managing Industrial Relations: Trade Unions - Employee Participation Schemes- Collective Bargaining- Grievances and disputes resolution mechanisms – Safety at work – nature and importance – work hazards – safety mechanisms - Managing work place stress. Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. K Aswathappa: "Human Resource and Personnel Management", Tata McGraw Hill, New Delhi, 2013.
2. N.Sambasiva Rao and Dr. Nirmal Kumar: "Human Resource Management and Industrial Relations", Himalaya Publishing House, Mumbai.
3. Mathis, Jackson, Tripathy: "Human Resource Management: A South-Asian Perspective", Cengage Learning, New Delhi, 2013.
4. Subba Rao P: "Personnel and Human Resource Management-Text and Cases", Himalaya Publications, Mumbai, 2013.
5. Madhurima Lall, Sakina Qasim Zaidi: "Human Resource Management", Excel Books, New Delhi, 2010

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	B.Tech.			
Course Code	INTELLECTUAL PROPERTY RIGHTS & PATENTS				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisite(s): Basic knowledge of Real Property and Personal Property Intellectual Property and Patents and Trademarks.		3	0	0	3

Course Objectives:

Objectives of intellectual property refer to the purposes of protection granted to creators of innovative intellectual creations. Intellectual property (IP) rights serve the important purpose of ensuring that creators will be recognized for their efforts and protected from infringement. When they are sure that their works are protected, creators are more likely to come up with more new creations. As such, IP also helps to promote creativity and innovation. There are many different forms of IP, each of which is protected by a certain type of IP rights.

Course outcomes:

On Completion of the course, the students will be able to-	
CO1:	to understand the concept of intellectual property rights.
CO2:	Develops procedural knowledge to Legal System and solving the problem relating to intellectual property rights.
CO3:	Skill to pursue the professional programs in Company Secretaryship, Law, Business International Affairs, Public Administration and Other fields.
CO4:	Employability as the Compliance Officer, Public Relation Officer and Liaison Officer.
CO5:	Establishment of Legal Consultancy and service provider.cyber crime

UNIT I Introduction to Intellectual Property Rights

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement - Regulatory – Over use or Misuse of Intellectual Property Rights - Compliance and Liability Issues.

UNIT II Copyrights

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law – Copyright Ownership – Transfer and Duration – Right to prepare Derivative Works – Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law- Semiconductor Chip Protection Act.

UNIT III Patent Rights and Laws

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – Patent Developers and Promoters.

UNIT IV Trade Marks

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

UNIT V Trade Secrets and Cyber Laws

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law. Introduction to Cyber Law – Information Technology Act - Cyber Crime and – Data Security – Confidentiality – Privacy – International aspects of Computer and Online Crime.

Text Books:

1. Deborah E. Bouchoux: "Intellectual Property". Cengage learning, New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western's Special Topics Collections

Reference:

1. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
2. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi.
3. M. Ashok Kumar and Mohd. Iqbal Ali: "Intellectual Property Right" Serials Publications.
4. Prabhuddha Ganguli: 'Intellectual Property Rights' Tata Mc-Graw – Hill, New Delhi

Web Links:

1. www.nptel.com
2. www.mooks.com

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech.ISem. (7 th Semester)			
Course Code 19160711	Computer Applications in Mining Laboratory				
Teaching	Total contact hours - 36	L	T	P	C
Prerequisite(s): Computer Applications in Mining		0	0	3	1.5

Course Objectives

1. To introduce the usage of computers and software in exploration, blasting, ground vibration, subsidence.
2. To elaborate the design of pillars, dumps and open pit slopes using numerical modeling.
3. To introduce the concepts of CPM/PERT and blast optimization.
4. To demonstrate the design of open cast and underground mines.
5. To familiarize with various software used in mining industry.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Comprehend the usage of software in various mining operations.
C02:	Design pillars, dumps and slopes using numerical modeling.
C03:	Comprehend the concepts of CPM/ PERT and blast optimization.
C04:	Plan and design open cast and underground mines.
C05:	Use software used in mining industry.

