ANNA UNIVERSITY, CHENNAI

UNIVERSITY DEPARTMENTS

B.E. MINING ENGINEERING

REGULATIONS – 2019

CHOICE BASED CREDIT SYSTEM

OUR VISION

To unveil the leadership qualities in students of mining engineering and impart knowledge of latest trends in mining and related industries to meet the present and future requirements of the industry embracing sustainability of the environment in order to produce well communicative, socially responsible and ethical mining engineers. To inculcate the habit of continuous learning, working in groups, safety at work, etc. for the overall development of the society in general, mining and related industries in particular adopting ethical means of profession.

OUR MISSION

- To improve the academic as well as co-curricular activities of the students.
- To organize activities for students in order to develop their soft skills which would aid them in their career prospects.
- To increase awareness of the students on the current state of affairs of the mining industry and to help them keep pace with the latest and emerging trends in the industry.
- To organize guest lectures by prominent personalities to update students constantly on the basic and latest terminologies related to mining and general issues.
- To promote active participation of students in sports activities for physical and mental fitness.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) :

I. The graduates acquire ability to create model, design, synthesize and analyze essential mining operational skills, mechanism and automation system.
II. The graduates use their talent, self-confidence, knowledge and engineering practice which facilitate them to presume position of scientific and/or managerial leadership in their career paths.
III. The graduates apply their consciousness of moral, professional responsibilities and motivation to practice life-long learning in a team work environment.

PROGRAMME OUTCOMES (POs):

After going through the four years of study, our Mining Engineering Graduates will exhibit ability to:

PO #	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply knowledge of mathematics, basic science and engineering science.
2	Problem analysis	Identify, formulate and solve engineering problems.

3	Design/development of solutions	Design a system or process to improve its performance, satisfying its constraints.
4	Conduct investigations of complex problems	Conduct experiments & collect, analyze and interpret the data.
5	Modern tool usage	Apply various tools and techniques to improve the efficiency of the system.
6	The Engineer and society	Conduct themselves to uphold the professional and social obligations.
7	Environment and sustainability	Design the system with environment consciousness and sustainable development.
8	Ethics	Interact in industry, business and society in a professional and ethical manner.
9	Individual and team work	Function effectively on a multidisciplinary team by understanding team dynamics, communication, social norms and conflict management.
10	Communication	Proficiency in oral and written Communication.
11	Project management and finance	Implement cost effective and improved system.
12	Life-long learning	Continue professional development and learning as a life-long activity.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

I. Find gainful employment and advance in their careers, in mining and related service sectors.

II. Function ethically in a variety of professional roles such as mines manager, mine planner, production manager, mineral processing engineer, technical support representative and regulatory specialist and lead the organization competitively.

III. Pursue advanced degrees in mineral-related fields both in post-graduate and research degrees.

IV. Utilize professional skills to become consultant and provide solutions to the practical problems of any organization.

V. Demonstrate an understanding of the critical role mining engineer's play in society with respect to health, safety and the environment for ensuring sustainable development.

Mapping of PSOs and POs

PROGRAMME SPECIFIC OUTCOMES	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
I	✓	✓	✓	✓				✓				
II			✓	✓		✓	✓	✓	✓	✓	✓	
III	✓	✓	✓	✓	✓			✓				
IV				✓	✓	✓	✓			✓	✓	✓
V			✓			✓	✓		✓	✓	✓	✓

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MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES:

		Course Name	PO1	PO2	PO3	PO04	PO5	PO6	PO7	PO8	PO09	PO10	PO11	PO12
YEAR 1	SEMESTER 1	Technical English												
		Engineering Mathematics - I												
		Engineering Physics												
		Engineering Chemistry												
		Engineering Graphics	✓		✓		✓					✓		✓
		Basic Sciences Laboratory												
		Workshop Practices Laboratory	✓	✓	✓	✓								
	SEMESTER 2	Engineering Mathematics - II												
		Problem Solving and Python Programming	✓	✓	✓	✓	✓			✓	✓			✓
		Basics of Electrical and Electronics Engineering	✓	✓	✓	✓	✓							
		Engineering Mechanics	✓		✓									
		Mine Development	✓	✓	✓	✓	✓	✓	✓	✓				✓
		Problem Solving and Python Programming Laboratory	✓	✓	✓	✓	✓			✓	✓			✓
		Electrical and Electronics Engineering Laboratory	✓	✓	✓	✓					✓		✓	
		Course Name	**PO1**	**PO2**	**PO3**	**PO04**	**PO5**	**PO6**	**PO7**	**PO8**	**PO09**	**PO10**	**PO11**	**PO12**
YEAR 2	SEMESTER 3	Numerical and Statistical Methods	✓	✓		✓							✓	✓
		Mechanics of Materials	✓	✓	✓	✓	✓				✓			
		Geology for Mining-I		✓	✓	✓		✓	✓		✓			✓
		Fluid Mechanics and Machinery	✓	✓	✓		✓	✓		✓				✓
		Electrical Drives and Control	✓	✓	✓		✓				✓		✓	
	SEMESTER 4	Geology for Mining - II	✓	✓	✓		✓	✓		✓			✓	✓
		Basic Mechanical Engineering for Mining	✓	✓	✓		✓	✓		✓				✓
		Mining Machinery-I	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
		Mine Environment and Ventilation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Plane and Geodetic Surveying	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
		Course Name	**PO1**	**PO2**	**PO3**	**PO04**	**PO5**	**PO6**	**PO7**	**PO8**	**PO09**	**PO10**	**PO11**	**PO12**
YEAR 3	SEMESTER 5	Surface Mining	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	
		Underground Mining Methods - Coal	✓	✓	✓		✓	✓		✓	✓		✓	
		Rock Mechanics and Ground Control	✓	✓	✓		✓			✓	✓		✓	✓
		Mine Surveying	✓		✓		✓		✓	✓	✓			✓
	SEMESTER 6	Environmental Sciences*		✓	✓	✓		✓	✓	✓	✓	✓	✓	
		Underground Mining Methods - Metal	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
		Mining Machinery-II	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
		Mineral Processing	✓	✓	✓		✓	✓		✓				✓
		Professional Elective-I												
		Open Elective-I												
		Course Name	**PO1**	**PO2**	**PO3**	**PO04**	**PO5**	**PO6**	**PO7**	**PO8**	**PO09**	**PO10**	**PO11**	**PO12**
YEAR 4	SEMESTER 7	Mine Legislation and Safety	✓	✓		✓							✓	✓
		Mine Planning and Design	✓	✓	✓		✓	✓		✓				✓
		Mine Environmental Engineering		✓	✓	✓		✓	✓		✓			✓
		Professional Elective-II												

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		Professional Elective-III												
		Open Elective-II												
	SEMESTER	Professional Elective-IV												
		Professional Elective-V												
		Professional Elective-VI												

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ANNA UNIVERSITY, CHENNAI

UNIVERSITY DEPARTMENTS

B.E. MINING ENGINEERING

REGULATIONS – 2019

CHOICE BASED CREDIT SYSTEM

CURRICULA AND SYLLABI FOR I TO VIII SEMESTERS

SEMESTER I

Sl. No	Course Code	Course Title	Category	Periods per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1.	HS5151	Technical English	HSMC	4	0	0	4	4
2.	MA5158	Engineering Mathematics - I	BSC	3	1	0	4	4
3.	PH5151	Engineering Physics	BSC	3	0	0	3	3
4.	CY5151	Engineering Chemistry	BSC	3	0	0	3	3
5.	GE5151	Engineering Graphics	ESC	1	0	4	5	3
PRACTICALS								
6.	BS5161	Basic Sciences Laboratory	BSC	0	0	4	4	2
7.	GE5162	Workshop Practices Laboratory	ESC	0	0	4	4	2
			TOTAL	**14**	**1**	**12**	**27**	**21**