List of Experiments

1. Flowcharts and symbols for mining activities.
2. Design of mine pillars using numerical modeling.
3. Design of open pit slopes using numerical modeling.
4. Design of dump slopes using numerical modeling.
5. Subsidence prediction in various mining methods.
6. Application of CPM/PERT network in mine planning.
7. Optimization of blast design - open cast & underground.
8. Design of support system for underground mining methods.
9. Design of open pit mine plan.
10. Design of underground mine plan.
11. Determination of area of lease boundaries by using coordinates in software.
12. Creation of an ore model using software.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem. (7 th Semester)			
Course Code 19160712	Mining Machinery Laboratory				
Teaching	Total contact hours - 36	L	T	P	C
Prerequisites: Mining Machinery, Mine Transportation		0	0	3	1.5

Course Objectives

1. To impart the knowledge of different types of wire ropes & rope capping.
2. To explain different transport systems and safety devices.
3. To study about gate end box and various cables used in mines
4. To impart the knowledge different types of support systems.
5. To study about different types of drill bits.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Identify various wire ropes used in mines.
C02:	Comprehend and plan transport systems and safety devices.
C03:	Demonstrate gate end box and various cables used in mines.
C04:	Plan and design different types of support systems.
C05:	Distinguish different types of drill bits.

List of Experiments

1. Identify and sketch the different types of wire ropes.
2. Sketch different types of rope capping.
3. Sketch the direct rope haulage system and endless rope haulage system.
4. Study and sketch various safety devices used in haulage system.
5. Study of constructional features of gate end box.
6. Study the constructional features of flame proof and intrinsically safe apparatus in mines.
7. Study and sketch different types of electrical cables used in mines.
8. Study of electrical coal drill mechanism and its working.
9. Study of head gear structure and its working.
10. Study about working mechanism of Jack hammer.
11. Sketch the different types of drill bits used in mining.
12. Study and sketch the chock shield supports used in long wall mining.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. I Sem. (7 th Semester)			
Course Code 19160764E	Mini Project-2/ Internship				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites: All major and minor subjects studied till 6 th Semester		0	0	0	2

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. IISem. (8 th Semester)			
Course Code 19160861A	Planning of Underground Metal Mines (Professional Elective-4)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites: Development of Mineral Deposits, Underground metal mining		2	1	0	3

Course Objectives

1. To discuss about overall planning and scheduling of activities in metal mining.
2. To impart the knowledge on drive of levels.
3. To educate on underground metal mining equipment selection & support.
4. To impart knowledge on planning the transportation activity.
5. To expound the layouts of underground metal mines.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Plan and schedule the working of an Underground metal mine.
C02:	Comprehend and drive levels.
C03:	Analyze underground metal mining equipment selection & support.
C04:	Demonstrate the transportation system in underground metal mines.
C05:	Design the layouts of working of underground metal mines.

Syllabus

UNIT-I

Introduction

Estimation of production rate, stope sizing, processing, winding and transport system & scheduling of activities in metal mining.

UNIT-II

Planning and scheduling

Planning and scheduling of insets, shaft bottoms, levels and stopes.

UNIT-III

Underground Mining operations & Equipment

Design of blasting, excavation and backfill sequences, underground mining equipment selection & support.

UNIT-IV

Underground Transportation

Material transportation (Ore waste & backfill), Grade control.

UNIT-V

Mine Surface layouts

Surface layouts including mill; Processing plants; Case studies on planning of mining operations.

Text books

1. Agoshkov Metal., Mining of ores and non-metallic minerals, Mir publishers, Moscow, 1983.

2. Y. P. Chacharkar, A study of Metalliferous Mining Methods, Lovely Prakshan, Dhanbad, 1994.
3. K. S. Stout, Mining Methods and Equipment, McGraw hill New York, 1980.

Reference Books

1. B. C. Arthur, SME Mining Engineers Hand Book, American Institute of Mining, Metallurgical and Petroleum Engineers New York, 1973.
2. D. J. Deshmukh, Elements of Mining Technology, Vol - II, Central Techno Publications, Nagpur, 2001.
3. Metal Mines Regulations-1961, Lovely Prakashan.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. IISem. (8 th Semester)			
Course Code 19160861B	Mine Management (Professional Elective-4)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite(s): Mine System Engineering		2	1	0	3

Course Objectives

1. To introduce the concepts of mine management.
2. To discuss the practices of personal management.
3. To impart the knowledge on operation management and work study.
4. To inculcate about the behavioral sciences for management.
5. To familiarize with the concept of maintenance and marketing management.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Comprehend and practice mine management.
C02:	Appraise the importance of personal management and human relations
C03:	Perform work study environment and comprehend operation management.
C04:	Outline the concepts of behavioural sciences for management.
C05:	Comprehend the principles of maintenance and marketing management.