SEMESTER II

Sl. No	Course Code	Course Title	Category	Periods per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1.	MA5252	Engineering Mathematics - II	BSC	3	1	0	4	4
2.	GE5153	Problem Solving and Python Programming	ESC	3	0	0	3	3
3.	EE5251	Basics of Electrical and Electronics Engineering	ESC	3	0	0	3	3
4.	GE5152	Engineering Mechanics	ESC	3	1	0	4	4
5.	MI5201	Mine Development	PCC	2	0	2	4	3
PRACTICALS								
6.	GE5161	Problem Solving and Python Programming Laboratory	ESC	0	0	4	4	2
7.	EE5261	Electrical and Electronics Engineering Laboratory.	ESC	0	0	4	4	2
			TOTAL	**14**	**2**	**10**	**26**	**21**

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SEMESTER III

Sl. No	Course Code	Course Title	Category	Periods per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1.		Elective – Humanities I	HSMC	3	0	0	3	3
2.	MA5352	Numerical and Statistical Methods	BSC	3	1	0	4	4
3.	ML5352	Mechanics of Materials	ESC	3	0	0	3	3
4.	AG5306	Geology for Mining-I	PCC	3	0	0	3	3
5.	CE5251	Fluid Mechanics and Machinery	ESC	3	0	0	3	3
6.	EE5305	Electrical Drives and Control	ESC	3	0	0	3	3
PRACTICALS								
7.	CE5313	Fluid Mechanics and Machinery Laboratory	ESC	0	0	4	4	2
8.	AG5313	Geology Laboratory - I	PCC	0	0	2	2	1
9.	MI5311	Practical Training-I* (Surface Mine)	EEC	0	0	0	0	1
			TOTAL	**18**	**1**	**6**	**25**	**23**

* The students have to undergo training in surface mines during summer vocation at the end of the II Semester for a period of **2 to 3 weeks** and training report with certificate obtained from the organization shall be submitted.

SEMESTER IV

Sl. No	Course Code	Course Title	Category	Periods per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1.		Elective – Humanities II	HSMC	3	0	0	3	3
2.	AG5401	Geology for Mining - II	PCC	3	0	0	3	3
3.	ME5404	Basic Mechanical Engineering for Mining	PCC	2	0	2	4	3
4.	MI5401	Mining Machinery-I	PCC	2	0	2	4	3
5.	MI5402	Mine Environment and Ventilation	PCC	3	0	0	3	3
6.	CE5451	Plane and Geodetic Surveying	ESC	3	0	0	3	3
7.		Audit Course – I*	AC	3	0	0	3	0
PRACTICALS								
8.	AG5412	Geology Laboratory-II and Field Work**	PCC	0	0	2	2	1
9.	CE5461	Plane and Geodetic Surveying Laboratory	ESC	0	0	4	4	2
			TOTAL	**19**	**2**	**10**	**31**	**21**

* Audit Course is optional.

**The students have to carry out the Geological Field Work covering metallic and non-metallic deposits during the IV Semester for a minimum period of 5 days.

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SEMESTER V

Sl. No	Course Code	Course Title	Category	Periods per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1.	GE5552	Engineering Management	HSMC	3	0	0	3	3
2.	MI5501	Surface Mining	PCC	3	0	0	3	3
3.	MI5502	Underground Mining Methods - Coal	PCC	3	0	0	3	3
4.	MI5503	Rock Mechanics and Ground Control	PCC	3	1	0	4	4
5.	MI5504	Mine Surveying	PCC	3	0	0	3	3
6.		Audit Course – II*	AC	3	0	0	3	0
PRACTICALS								
7.	MI5511	Rock Mechanics and Ground Control Laboratory	PCC	0	0	2	2	1
8.	MI5512	Mine Ventilation Laboratory	PCC	0	0	2	2	1
9.	MI5513	Practical Training-II**	EEC	0	0	0	0	1
			TOTAL	**18**	**1**	**4**	**23**	**19**

* Audit Course is optional.

The students have to undergo training/internship in underground mines (coal or metal)/allied industry/research institute during summer vocation at the end of the IV Semester for a period of **2 to 3 weeks and training report with certificate obtained from the organization shall be submitted**.**

SEMESTER VI

Sl. No	Course Code	Course Title	Category	Periods per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1.	GE5251	Environmental Sciences	BSC	3	0	0	3	3
2.	MI5601	Underground Mining Methods – Metal	PCC	3	0	0	3	3
3.	MI5602	Mining Machinery-II	PCC	3	0	2	5	4
4.	MI5603	Mineral Processing	PCC	3	0	0	3	3
5.		Professional Elective-I	PEC	3	0	0	3	3
6.		Open Elective-I	OEC	3	0	0	3	3
PRACTICALS								
7.	MI5611	Mineral Processing Laboratory	PCC	0	0	2	2	1
8.	MI5612	Rock Blasting Laboratory	PCC	0	0	2	2	1
9.	MI5613	Survey Camp**	EEC	0	0	0	0	1
			TOTAL	**18**	**0**	**6**	**24**	**22**

**The students have to undergo the survey camp in underground mines/surface mines during winter vocation at the end of the V Semester (or) during VI Semester for a period of 10 days.

SEMESTER VII

Sl. No	Course Code	Course Title	Category	Periods per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1.	MI5701	Mine Legislation and Safety	PCC	3	0	0	3	3
2.	MI5702	Mine Planning and Design	PCC	3	0	0	3	3
3.	MI5703	Mine Environmental Engineering	PCC	2	0	2	4	3
4.		Professional Elective-II	PEC	3	0	0	3	3
5.		Professional Elective-III	PEC	3	0	0	3	3
6.		Open Elective-II	OEC	3	0	0	3	3
PRACTICALS								
7.	MI5711	Computer Aided Mine Planning and Design (CAMPAD) Laboratory	PCC	0	0	2	2	1
8.	MI5712	Practical Training-III*	EEC	0	0	0	0	1
9.	MI5713	Project I	EEC	0	0	6	6	3
			TOTAL	**17**	**0**	**10**	**27**	**23**

*The students have to undergo training/internship in underground mines (coal or metal)/allied industry/research institute during summer vocation at the end of the VI Semester for a period of **2 to 3 weeks** and training report with certificate obtained from the organization shall be submitted**.**

SEMESTER VIII

Sl. No	Course Code	Course Title	Category	Periods per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1.		Professional Elective-IV	PEC	3	0	0	3	3
2.		Professional Elective-V	PEC	3	0	0	3	3
3.		Professional Elective-VI	PEC	3	0	0	3	3
PRACTICALS								
4.	MI5811	Project II	EEC	0	0	16	16	8
			TOTAL	**9**	**0**	**16**	**25**	**17**
							TOTAL CREDITS FOR THE PROGRAMME	**167**

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HUMANITIES AND SOCIAL SCIENCES (HSMC) – MANAGEMENT AND OTHERS

Sl. No	Course Code	Course Title	Periods per week			Credits	Semester
			Lecture	Tutorial	Practical		
1.	HS5151	Technical English	4	0	0	4	1
2.	GE5451	Total Quality Management	3	0	0	3	3

HSMC– ELECTIVES – HUMANITIES I (ODD SEMESTER)

Sl. No	Course Code	Course Title	Periods per week			Credits
			Lecture	Tutorial	Practical	
1.	HU5171	Language and Communication	3	0	0	3
2.	HU5172	Values and Ethics	3	0	0	3
3.	HU5173	Human Relations at Work	3	0	0	3
4.	HU5174	Psychological Processes	3	0	0	3
5.	HU5175	Education, Technology and Society	3	0	0	3
6.	HU5176	Philosophy	3	0	0	3
7.	HU5177	Applications of Psychology in Everyday Life	3	0	0	3

HSMC– ELECTIVES – HUMANITIES II (EVEN SEMESTER)

Sl. No	Course Code	Course Title	Periods per week			Credits
			Lecture	Tutorial	Practical	
1.	HU5271	Gender Culture and Development	3	0	0	3
2.	HU5272	Ethics and Holistic Life	3	0	0	3
3.	HU5273	Law and Engineering	3	0	0	3
4.	HU5274	Film Appreciation	3	0	0	3
5.	HU5275	Fundamentals of Language and Linguistics	3	0	0	3
6.	HU5276	Understanding Society and Culture through Literature	3	0	0	3

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BASIC SCIENCE COURSE [BSC]

Sl. No	Course Code	Course Title	Periods per week			Credits	Semester
			Lecture	Tutorial	Practical		
1.	MA5158	Engineering Mathematics - I	3	1	0	4	1
2.	PH5151	Engineering Physics	3	0	0	3	1
3.	CY5151	Engineering Chemistry	3	0	0	3	1
4.	BS5161	Basic Sciences Laboratory	0	0	4	2	1
5.	MA5252	Engineering Mathematics- II	3	1	0	4	2
6.	MA5352	Numerical and Statistical Methods	3	1	0	4	3
7.	GE5251	Environmental Sciences	3	0	0	3	4

ENGINEERING SCIENCE COURSE [ESC]

Sl. No	Course Code	Course Title	Periods per week			Credits	Semester
			Lecture	Tutorial	Practical		
1.	GE5151	Engineering Graphics	1	0	4	3	1
2.	GE5162	Workshop Practices Laboratory	0	0	4	2	1
3.	GE5153	Problem Solving and Python programming	3	0	0	3	2
4.	EE5251	Basics of Electrical and Electronics Engineering	3	0	0	3	2
5.	GE5152	Engineering Mechanics	3	0	0	3	2
6.	EE5261	Electrical and Electronics Engineering Laboratory	0	0	4	2	2
7.	GE5161	Problem Solving and Python Programming Laboratory	0	0	4	2	2
8.	ML5352	Mechanics of Materials	3	0	0	3	3
9.	CE5251	Fluid Mechanics and Machinery	3	0	0	3	3
10.	CE5313	Fluid Mechanics and Machinery Laboratory	0	0	4	2	3
11.	CE5451	Plane and Geodetic	3	0	0	3	4
12.	CE5461	Plane and Geodetic Surveying Laboratory	0	0	4	2	4
13.	EE5305	Electrical Drives and Control	3	0	0	3	3

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PROFESSIONAL CORE COURSES [PCC]

Sl. No	Course Code	Course Title	Periods per week			Credits	Semester
			Lecture	Tutorial	Practical		
1.	AG5306	Geology for Mining-I	3	0	0	3	3
2.	EE5305	Electrical Drives and Control	3	0	0	3	3
3.	AG5313	Geology Laboratory - I	0	0	2	1	3
4.	AG5401	Geology for Mining - II	3	0	0	3	4
5.	ME5404	Basic Mechanical Engineering for Mining	2	0	2	3	4
6.	MI5401	Mining Machinery-I	2	0	2	3	4
7.	MI5402	Mine Environment and Ventilation	3	0	0	3	3
8.	AG5412	Geology Laboratory-II and Field Work**	0	0	4	2	4
9.	MI5501	Surface Mining	3	0	0	3	5
10.	MI5502	Underground Mining Methods - Coal	3	0	0	3	5
11.	MI5503	Rock Mechanics and Ground Control	3	1	0	4	5
12.	MI5504	Mine Surveying	3	0	0	3	5
13.	MI5511	Rock Mechanics and Ground Control Laboratory	0	0	2	1	5
14.	MI5512	Mine Ventilation Laboratory	0	0	2	1	5
15.	MI5602	Underground Mining Methods – Metal	3	0	0	3	6
16.	MI5603	Mining Machinery-II	3	0	0	3	6
17.	MI5604	Mineral Processing	3	0	0	3	6
18.	MI5611	Mineral Processing Laboratory	0	0	2	1	6
19.	MI5612	Rock Blasting Laboratory	0	0	2	1	6
20.	MI5701	Mine Legislation and Safety	3	0	0	3	7
21.	MI5702	Mine Planning and Design	3	0	0	3	7
22.	MI5703	Mine Environmental Engineering	3	0	0	3	7
23.	MI5711	Computer Aided Mine Planning and Design (CAMPAD) Laboratory	0	0	2	1	7

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PROFESSIONAL ELECTIVES COURSES

SEMESTER VI, ELECTIVE – I

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CONTACT PERIODS	CREDITS
				L	T	P		
1	MI5001	Applied Rock Engineering (RMGC-II)	PEC	3	0	0	3	3
2	MI5002	Subsidence Engineering	PEC	3	0	0	3	3
3	MI5003	Rock Reinforcement Engineering	PEC	3	0	0	3	3
4	GE5451	Total Quality Management	PEC	3	0	0	3	3

SEMESTER VII, ELECTIVE – II

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CONTACT PERIODS	CREDITS
				L	T	P		
1	MI5004	Computer Applications in Mining	PEC	3	0	0	3	3
2	MI5005	Numerical Methods in Mining Engineering	PEC	3	0	0	3	3
3	MI5006	Engineering Materials, Fuels and Assaying	PEC	3	0	0	3	3

SEMESTER VII, ELECTIVE – III

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CONTACT PERIODS	CREDITS
				L	T	P		
1	MI5007	System Engineering in Mining	PEC	3	0	0	3	3
2	MI5008	Small Scale Mining and Marine Mining	PEC	3	0	0	3	3
3	MI5009	Energy Conservation and Management	PEC	3	0	0	3	3

SEMESTER VIII, ELECTIVE – IV

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CONTACT PERIODS	CREDITS
				L	T	P		
1	MI5010	Drilling and Blasting Engineering	PEC	3	0	0	3	3
2	MI5011	Rock Excavation Engineering	PEC	3	0	0	3	3
3	MI5012	Advanced Rock Blasting Technology	PEC	3	0	0	3	3

SEMESTER VIII, ELECTIVE – V

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CONTACT PERIODS	CREDITS
				L	T	P		
1	MI5013	Environmental Management for Sustainable Mining	PEC	3	0	0	3	3
2	ME5751	Finite Element Analysis	PEC	3	0	0	3	3
3	MI5014	Non-destructive Testing	PEC	3	0	0	3	3
4	GE5003	Mine Economics and Investment	PEC	3	0	0	3	3

SEMESTER VIII, ELECTIVE – VI

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CONTACT PERIODS	CREDITS
				L	T	P		
1	MI5015	Rock Slope Engineering	PEC	3	0	0	3	3
2	MI5016	Material Handling	PEC	3	0	0	3	3
3	MI5017	Advanced Surface Mining Technology	PEC	3	0	0	3	3

AUDIT COURSES (AC)

Registration for any of these courses is optional to students

Sl. No	Course	Course Title	Periods per week			Total Contact Periods	Credits
			L	T	P		
1.	AD5091	Constitution of India	3	0	0	3	0
2.	AD5092	Value Education	3	0	0	3	0
3.	AD5093	Pedagogy Studies	3	0	0	3	0
4.	AD5094	Stress Management by Yoga	3	0	0	3	0
5.	AD5095	Personality Development Through Life Enlightenment Skills	3	0	0	3	0
6.	AD5096	Unnat Bharat Abhiyan	3	0	0	3	0
7.	AD5097	Essence of Indian Knowledge Tradition	3	0	0	3	0
8.	AD5098	Sanga Tamil Literature Appreciation	3	0	0	3	0