Syllabus

UNIT -I

Introduction

Evolution of management; Theory and practice; Principles of scientific management; Elements of management function; Planning; Organization and control; Structure and design of organization for mining enterprises.

UNIT -II

Personal Management

Selection, training and development of human resources for mining enterprises; Leadership; study of traditional leader behavior; Autocratic; Democratic and Laissez-Faire behaviors.

UNIT -III

Operations Management

Determination of norms and standards of operations by work study; Analysis of mine capacities and capability; Production planning; Scheduling and control; Productivity; Concepts and measurements; Application of Ergonomics in mine operation.

UNIT -IV

Behavioral Sciences for Management

Conflict management; Conflict in organization; Sources of conflict; Dealing with conflict; Organizing for conflict resolution; Conflict and growth; Individual motivation; Two way personal communication.

UNIT -V

Maintenance Management

Definition, classifying reliability, types of Maintenance; Break-down, scheduled, preventive, predictive, protective and lean maintenance.

Marketing Management

Strategic planning & marketing management processes, marketing environment, marketing information systems, market management and forecasting; New product development processes.

Text Books

1. I M Pandey, Financial Management, Vikash Publishing House Pvt. Ltd., New Delhi.
2. P. Gopalakrishnan & M. Sundaresam, Materials Management- An Integrate Approach, Prentice Hall India Pvt. Ltd., New Delhi.
3. SC Saksena, Business Administration and Management, Sahitya Bhawan, Agra.

Reference Books

1. P. Kstler, Marketing Management, Prentice Hall India Pvt. Ltd. New Delhi.
2. M. Telsang, Industrial Engineering and Production Management, S. Chand & Co. Ltd., New Delhi.
3. Lee & Dobbler, Purchasing and Materials Management, Tata Mc-Grand Hill Publishing Co. Ltd. New Delhi.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. IISem. (8 th Semester)			
Course Code 19160861C	Mine Subsidence Engineering (Professional Elective-4)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite: Rock Mechanics		2	1	0	3

Course Objectives

1. To discuss the basic mechanics of mine subsidence.
2. To familiarize with the methods of subsidence prediction.
3. To expound the time influence of subsidence and its impact on structures.
4. To enlighten the effect of subsidence and damages to structures.
5. To illustrate the different control measures to prevent subsidence.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Comprehend and analyze the subsidence mechanism.
C02:	Outline the different methods of subsidence prediction.
C03:	Assess the time influence of subsidence and impact on structures.
C04:	Summarize the effects of subsidence.
C05:	Outline the methods to control subsidence.

Syllabus

UNIT -I

Introduction

Introduction to subsidence, Factors affecting subsidence; Zones of movement in the overlying beds, vertical and horizontal movement; subsidence trough, angle of draw, angle of break; sub-surface subsidence.

UNIT -II

Subsidence prediction

Different methods of surface subsidence prediction - graphical, analytical, profile function, empirical and theoretical models.

UNIT -III

Time influence and impact on structures

Influence of time on subsidence; example from long wall and board and pillar working; Calculation of ground movement over time; Types of stress on structures; stress-strain behavior of soils.

UNIT -IV

Effects of subsidence

Effect of subsidence; Mining damage to building, industrial installations, railway lines, pipes & channels.

UNIT -V

Methods to control subsidence

Methods of Mining to control subsidence; Laws governing mining damage; Different standards suggested for mining and building ground in respect to subsidence.

Text Books

1. Kratzsch, Mining subsidence Engineering, Springer-Verlag publications, 1983.
2. Whittakerm B.N. and Raddish, Subsidence-occurrence, prediction and control, Elsevier Publication, 1989.

Reference Books

1. Brauner, G., Subsidence Due to Underground Mining, Part I, II and III, U.S. Department of Interior, Bureau of Mines, 1973.
2. Peng, S., Surface Subsidence Engineering, SME, New York, 1992.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. IISem. (8 th Semester)			
Course Code 19160861D	Dimensional Stone Mining (Professional Elective-4)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites: Introductory Geology, Development of Mineral Deposits		2	1	0	3

Course Objectives

1. To discuss the aspects of dimensional stone mining
2. To elaborate various techniques of dimensional stone mining.
3. To educate on different equipment used in dimensional stone mining.
4. To enlighten about various environmental issues.
5. To familiarize with the applications of dimensional stone mining.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Comprehend the concept of dimensional stone mining.
CO2:	Analyze the different methods of dimensional stone mining.
CO3:	Identify the various equipment used in dimensional stone mining.
CO4:	Assess the different environmental issues.
CO5:	Summarize the applications of dimensional stone mining.

Syllabus

UNIT -I

Introduction

Definition, historical use of natural stones; Geology and occurrences-Classification of dimensional stones, composition, chemical and geo-chemical properties; Various standards for normalization of dimensional stones.

UNIT -II

Mining of dimensional stones

Various techniques of dimensional stone mining - block mining and slab mining; Manual mining; Mechanized mining - line drilling, in-situ sawing by wire saw, chain saw, portable circular saw, flame cutting; Cutting / Sawing tools- Tool carrier, circular steel blade, steel wire rope, diamond segments, diamond pearls / bits, chain jib saw; physical and mechanical properties, elastic properties.

UNIT -III

Handling of blocks and slabs

Equipment used - derrick crane, front loaders, fork-lifts, mobile cranes, trucks and trailers; Quarrying machines for dimensional stones- Portable circular saw, wire saw, chain saw, line drills; special design features of the machines, their use and maintenance; Production monitoring- Recovery, waste generation, productivity, inherent defects, measurement and corrective actions, cost evaluation.

UNIT -IV

Environmental issues

Management of solid waste, slurry waste and water; Protection and rehabilitation; Health, safety and welfare-Protective care from abrasive dust; Personal safety and welfare.

UNIT -V

Application, processing and architecture in dimensional stone

Application - flooring, roofing, cladding, stairs, paving, facets; Processing and polishing - various techniques for sawing of blocks, shaping of edges, polishing and calibration; Fixing and installation - techniques of fixing of dimensional stones in various applications like flooring, cladding, faces, stairs, roofing and paving; Care and maintenance of dimensional stones - techniques for post fixing care and maintenance of dimensional stones in various applications.

Text Books

1. Rathore S. S., Bhardwaj G. S., Jain S. C, Dimensional Stone Technology, Himanshu Publication, New Delhi, 2000.
2. Rathore S. S., Gupta Y. C., Parmar R. L., Recent Development in Machinery and Equipment for Dimensional Stone Mining, 2003.

Reference Books

1. Rathore S. S., Laxminarayana, Safety and Technology in Marble Mining and Processing in New Millennium, Proc. of National Workshop, Udaipur, 2000.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. IISem. (8 th Semester)			
Course Code 19160861E	Environmental Management in Mines (Professional Elective-4)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite: Mine Environment Engineering		2	1	0	3

Course Objectives

1. To discuss the environmental issues in mineral industry.
2. To expound about air and water pollution in mines.
3. To elaborate about noise pollution in mines.
4. To impart the knowledge on the biological land reclamation.
5. To educate on the Environmental Administration in India.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Outline the environmental issues in mineral industry.
C02:	Interpret the air and water pollution in mines.
C03:	Assess the importance of noise pollution in mines.
C04:	Comprehend and analyse the biological land reclamation.
C05:	Perceive the basic information required for the preparation of environmental impact assessment and environmental management plan.

Syllabus

UNIT-I

Introduction

Environmental issues in mineral industry – national and global; ambient environment mining complexes; environmental impacts of mineral exploitation - opencast mining and associated activities.

Air Pollution

Sources, characterization, ill effects, measurement, monitoring, standards, mitigating measures.

UNIT- II

Water Pollution

Sources, ill effects, water quality parameters - physico-chemical, biological and bacteriological; Water quality criteria, standards, monitoring and mitigating measures; Heavy metal pollution and its abatement; Ground water pollution - detection and management; Acid mine drainage.

UNIT - III

Noise Pollution

Basics of acoustics; Sound power, intensity and pressure levels; Noise indices, effects, standards, instrumentation, monitoring and control.

Blasting

Environmental aspects of blasting.

UNIT- IV

Biological Land Reclamation

Environmental factors affecting re-vegetation - climatic, physical and chemical factors; Analysis and evaluation of site and soil; Plant species selection; Methods of vegetation establishment; Vegetation survey.