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EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Sl. No	Course Code	Course Title	Periods per week			Credits	Semester
			Lecture	Tutorial	Practical		
1.	MI5311	Practical Training-I* (Surface Mine)	0	0	0	1	3
2.	MI5513	Practical Training-II*	0	0	0	1	5
3.	MI5613	Survey Camp**	0	0	2	1	6
4.	MI5712	Practical Training-III*	0	0	0	1	7
5.	MI5713	Project I	0	0	6	3	7
6.	MI5811	Project II	0	0	16	8	8

SUMMARY

Sl. No	Subject Area	Credits per Semester								Credits
		I	II	III	IV	V	VI	VII	VIII	
1.	**HSMC**	4	0	3	3	3	0	0	0	**13**
2.	**BSC**	12	4	4	0	0	3	0	0	**23**
3.	**ESC**	5	14	8	5	0	0	0	0	**32**
4.	**PCC**	0	3	7	13	15	12	10	0	**60**
5.	**PEC**	0	0	0	0	0	3	6	9	**18**
6.	**OEC**	0	0	0	0	0	3	3	0	**6**
7.	**EEC**	0	0	1	0	1	1	4	8	**15**
	TOTAL	**21**	**21**	**23**	**21**	**19**	**22**	**23**	**17**	**167**
	Non-Credit / (Audit course)	-	-	-	-	-	-	-	-	

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HS5151	TECHNICAL ENGLISH	L	T	P	C
		4	0	0	4

COURSE OBJECTIVES:

The first semester English course entitled 'Technical English' aims to,

- Familiarise first year students of engineering and technology with the fundamental aspects of technical English.
- Develop all the four language skills by giving sufficient practice in the use of the skills in real life contexts.
- Enhance the linguistic and communicative competence of first year engineering and technology students.

UNIT I INTRODUCING ONESELF 12

Listening: Listening and filling a form, listening to speeches by specialists from various branches of engineering and completing activities such as answering questions, identifying the main ideas of the listening text, style of the speaker (tone and tenor) – **Speaking**: Introducing oneself –introducing friend/ family - **Reading:** Descriptive passages (from newspapers / magazines)- **Writing**: Writing a paragraph (native place, school life)- **Grammar:** Simple present, present continuous – **Vocabulary Development**: One word substitution

UNIT II DIALOGUE WRITING 12

Listening: Listening to conversations (asking for and giving directions) –**Speaking:** making conversation using (asking for directions, making an enquiry), Role plays-dialogues- **Reading:** Reading a print interview and answering comprehension questions-**Writing**: Writing a checklist, Dialogue writing- **Grammar**: Simple past – question formation (Wh- questions, Yes or No questions, Tag questions)- **Vocabulary Development**: Stress shift, lexical items related to the theme of the given unit.

UNIT III FORMAL LETTER WRITING 12

Listening: Listening to speeches by famous people and identifying the central message of the speech – answering multiple-choice questions)-**Speaking:** Giving short talks on a given topic- **Reading:** Reading motivational essays on famous engineers and technologists (answering open-ended and closed questions)- **Writing:** Writing formal letters/ emails (Complaint letters)-**Grammar**: Future Tense forms of verbs, subject and verb agreement-**Vocabulary Development**: Collocations – Fixed expressions

UNIT IV WRITING COMPLAINT LETTERS 12

Listening: Listening to short talks (5 minutes duration and fill a table, gap-filling exercise) note taking/note making- **Speaking:** Small group discussion, giving recommendations-**Reading:** Reading problem – solution articles/essays drawn from various sources- **Writing:** Making recommendations – Writing a letter/ sending an email to the Editor- note making- **Grammar:** Modals – Phrasal verbs – cause and effect sentences- **Vocabulary Development**: Connectives, use of cohesive devices in writing, technical vocabulary.

UNIT V WRITING DEFINITIONS AND PRODUCT DESCRIPTION 12

Listening: Listening to a product description (labeling and gap filling) exercises- **Speaking:** Describing a product and comparing and contrasting it with other products- **Reading**: Reading graphical material for comparison (advertisements)-**Writing:** Writing Definitions (short and long) – compare and contrast paragraphs- **Grammar:** Adjectives – Degrees of comparison - compound nouns- **Vocabulary Development**: Use of discourse markers – suffixes (adjectival endings).

TOTAL : 60 PERIODS

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LEARNING OUTCOMES

At the end of the course the students will have gained,

- Exposure to basic aspects of technical English.
- The confidence to communicate effectively I various academic situations.
- Learnt the use of basic features of Technical English.

TEXT BOOK:

1. Revised Edition of 'English for Engineers and Technologists' Volume 1 published by Orient Black Swan Limited 2019.

ASSESSMENT PATTERN

- Assessments will assess all the four skills through both pen and paper and computer based tests.
- Assessments can be pen and paper based, quizzes.

MA5158	**ENGINEERING MATHEMATICS – I (Common to all branches of B.E. / B.Tech. Programmes in I Semester)**	**L** **3**	**T** **1**	**P** **0**	**C** **4**

COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I MATRICES 12

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II DIFFERENTIAL CALCULUS 12

Limit of function – One sided limit – Limit Laws – Continuity – left and right continuity – types of discontinuities – Intermediate Value Theorem – Derivatives of a function - Differentiation rules – Chain rule – Implicit differentiation – logarithmic differentiation – Maxima and minima – Mean value theorem – (Optional: Polar coordinate system – Differentiation in polar coordinates).

UNIT III FUNCTIONS OF SEVERAL VARIABLES 12

Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Errors and approximations – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV INTEGRAL CALCULUS 12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT V MULTIPLE INTEGRALS 12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

TOTAL :60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

- Use the matrix algebra methods for solving practical problems.
- Apply differential calculus tools in solving various application problems.
- Able to use differential calculus ideas on several variable functions.
- Apply different methods of integration in solving practical problems.
- Apply multiple integral ideas in solving areas, volumes and other practical problems.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2017.
2. James Stewart, "Calculus with Early Transcendental Functions", Cengage Learning, 6th Edition, New Delhi,2013.
3. Joel Hass, Christopher Heil and Maurice D.Weir, "Thomas' Calculus", Pearson, 14th Edition, New Delhi, 2018.
4. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), 7th Edition, New Delhi, 2009.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2015.
3. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education2nd Edition, 5th Reprint, Delhi, 2009.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics",Narosa Publications, 5th Edition, New Delhi, 2017.
5. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7th Edition, New Delhi , 2012.
6. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

PH5151 ENGINEERING PHYSICS L T P C

(Common to all branches of B.E / B.Tech programmes) **3 0 0 3**

COURSE OBJECTIVES:

- To make the students in understanding the importance of mechanics.
- To equip the students on the knowledge of electromagnetic waves.
- To introduce the basics of oscillations, optics and lasers.
- To enable the students in understanding the importance of quantum physics.
- To elucidate the application of quantum mechanics towards the formation of energy bands in crystalline materials.

UNIT I MECHANICS 9

Moment of inertia (M.I) - Radius of gyration - Theorems of M .I - M.I of circular disc, solid cylinder , hollow cylinder , solid sphere and hollow sphere - K.E of a rotating body – M.I of a diatomic molecule – Rotational energy state of a rigid diatomic molecule - centre of mass – conservation of linear momentum – Relation between Torque and angular momentum - Torsional pendulum.

UNIT II ELECTROMAGNETIC WAVES 9

Gauss's law – Faraday's law - Ampere's law - The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS 9

Simple harmonic motion - resonance - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect - reflection and refraction of light waves - total internal reflection - interference - interferometers - air wedge experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO_2 laser, semiconductor laser - applications.

UNIT IV BASIC QUANTUM MECHANICS 9

Photons and light waves - Electrons and matter waves - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization - Particle in a infinite potential well - Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS 9

The harmonic oscillator - Barrier penetration and quantum tunneling - Tunneling microscope - Resonant diode - Finite potential wells - particle in a three dimensional box - Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of this course, the students should able to

- Understanding the importance of mechanics.
- Express the knowledge of electromagnetic waves.
- Know the basics of oscillations, optics and lasers.
- Understanding the importance of quantum physics.
- Apply quantum mechanical principles towards the formation of energy bands in crystalline materials.