Societal Environment

Societal environment and its management including resettlement and rehabilitation; socio-economic impacts; sustainable development; concept of carrying capacity-based planning.

UNIT- V

Environmental Administration in India

Administration and management; Environmental Impact Assessment - methods of EIA and their applicability; Environmental Management Plan - structure and preparation of EMP; Environmental audit; salient features of Environment Protection Act; environmental laws.

Text Books

1. C. G. Down. and J. Stock, Environmental Impact of Mining, Applied Science Publishers Ltd. London, Second Edition, 1980
2. B. B. Dhar, Mining and Environment, Ashish Publishing House, New Delhi, 1986.

Reference Books

1. R. Rajagopalan, Environmental Studies, Oxford University Press, 3rd Edition, 2011.
2. Lawrence D.P., Environmental Impact Assessment - Practical solutions to recurrent problems, Wiley - Interscience, New Jersey, 2003.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. IISem. (8 th Semester)			
Course Code 19160862A	Open Pit Slope Analysis and Design (Professional Elective-5)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites: Surface Mining, Development of Mineral Deposits		2	1	0	3

Course Objectives

1. To impart the knowledge on slopes, slope failures and factors that influence slopes.
2. To discuss the geotechnical parameters required for stability studies of a slope.
3. To elaborate the shear strength of intact rock mass and jointed rock mass.
4. To explain the impacts of water in slope stability.
5. To inculcate various methods and techniques used to assess the slope stability.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Classify various modes of slope failure.
C02:	Comprehend and analyse the geotechnical parameters required for slope stability analysis.
C03:	Interpret the shear strength of intact rock mass and jointed rock mass.
C04:	Analyse the flow of water in slope stability.
C05:	Summarize various methods and techniques used to assess the slope stability.

Syllabus

UNIT -I

Introduction

Types and formation of slopes in surface mines; Pit slope vis-à-vis mine economics; Mechanism of common modes of slope failure; Factors influencing stability of slopes and planning of slope stability investigations.

UNIT -II

Geotechnical Information

Geotechnical data required for high wall slope stability studies; Collection of geological data and their interpretation for stability studies of high wall slopes.

UNIT -III

Shear Strength

Shear strength of intact rock, discontinuity surfaces, filled discontinuities; Surface roughness, joint roughness coefficient - estimation and determination.

UNIT -IV

Impacts of Water on strength

Concepts of water flow through a material and its permeability; Water flow through rock-mass, water flow through soil type material and broken soil material; Estimation and measurement of permeability and water pressure; Graphical solution of seepage problems (flow nets), seepage forces and seepage patterns under different conditions.

UNIT -V

Analysis and Design of Pit Slopes and Waste Dumps

Slope stability assessment methods and techniques; Analysis and design criteria and methodology for high wall slopes and backfill and waste dumps; Probabilistic approaches of slope analysis and design.

Text Books

1. Hoek and Bray, Rock Slope Engineering, The Institution of Mining and Metallurgy, 3rd edition, 1981.
2. G.B. Mishra, Surface Mining, Dhanbad Publishers, 1978.

Reference Books

1. R.T. Deshmukh, Opencast Mining, M. Publications, Nagpur, 1996.
2. S. K. Das, Surface Mining Technology, Lovely Prakashan, Dhanbad, 1994.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. IISem. (8 th Semester)			
Course Code 19160862B	Waste Management (Professional Elective-5)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite(s): Surface Mining, Underground Coal Mining, Underground Metal Mining		2	1	0	3

Course Objectives

1. To impart the knowledge of collection and optimization of collection routing of solid waste.
2. To discuss the principles of treatment of municipal solid waste.
3. To elaborate the impact of solid waste on the health of the living beings.
4. To expound the criterion for selection of landfill and its design.
5. To educate on various methods of processing and treatment of mine waste.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Identify the collection systems of solid waste of a town.
CO2:	Design and plan municipal solid waste treatment and landfill.
CO3:	Identify the criteria for selection of landfill
CO4:	Analyze the solid waste and design a composting facility.
CO5:	Demonstrate the different processing and treatment techniques of tailings management.

Syllabus

UNIT -I

Introduction

Goals and objectives of solid waste management; Classification of Solid Waste; Factors Influencing generation of solid waste; Sampling and characterization; Future changes in waste composition; Major legislation; Monitoring responsibilities.

UNIT -II

Basic Elements in Waste Management

Elements and their inter relationship; Principles of solid waste management; Onsite handling, storage and processing of solid waste.

Collection of Waste

Type and methods of waste collection systems; Analysis of collection system; optimization of collection routes; Alternative techniques for collection system

UNIT -III

Transfer and Transportation of waste

Need for transfer operation; Compaction of solid waste; Transport means and methods; Transfer station types and design requirements.

UNIT -IV

Separation and Transformation of Solid Waste

Unit operations used for separation and transformation- shredding, materials separation and recovery, source reduction and waste minimization.

UNIT -V

Processing and Treatment

Processing of solid waste - Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment; Energy recovery; Biogas generation and cleaning; Incinerators.

Text Books

1. George Tchobanoglous, Integrated Solid Waste Management, McGraw Hill Publication, 1993.

Reference Books

1. Vesilind P.A., Worrell W.A, Solid Waste Engineering, Cengage learning, 3rd Edition, 2011
2. Charles A. Wentz, Hazardous Waste Management, McGraw Hill Publication, 1995.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. II Sem. (8 th Semester)			
Course Code 19160862C	Rock Fragmentation Engineering (Professional Elective-5)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite: Drilling & Blasting		2	1	0	3

Course Objectives

1. To introduce the theory of rock breaking.
2. To expound the mechanism of rock fragmentation using various types of rock drilling.
3. To elaborate the mechanism of rock fragmentation due to explosive action
4. To impart knowledge on the techniques of blast design.
5. To educate the techniques of controlled blasting.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Comprehend the concept of rock breaking theory.
CO2:	Comprehend and analyze the mechanism of different types of rock drilling
CO3:	Analyze the mechanism of rock fragmentation.
CO4:	Comprehend the techniques of the blast design.
CO5:	Outline the techniques of controlled blasting.

Syllabus

UNIT -I

Mechanism of Rock Breaking

Mechanism of rock breaking, different rock breaking processes; General theory of rock cutting; different cutting tools and its applications; Phases of tool penetration into rock surface; Classification of drilling system; Rock drilling methods; Parameters affecting choice of drilling.

UNIT -II

Drilling Methods

Mechanics of rotary, percussive and rotary-percussive drilling, Top hammer and Down-The-Hole hammer drilling; Short and long hole drilling equipment; Pneumatic and hydraulic rock hammers; Types of drill bits and its applications.

UNIT -III

Drill-ability of Rocks

Drill-ability of rocks, purpose of drill-ability, drilling performance-drill rate index, Swedish brittleness test, Siever's j miniature test, bit wear index.

Mechanics of Rock Fragmentation by blasting

Explosive-rock interaction, formation of crater by blast; Mechanics of rock fragmentation and fracture by explosive action.

UNIT -IV

Blasting Accessories

Blasting accessories, blasting parameters.

Design of Blasting Rounds

Design of blasting rounds for opencast and underground mines.

Blasting Results

Blasting efficiency; Mean fragment size; Blown-out shots, Misfires-their causes and remedial measures; Ground vibrations and air over pressure from blasting, mitigative measures.

UNIT -V

Controlled Blasting Technique

Controlled blasting techniques, Safety precautions.

Instrumentation in Blasting

Instrumentation in blasting, borehole pressure transducer, VOD probe, vibration monitor, high speed video camera.

Text books

1. G.K Pradhan, Drilling & Blasting, Mine Tech publication, 1996.
2. George B. Clarke, Principles of Rock Fragmentation, Wiley Interscience, 1987.

Reference Books

1. V.R. Sastry, Advance Drilling & Blasting, Allied Publishers, 1993.
2. E. Hoek and J. Bray, Rock Slope Engineering, The Inst. of Mining & Metallurgy, London, 1981.
3. Sushil Bhandari, Engineering Rock Blasting Operations, A.A Balkema/Rotterdam/Brookfield, 1997.
4. B.V. Ghokhle, Rotary-Drilling and Blasting in Large Surface Mines, CRC Press, 2010.
5. M. Rao, K.U., Prof. S.C Roy, Principles of Rock Drilling, CRC Press, 1998.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. IISem. (8 th Semester)			
Course Code 19160862D	Deep Sea Mining (Professional Elective-5)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisite(s): Nil		2	1	0	3