TEXT BOOKS

1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education, 2017.
2. D.Halliday, R.Resnick and J.Walker. Principles of Physics. John Wiley & Sons, 2015.
3. N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer- Verlag, 2012.

REFERENCES

1. R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson, 2016.
2. D.J.Griffiths. Introduction to Electrodynamics. Pearson Education, 2015
3. K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications. Springer, 2012.

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CY5151	ENGINEERING CHEMISTRY (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

COURSE OBJECTIVES:

- To introduce the basic concepts of polymers, their properties and some of the important applications.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To facilitate the understanding of the laws of photochemistry, photo processes and instrumentation & applications of spectroscopic techniques.
- To familiarize the operating principles and applications of energy conversion, its processes and storage devices.
- To inculcate sound understanding of water quality parameters and water treatment techniques.

UNIT I POLYMER CHEMISTRY 9

Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension. Structure, Properties and uses of: PE, PVC, PC, PTFE, PP, Nylon 6, Nylon 66, Bakelite, Epoxy; Conducting polymers – polyaniline and polypyrrole.

UNIT II NANOCHEMISTRY 9

Basics-distinction between molecules, nanomaterials and bulk materials; size-dependent properties. Types –nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Characterization - Scanning Electron Microscope and Transmission Electron Microscope - Principle and instrumentation (block diagram). Properties (optical, electrical, mechanical and magnetic) and Applications of nanomaterials - medicine, agriculture, electronics and catalysis.

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry - Grotthuss-Draper law, Stark-Einstein law and Lambert-Beer Law (derivation and problems). Photo physical processes – Jablonski diagram. Chemiluminescence, photo-sensitization and photoquenching – mechanism and examples. Spectroscopy: Electromagnetic spectrum - absorption of radiation - electronic, vibrational and rotational transitions. Width and intensities of spectral lines. Atomic absorption spectroscopy, UV-Vis and IR spectroscopy- principles, instrumentation (Block diagram) and applications.

UNIT IV ENERGY CONVERSIONS AND STORAGE 9

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant – fast breeder reactor. Solar energy conversion - solar cells. Wind energy. Batteries - types of batteries – primary battery (dry cell), secondary battery (lead acid, nickel-cadmium and lithium-ion-battery). Fuel cells – H_2-O_2 and microbial fuel cell. Explosives – classification, examples: TNT, RDX, Dynamite; Rocket fuels and propellants – definition and uses.

UNIT V WATER TECHNOLOGY 9

Water – sources and impurities – water quality parameters: colour, odour, pH, hardness, alkalinity, TDS, COD and BOD. Boiler feed water – requirement – troubles (scale & sludge, caustic embrittlement, boiler corrosion and priming & foaming. Internal conditioning – phosphate, calgon and carbonate treatment. External conditioning - zeolite (permutit) and ion exchange demineralization. Municipal water treatment process – primary (screening, sedimentation and coagulation), secondary (activated sludge process and trickling filter process) and tertiary (ozonolysis, UV treatment, chlorination, reverse osmosis).

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- To recognize and apply basic knowledge on different types of polymeric materials, their general preparation methods and applications to futuristic material fabrication needs.
- To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
- To identify and apply suitable spectroscopic technique for material analysis and study different forms of photochemical reactions.
- To recognize different forms of energy resources and apply them for suitable applications in energy sectors.
- To demonstrate the knowledge of water and their quality in using at different industries.

TEXT BOOKS:

1. Jain P. C. & Monica Jain., "Engineering Chemistry", 16th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2015.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3. S.S.Dara, "A text book of Engineering Chemistry", Chand Publications, 2014.

REFERENCES:

1. Schdeva M V, "Basics of Nano Chemistry", Anmol Publications Pvt Ltd
2. B.Sivasankar, "Instrumental Methods of Analysis", Oxford University Press. 2012.
3. Friedrich Emich, "Engineering Chemistry", Scientific International Ltd.
4. V RGowariker, N V Viswanathan and Jayadev Sreedhar, "Polymer Science" New AGE International Publishers, 2009.

GE5151 ENGINEERING GRAPHICS L T P C
1 0 4 3

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

1. Drawing free hand sketches of basic geometrical shapes and multiple views of objects.
2. Drawing orthographic projections of lines and planes.
3. Drawing orthographic projections of solids.
4. Drawing development of the surfaces of objects.
5. Drawing isometric and perspective views of simple solids.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) 1

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HANDSKETCHING 14

Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by different methods – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three-Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 15

Orthographic projection- principles-Principle planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes-Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 15

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 15

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 12

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) 3

Introduction to drafting packages and demonstration of their use

TOTAL (L: 15 + P: 60)=75 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

1. Draw free hand sketching of basic geometrical shapes and multiple views of objects.
2. Draw orthographic projections of lines and planes
3. Draw orthographic projections of solids
4. Draw development of the surfaces of objects
5. Draw isometric and perspective views of simple solids.

TEXT BOOKS:

1. Bhatt, N. D.,Panchal V M and Pramod R. Ingle, “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2014.
2. Parthasarathy, N. S. and Vela Murali, “Engineering Drawing”, Oxford University Press, 2015

REFERENCES:

1. Agrawal, B. and Agrawal C.M., “Engineering Drawing”, Tata McGraw, N.Delhi, 2008.
2. Gopalakrishna, K. R., “Engineering Drawing”, Subhas Stores, Bangalore, 2007.
3. Natarajan, K. V., “A text book of Engineering Graphics”, 28th Ed., Dhanalakshmi Publishers, Chennai, 2015.
4. Shah, M. B., and Rana, B. C., “Engineering Drawing”, Pearson, 2nd Ed., 2009.
5. Venugopal, K. and Prabhu Raja, V., “Engineering Graphics”, New Age,2008.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

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Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only.
4. The students will be permitted to use appropriate scale to fit solution within A3 size.
5. The examination will be conducted in appropriate sessions on the same day.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	0.9				0.9					0.6		0.6	0.6	0.9	0.6
2	0.9									0.6		0.6	0.6	0.6	
3	0.9				0.9					0.6		0.6	0.6	0.6	
4	0.9		0.6		0.9					0.6		0.6	0.6	0.6	
5	0.9		0.9		0.9					0.6		0.6	0.6	0.6	

BS5161 **BASIC SCIENCES LABORATORY** **L T P C**

(Common to all branches of B.E. / B.Tech Programmes) **0 0 4 2**

PHYSICS LABORATORY: (Any Seven Experiments)

COURSE OBJECTIVES:

- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves and band gap determination.

LIST OF EXPERIMENTS:

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of Young's modulus
3. Uniform bending – Determination of Young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
9. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box -Determination of Band gap of a semiconductor.
12. Spectrometer- Determination of wavelength using gating.
13. Photoelectric effect
14. Michelson Interferometer.
15. Estimation of laser parameters.
16. Melde's string experiment

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TOTAL: 30 PERIODS

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COURSE OUTCOMES:

Upon completion of the course, the students will be able

- To determine various moduli of elasticity and also various thermal and optical properties of materials.
- To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids

CHEMISTRY LABORATORY: (Minimum of 8 experiments to be conducted)

COURSE OBJECTIVES:

- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and polymers by spectroscopy and viscometry methods.

LIST OF EXPERIMENTS:

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler‟s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of polyvinylalcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Phase change in a solid.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

- To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
- To determine the amount of metal ions through volumetric and spectroscopic techniques
- To determine the molecular weight of polymers by viscometric method.
- To quantitatively analyse the impurities in solution by electroanalytical techniques
- To design and analyse the kinetics of reactions and corrosion of metals

TEXT BOOKS:

1. Laboratory Manual- Department of Chemistry, CEGC, Anna University (2014).
2. Vogel‟s Textbook of Quantitative Chemical Analysis (8th edition, 2014).

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GE5162	WORKSHOP PRACTICES LABORATORY (Common to all Branches of B.E. / B.Tech. Programmes)	L T P C 0 0 4 2

COURSE OBJECTIVES:

The main learning objective of this course is to provide hands on training to the students in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES 15

PLUMBING WORK:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
b) Preparing plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:

a) Sawing,
b) Planing and
c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:

a) Studying joints in door panels and wooden furniture
b) Studying common industrial trusses using models.

PART II ELECTRICAL ENGINEERING PRACTICES 15

WIRING WORK:

a) Wiring Switches, Fuse, Indicator and Lamp etc. such as in basic household,
b) Wiring Stair case light.
c) Wiring tube – light.
d) Preparing wiring diagrams for a given situation.

Wiring Study:

a) Studying an Iron-Box wiring.
b) Studying a Fan Regulator wiring.
c) Studying an Emergency Lamp wiring.

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES 15

WELDING WORK:

a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
b) Practicing gas welding.

BASIC MACHINING WORK:

a) (simple)Turning.
b) (simple)Drilling.
c) (simple)Tapping.

ASSEMBLY WORK:

a) Assembling a centrifugal pump.
b) Assembling a household mixer.
c) Assembling an air conditioner.

SHEET METAL WORK:

a) Making of a square tray

FOUNDRY WORK:

a) Demonstrating basic foundry operations.

PART IV ELECTRONIC ENGINEERING PRACTICES 15

SOLDERING WORK:

a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:

a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:

a) Studying a FM radio.
b) Studying an electronic telephone.

TOTAL = 60 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:

1. Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
2. Wire various electrical joints in common household electrical wire work.
3. Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
4. Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	0.6	0.3											0.3	0.3	
2		0.6	0.6											0.6	
3		0.6	0.3										0.6	0.6	
4		0.6	0.6	0.3										0.6	

ENGINEERING MATHEMATICS – II **L T P C**

MA5252 (Common to all branches of B.E. / B.Tech. Programmes in II Semester) **3 1 0 4**

COURSE OBJECTIVES:

- To acquaint the students with the concepts of vector calculus which naturally arises in many engineering problems.
- To develop an understanding of the standard techniques of complex variable theory in particular analytic function and its mapping property.
- To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.
- To acquaint the students with Differential Equations which are significantly used in Engineering problems.
- To make the students appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I VECTOR CALCULUS **12**

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's theorem, Stoke's theorem and Gauss divergence theorem – Verification and application in evaluating line, surface and volume integrals.

UNIT II ANALYTIC FUNCTION **12**

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions - Bilinear transformation $w = c + z,\ az,\ 1/z,\ z^2$.

UNIT III COMPLEX INTEGRATION **12**

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT IV DIFFERENTIAL EQUATIONS **12**

Method of variation of parameters – Method of undetermined coefficients – Homogenous equations of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

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UNIT V LAPLACE TRANSFORMS 12

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives and integrals – Initial and Final Value Theorems – Inverse Transforms – Convolution Theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to:

- Calculate grad, div and curl and use Gauss, Stokes and Greens theorems to simplify calculations of integrals.
- Construct analytic functions and use their conformal mapping property in application problems.
- Evaluate real and complex integrals using the Cauchy's integral formula and residue theorem.
- Apply various methods of solving differential equation which arise in many application problems.
- Apply Laplace transform methods for solving linear differential equations.Z

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2015.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2017.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), 7th Edition, New Delhi, 2009.
2. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 4th Edition, New Delhi, 2011.
3. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, 5th Edition, New Delhi, 2017.
4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7th Edition, New Delhi, 2012.
5. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

GE5153 PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C
3 0 0 3

COURSE OBJECTIVES:

- To know the basics of algorithmic problem solving.
- To develop Python programs with conditionals and loops.
- To define Python functions and use function calls.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I INTRODUCTION TO COMPUTING AND PROBLEM SOLVING 9

Fundamentals of Computing – Computing Devices – Identification of Computational Problems – Pseudocodes and Flowcharts – Instructions – Algorithms – Building Blocks of Algorithms – Introduction to Python Programming – Python Interpreter and Interactive Mode – Variables and Identifiers – Arithmetic Operators– Values and Types – Statements.

SUGGESTED ACTIVITIES:

- Developing Pseudocodes and flowcharts for real life activities such as railway ticket booking using IRCTC, admission process to undergraduate course, academic schedules during a semester etc.
- Developing algorithms for basic mathematical expressions using arithmetic operations.
- Installing Python.
- Simple programs on print statements, arithmetic operations.

SUGGESTED EVALUATION METHODS:

- Assignments on pseudocodes and flowcharts.
- Tutorials on Python programs.

UNIT II CONDITIONALS AND FUNCTIONS 9

Operators – Boolean Values – Operator Precedence – Expression – Conditionals: If-Else Constructs – Loop Structures/Iterative Statements – While Loop – For Loop – Break Statement – Function Call and Returning Values – Parameter Passing – Local and Global Scope – Recursive Functions.

SUGGESTED ACTIVITIES:

- Simple Python program implementation using Operators, Conditionals, Iterative Constructs and Functions.
- Implementation of a simple calculator.
- Developing simple applications like calendar, phone directory, to-do lists etc.
- Flow charts for GCD, Exponent Functions, Fibonacci Series using conditionals and iterative statements.
- External learning - Recursion vs. Iteration.

SUGGESTED EVALUATION METHODS:

- Tutorials on the above activities.
- Group discussion on external learning.

UNIT III SIMPLE DATA STRUCTURES IN PYTHON 10

Introduction to Data Structures – List – Adding Items to a List – Finding and Updating an Item – Nested Lists – Cloning Lists – Looping Through a List – Sorting a List – List Concatenation – List Slices – List Methods – List Loop – Mutability – Aliasing – Tuples: Creation, Accessing, Updating, Deleting Elements in a Tuple, Tuple Assignment, Tuple as Return Value, Nested Tuples, Basic Tuple Operations – Sets.

SUGGESTED ACTIVITIES:

- Implementing python program using lists, tuples, sets for the following scenario:
  - Simple sorting techniques
  - Student Examination Report
  - Billing Scheme during shopping.
- External learning - List vs. Tuple vs. Set – Implementing any application using all the three data structures.

SUGGESTED EVALUATION METHODS:

- Tutorials on the above activities.
- Group Discussion on external learning component.

UNIT IV STRINGS, DICTIONARIES, MODULES 10

Strings: Introduction, Indexing, Traversing, Concatenating, Appending, Multiplying, Formatting, Slicing, Comparing, Iterating – Basic Built-In String Functions – Dictionary: Creating, Accessing, Adding Items, Modifying, Deleting, Sorting, Looping, Nested Dictionaries Built-in Dictionary Function – Finding Key and Value in a Dictionary – Modules – Module Loading and Execution – Packages – Python Standard Libraries.

SUGGESTED ACTIVITIES:

- Implementing Python program by importing Time module, Math package etc.
- Creation of any package (student's choice) and importing into the application.

SUGGESTED EVALUATION METHODS:

- Tutorials on the above activities.

UNIT V FILE HANDLING AND EXCEPTION HANDLING 7

Introduction to Files – File Path – Opening and Closing Files – Reading and Writing Files – File Position – Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

SUGGESTED ACTIVITIES:

- Developing modules using Python to handle files and apply various operations on files.
- Usage of exceptions, multiple except blocks - for applications that use delimiters like age, range of numerals etc.
- Implementing Python program to open a non-existent file using exceptions.

SUGGESTED EVALUATION METHODS:

- Tutorials on the above activities.
- Case Studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6: Read and write data from/to files in Python programs.