Course Objectives

1. To impart knowledge on mining of shallow and deep-sea mineral resources.
2. To elaborate the sea profile with an overview of marine mineral deposits.
3. To discuss the nature of continental shelf, slope sea floor, and mining conditions.
4. To educate about the production of oil and natural gas from off-shore areas.
5. To familiarize with the environmental impacts of deep-sea mining.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Comprehend the process of mining of shallow and deep-sea mineral resources.
CO2:	Analyze the profile of sea with the mineral deposits.
CO3:	Comprehend and predict the nature of continental shelf, slope sea floor, and mining conditions.
CO4:	Comprehend and Analyze the production of oil and natural gas from sea mining.
CO5:	Outline the environmental impacts of deep-sea mining.

Syllabus

UNIT -I

Introduction

Introduction to marine environment; Development & status of ocean resources of mining in India and other parts of the world; Characteristics of the ocean floor.

UNIT -II

Overview of marine mineral deposits

Physical and chemical properties of seawater; Overview of marine mineral deposits, deep-sea bed mineral resources, polymetallic nodules, sulphate nodules, chemicals from the ocean profile of the sea, shelf, slope and raise; Nature of the deposits of environments.

UNIT -III

Mineralogical studies of marine sediments

Exploration and characterization of inland water; Mineralogical studies of marine sediments and continental slope; Continental shelf and deep-sea bed mineral resources; Exploration systems of dissolved and undissolved mineral deposits.

UNIT -IV

Deep sea exploration methods

Exploitation of marine deposits- shallow and deep sea bed; Oceanographic instruments; Mining of manganese nodules; Deep sea drilling methods; Ocean bottom samplers; Drag buckets; Grab buckets; Coring systems; Ocean bathymetry; Temperature measurement systems; Water samplers; Ocean dynamic analysis; Beach placer mining; Underwater photographs; Vehicles and transportation; Offshore oil platforms.

UNIT -V

Environmental Impacts

Deep sea bed Mining; Wells and algae for extraction of minerals; Economic & Technologies; Environmental impact of ocean mining; Law of the sea, legal considerations in ocean mining.

Text Books

1. Hartman HL, Introductory Mining Engineering, Willey Eastern, 2002.
2. Manjula R. Shyam, Issues of marine mining, Oxford and IBH.

Reference Books

1. Rahul Sharma, Deep-Sea Mining: Resource Potential, Technical and Environmental Considerations, Springer publication, 2017.
2. Timothy J. Ragen, Marine Mammal Research: Conservation Beyond Crisis, JHU Press, 2005.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. IISem. (8 th Semester)			
Course Code 19160862E	Mine Hazards and Rescue (Professional Elective-5)				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisite: Mine Environment Engineering		2	1	0	3

Course Objectives

1. To expound the mechanism of spontaneous heating in mines and Graham's Index.
2. To communicate the different types of explosion and preventive measures.
3. To educate on various types inundation in mines and preventive measures.
4. To impart knowledge on methods of mine rescue operations.
5. To discuss the various methods of mine illumination.

Course Outcomes

On Completion of the course, the students will be able to-	
C01:	Outline the techniques to control spontaneous heating and mine fires in mines.
C02:	Comprehend the techniques to prevent explosion.
C03:	Comprehend and analyze the techniques to prevent inundation in mines.
C04:	Summarize the techniques of mine rescue and recovery work.
C05:	Outline the different methods of mine illumination.

Syllabus

UNIT -I

Introduction

Classification of fires-causes, detection, monitoring and control of surface and underground fires; Preventive measures-firefighting and inertization; Monitoring of atmosphere behind sealed off areas; Re-opening of sealed off areas.

Spontaneous Heating

Mechanism; Factors governing spontaneous heating; Stages of spontaneous heating; Detection and prevention of spontaneous heating; Graham's index.

UNIT -II

Explosions

Types of explosions; Coward's diagram; Ignition temperature; lag on ignition; Inflammability limits of fire damp and coal dust explosion; Causes and preventive measures of firedamp and coal dust explosion; Stone dust and water barriers; Investigation after explosion; Regulation of Explosion.

UNIT -III

Inundations

Causes; Precautionary measures; Precautions to be taken while approaching old workings; Burnside boring apparatus; Design and construction of water dams; Recovery of flooded mines; Dewatering of old working; Regulation of Inundation.

UNIT -IV

Mine Rescue & Recovery

Mine rescue and equipment; Short distance apparatus; Self-contained breathing apparatus; Reviving apparatus; Self rescuers; Rescue stations; Rescue organization; Reopening of Mines; Rescue and recovery work in connection with fire, explosions, and gases.

UNIT -V

Mine Illumination

Photometric terminologies; General lighting arrangements; Standards for underground and surface mine lighting; Factors affecting visual environment; Types of glare and its reduction; Mine lighting and its effect on accidents, production and health; Law of illumination; Type of light sources used in mines- incandescent lamp, fluorescent tube, metal halide lamps, sodium vapour lamps, compact fluorescent lamp and LED; Electric Cap lamp.

Text Books

1. D. J. Deshmukh, Elements of Mining Technology, Volume-II, Denett & Co., 9th Edition, 2016.
2. M.A. Ramlu, Mine Disasters and Mine Rescue, CRC Press, 1991.

Reference Books

1. Dr. G.B. Mishra, Mine Ventilation, Oxford University Press, 1994.

Regulation GRBT-19	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. IISem. (8 th Semester)			
Course Code 19160841	Project				
Teaching		L	T	P	C
Prerequisite: All major and minor mining subjects		0	0	18	9

GODAVARI INSTITUTE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)**NH-16, Chaitanya Knowledge City, Rajahmundry****Department of Mining Engineering**

A.Y: 2020-21

Year: II Semester: I.

Subject: Development of Mineral Deposits

Max. Marks: 20

Regulations: GR-19

MID Term: I

QP SET: 1

Time: 90mins

PART-A

Answer ALL questions (All questions carry equal marks)

2 x 7 = 14 M

S. No	Question	Bloom's taxonomy level	Course Outcomes	Marks
1a)	Explain about different prospecting Techniques	L3	CO1	7
OR				
1b)	Explain the factors considered for Selection of underground or open cast mining methods.	L2	CO1	7
2a)	Explain the factors effecting while choosing site for constructing Shaft	L4	CO2	7
OR				
2b)	Explain the process involved in Box cut with neat sketch	L1	CO2	7

PART-B

Answer Any Three questions

3 x 2 = 6 M

S. No.	Question	Bloom's taxonomy level	Course Outcomes	Marks
1	Define the terms a) Mineral b) Ore	L2	CO1	2
2	Write the full form of a) CIMFIR b) NIRM	L1	CO2	2
3	What is the role of mining on nation development	L2	CO2	2
4	What is the sequence of operations followed in Mining Industry	L2	CO2	2
5	List the different surface mining methods	L2	CO2	2



GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY (A), RJY
B. Tech (MM) – 3 SEM (R), (R-19), END EXAM QUESTION PAPER
DEVELOPMENT OF MINERAL DEPOSITS

CODE No. 19160305; DATE: 12/03/2021: 02.00PM to 05.00PM

Duration: 3 Hrs

Maximum Marks: 5 x 14 = 70M

ANSWER ALL QUESTIONS
ALL QUESTIONS CARRY EQUAL MARKS

- | | | |
|-----|---|---------------|
| 1.1 | Briefly explain about the selection criteria for underground or opencast mining methods? | [14M] |
| | OR | |
| 1.2 | a) List out various mining industries in India.
b) Draw a table for mineral resources availability in India with their location. | [7M]
[7M] |
| 2.1 | Explain different mode of entries for underground mine with neat sketch | [14M] |
| | OR | |
| 2.2 | Explain the terminology related to opencast mining with neat sketch | [14M] |
| 3.1 | List out the special methods of shaft sinking and explain a method with a neat sketch | [14M] |
| | OR | |
| 3.2 | a) Write a short note on drilling and blasting in shaft sinking operations.
b) Discuss the parameters affecting the selection of shaft location. | [10M]
[4M] |
| 4.1 | Write a brief note on transportation arrangements in development of workings | [14M] |
| | OR | |
| 4.2 | List the raising methods and explain any one of them with a neat sketch. | [14M] |
| 5.1 | Write a brief note on theories of roof bolting with neat sketches. | [14M] |
| | OR | |
| 5.2 | a) Explain about the supporting system used at roadways and junctions in mines,
b) What is purpose of installing of support system in underground mines? | [7M]
[7M] |