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

TEXT BOOKS:

1. Reema Thareja, "Python Programming: Using Problem Solving Approach", Oxford University Press, 2017.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff/O'Reilly Publishers, 2016. (http://greenteapress.com/wp/thinkpython/).

REFERENCES:

1. Guido van Rossum, Fred L. Drake Jr., “An Introduction to Python – Revised and Updated for Python 3.2”, Network Theory Ltd., 2011.
2. John V Guttag, “Introduction to Computation and Programming Using Python”, Revised and Expanded Edition, MIT Press , 2013
3. Charles Dierbach, “Introduction to Computer Science using Python”, Wiley India Edition, 2016.
4. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, Cengage Learning, 2012.

EE5251 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the basic concepts of electric circuits, magnetic circuits and wiring.
- To understand the operation of AC and DC machines.
- To understand the working principle of electronic devices and circuits.

UNIT I BASIC CIRCUITS AND DOMESTIC WIRING 9

Electrical circuit elements (R, L and C)-Dependent and independent sources – Ohm’s Law-Kirchhoff’s laws - mesh current and node voltage methods (Analysis with only independent source) - Phasors – RMS-Average values-sinusoidal steady state response of simple RLC circuits. Types of wiring- Domestic wiring - Specification of Wires-Earthing-Methods-Protective devices.

UNIT II THREE PHASE CIRCUITS AND MAGNETIC CIRCUITS 9

Three phase supply – Star connection – Delta connection –Balanced and Unbalanced Loads- Power in three-phase systems – Comparison of star and delta connections – Advantages-Magnetic circuits-Definitions-MMF, Flux, Reluctance, Magnetic field intensity, Flux density, Fringing, self and mutual inductances-simple problems.

UNIT III ELECTRICAL MACHINES 9

Working principle of DC generator, motor-EMF and Torque equation-Types –Shunt, Series and Compound-Applications. Working principle of transformer-EMF equation-Operating principles of three phase and single phase induction motor-Applications. Working principles of alternator-EMF equation-Operating principles of Synchronous motor, stepper motor-Applications.

UNIT IV BASICS OF ELECTRONICS 9

Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type, P-N junction, VI Characteristics of PN junction diode, Zener effect, Zener diode, Zener diode Characteristics-Rectifier circuits-Wave shaping.

UNIT V CURRENT CONTROLLED AND VOLTAGE CONTROLLED DEVICES 9

Working principle and characteristics - BJT, SCR, JFET, MOSFET.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1 To be able to understand the concepts related with electrical circuits and wiring.
CO2 To be able to study the different three phase connections and the concepts of magnetic circuits.
CO3 Capable of understanding the operating principle of AC and DC machines.
CO4 To be able to understand the working principle of electronic devices such as diode and zener diode.
CO 5 To be able to understand the characteristics and working of current controlled and voltage controlled devices.

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

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", McGraw Hill Education, 2014
2. Del Toro, "Electrical Engineering Fundamentals", Second edition, Pearson Education, New Delhi, 1989.
3. John Bird, "Electrical Circuit theory and technology", Routledge; 5th edition, 2013

REFERENCES:

1. Thomas L. Floyd, 'Electronic Devices', 10th Edition, Pearson Education, 2018.
2. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017
3 Kothari DP and I.J Nagrath, "Basic Electrical Engineering", McGraw Hill, 2010.
4 Muhammad H.Rashid, "Spice for Circuits and electronics", 4th ed., Cengage India,2019.

GE5152 ENGINEERING MECHANICS L T P C
3 1 0 4

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

1. Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
2. Applying the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.
3. Applying the concepts of locating centroids/center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.
4. Applying the concepts of frictional forces at the contact surfaces of various engineering systems.
5. Applying the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

UNIT I STATICS OF PARTICLES (9+3)

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles -Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNITII EQUILIBRIUM OF RIGID BODIES (9+3)

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections.

UNITIII DISTRIBUTED FORCES (9+3)

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration , Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies , Determination of Centroids of Volumes by Integration.

Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration , Polar Moment of Inertia , Radius of Gyration of an Area , Parallel-Axis Theorem , Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration

UNIT IV FRICTION (9+3)

The Laws of Dry Friction. Coefficients of Friction, Angles of Friction, Wedges, Wheel Friction. Rolling Resistance, Ladder friction.

UNITV DYNAMICS OF PARTICLES (9+3)

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force , Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact, Method of Virtual Work - Work of a Force, Potential Energy, Potential Energy and Equilibrium.

TOTAL (L: 45 + T: 15)=60 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

1. Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
2. Apply the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.
3. Apply the concepts of locating centroids / center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.
4. Apply the concepts of frictional forces at the contact surfaces of various engineering systems.
5. Apply the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

TEXT BOOKS:

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, SanjeevSanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 11thEdition, 2017.
2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

REFERENCES:

1. Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
2. Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.
3. Irving H. Shames, Krishna Mohana Rao G, Engineering Mechanics – Statics and Dynamics, 4thEdition, Pearson Education Asia Pvt. Ltd., 2005.
4. Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.
5. Timoshenko S, Young D H, Rao J V and Sukumar Pati, Engineering Mechanics, 5thEdition, McGraw Hill Higher Education, 2013.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	0.9	0.6	0.6	0.3								0.6	0.9	0.3	0.3
2	0.9	0.6	0.6	0.3								0.6	0.9	0.3	0.3
3	0.9	0.6	0.9	0.3								0.6	0.9	0.3	0.6
4	0.9	0.6	0.9	0.3								0.6	0.9	0.3	0.6
5	0.9	0.6	0.9	0.3								0.6	0.9	0.3	0.6

MI5201 **MINE DEVELOPMENT** **L T P C 2 0 2 3**

COURSE OBJECTIVES:

1. To demonstrate the importance of mining in national economy
2. To impart the terminology associated with the discipline and be familiar with the safe & sustainable mining operations.
3. To study the basic concepts involved in exploration & drilling, blasting and development of a mine.

UNIT I INTRODUCTION TO MINING 6

Historical overview of mining, role of the mining industry in the modern world and contribution to national economy; Role of mining engineers in industry. Statute related to Mining Industry; Present and future trends of mining industry. Mineral deposit – different types and their classification; Distribution of mineral deposits in India and other countries; Stages in the life of a mine- prospecting, exploration, development, exploitation and reclamation.

UNIT II ACCESS TO DEPOSIT 10

Choice, location and size of mine entries – adit, shaft, incline and combined mode; Sinking methods through soft, strong and water bearing strata, support system, ventilation, lighting and drainage arrangements during sinking, material handling and safety in sinking shafts. Introduction to piling, caisson and freezing methods - cementation method - widening and deepening of shafts. Modern techniques of shaft sinking – shaft boring, design of shaft insets, pit bottom excavation and shaft raising. Recent developments in shaft sinking.

UNIT III DRILLING AND BLASTING 7

Principles of drilling, Types of drilling methods and equipments, selection, applications and limitations, exploration and production drilling in surface and underground workings, Explosives and accessories, handling and storage, transportation of explosives; Mechanism of rock blasting, Overview of Environmental impacts due to blasting.

UNIT IV DRIFTING AND TUNNELING 6

Drivage of drifts, organisation and cycle of operations; support system, ventilation, lighting and drainage arrangements during development; modern methods of drifting, continuous miners, tunnelling, road heading and tunnel boring, recent developments in tunneling and drifting.

UNIT V MINING METHODS 6

Introduction to mining methods – selection criteria & comparison. Overview of surface mining: Types of surface mines - basic bench geometry, applicability & limitations. Overview of underground mining: Different coal mining methods and their applicability & limitations; Different metal mining methods and their applicability & limitations.

TOTAL:60 PERIODS

Attested

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COURSE OUTCOMES:

The students will have ability

1. To understand the distribution of mineral deposits, and mining terminology
2. To analyze design requirement of approach to mineral deposits
3, To obtain fundamentals related to the drilling and blasting operations.
4. To acquire basic knowledge on drifting and tunnelling.
5. To learn the overview of mining operations in underground and surface mines.

TEXT BOOKS:

1. Hartman, H.L., Introduction to Mining Engineering, John Wiley and Sons, Second Edition,1999.
2. Deshmukh, D. J., Elements of Mining Technology, Vol.I, Vidyaseva Prakashan, Nagpur,1994.
3. Jimeno, C.L., Jimeno, E.L, Carcedo, E.J. Drilling and Blasting of Rocks, A. A. Balkema, Rotterdam, 1995.

REFERENCES:

1. Michael Coulson, The History of Mining: The Events, Technology and People Involved in the Industry That Forged the Modern World, First Edition, Harriman House, 2012.
2. Hartman, H. L. (Editor), SME Mining Engineering Handbook, 3rd edition, Vol I & II, Society of Mining Engineers, New York,2011.
3. Universal Mining School - Lecture notes, cardiff,U.K
4. Tatiya, R.R., Surface and Underground Excavations. A.A. Balkema, Rotterdam,2005.
5. Bhandari, Sushil, Engineering Rock Blasting Operations, A.A.Balkema, Rotterdam, 1997.

PRACTICAL:

1. To study the various aspects of rotary diamond drilling used in exploration.
2. To study the various aspects of percussive and rotary percussive drilling.
3. To study salient features of a mechanised shaft sinking operations.
4. To study different types of shaft lining & special methods of shaft sinking.
5. To study different types of explosives and accessories used in blasting.
6. To study different types of opencast and underground drilling and initiation patterns.
7. To study different types of alternatives to blasting.
8. To study the salient features of a tunnel boring machine.

GE5161 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To articulate where computing strategies support in providing Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

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EXPERIMENTS:

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.
2. Python programming using simple statements and expressions.
3. Scientific problems using Conditionals and Iterative loops.
4. Implementing real-time/technical applications using Lists, Tuples.
5. Implementing real-time/technical applications using Sets, Dictionaries.
6. Implementing programs using Functions.
7. Implementing programs using Strings.
8. Implementing programs using written modules and Python Standard Libraries.
9. Implementing real-time/technical applications using File handling.
10. Implementing real-time/technical applications using Exception handling.
11. Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs.
CO3: Structure simple Python programs for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python data structures.
CO6: Apply Python features in developing software applications.

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

EE5261 ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

1. To impart hands on experience in verification of circuit laws and measurement of circuit parameters
2. To train the students in performing various tests on electrical motors.
3. It also gives practical exposure to the usage of CRO, power sources & function generators

LIST OF EXPERIMENTS

1. Verification of Kirchhoff's Law.
2. Steady state response of AC and DC circuits (Mesh, Node Analysis)
3. Frequency response of RLC circuits.
4. Measurement power in three phase circuits by two-watt meter method.
5. Regulation of single phase transformer.
6. Performance characteristics of DC shunt generator.

7. Performance characteristics of single phase induction motor.
8. Characteristics of PN diode and Zener diode
9. Characteristics of Zener diode
10. Half wave and full wave Rectifiers
11. Application of Zener diode as shunt regulator.
12. Characteristics of BJT and JFET

TOTAL: 60 PERIODS

COURSE OUTCOMES:

1. To become familiar with the basic circuit components and know how to connect them to make a real electrical circuit;
2. Ability to perform speed characteristic of different electrical machines
3. Ability to use logic gates and Flip flops

MA5352 NUMERICAL AND STATISTICAL METHODS

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

1. To understand and apply numerical methods for solving systems of linear equations
2. To understand and apply numerical integration and differentiation
3. To solving initial value problems of ordinary differential equations numerically
4. To provide an understanding of the statistical methods and concepts by which real-life problems are analyzed
5. To analyze various datas by using Statistical Techniques.

UNIT I ROOT FINDING METHOD AND SYSTEM OF LINEAR EQUATIONS 12

Root finding – Newton Raphson method – Simultaneous linear equations – Direct methods – Gauss elimination and Gauss Jordan methods – Iterative methods – Jacobi and Gauss Seidal methods

UNIT II INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Difference table – Newton's forward and backward interpolation for equal intervals – Newton's divided differences – Lagrangian interpolation – Differentiation formulae – Trapezoidal and Simpson rules Gaussian-Quadrature formulae

UNIT III IVP FOR DIFFERENTIAL EQUATIONS 12

Taylor Series and Euler methods, Fourth order Runge-Kutta method for First order Differential Equations – Predictor-corrector method – Milne and Adam-Bashforth methods

UNIT IV ESTIMATION THEORY 12

Unbiased Estimators – Method of Moments – Maximum Likelihood Estimation – Curve fitting by Principle of least squares – Regression Lines.

UNIT V TESTING OF HYPOTHESIS 12

Sampling distributions – Type I and Type II errors – Tests based on Normal, t, χ^2 and F distributions for testing of mean, variance and proportions – Tests for Independence of attributes and Goodness of fit.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able to

- Develop a good understanding of the various methods used for the numerical solution of scientific problems.

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- Solve system of linear equations and initial value problems of ordinary differential equations numerically.
- Understand the value of probability and Statistics in acquiring knowledge and making decisions.
- Develop an ability to apply statistical tests in experiments, as well as to analyze and interpret data.
- Use the statistical tools for their Project work and their future research.

TEXT BOOKS

1) Devore, J.L. "Probability and Statistics for Engineering and the Sciences", Cengage Learning, 9th Edition, Boston, 2017.
2) Grewal, B. S., "Numerical Methods in Engineering and Science", Khanna Publishers, 11th Edition, New Delhi, 2013.
3) Miller, I. and Miller, M., "John E. Freund's Mathematical Statistics", Pearson, Eighth Edition, Harlow, 2013.

REFERENCES

1. Chapra, S. C. and Canale, R. P., "Numerical methods for Engineers", McGraw-Hill Higher Education, 7th Edition, New York, 2014.
2. Johnson R.A., "Miller and Freund's Probability and Statistics for Engineers", PHI Learning Pvt. Ltd., 8th Edition, New Delhi, 2011.
3. Walpole, R.E., Myers R.H., Myres S.L., and Ye, K., "Probability ad Statistics for Engineers and Scientists", Pearson Education 9th Edition, New Delhi, 2011.
4. Woodford, C and Phillips, C., "Numerical Methods with Worked Examples: Matlab", Springer, Dordrecht, 2012.

ML5352 MECHANICS OF MATERIALS L T P C
3 0 0 3

COURSE OBJECTIVES:

The main learning objective of this course is to prepare students for:

1. Applying the principle concepts behind stress, strain and deformation of solids for various engineering applications.
2. Analyzing the transverse loading on beams and stresses in beam for various engineering applications.
3. Analyzing the torsion principles on shafts and springs for various engineering applications.
4. Analyzing the deflection of beams for various engineering applications.
5. Analyzing the thin and thick shells and principal stresses in beam for various engineering applications

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumertric strains

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM 9

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending

– Bending stress distribution – Flitched beams – Shear stress distribution.

UNIT III TORSION 9

Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV DEFLECTION OF BEAMS 9

Double Integration method – Macaulay's method – Area moment Theorems for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell's reciprocal theorems.

UNIT V THICK & THIN SHELLS & PRINCIPAL STRESSES 9

Stresses in thin cylindrical shell due to internal pressure, circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame's theory – Application of theories of failure – Stresses on inclined planes – principal stresses and principal planes – Mohr's circle of stress.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

1. Apply the principle concepts behind stress, strain and deformation of solids for various engineering applications.
2. Analyze the transverse loading on beams and stresses in beam for various engineering applications.
3. Analyze the torsion principles on shafts and springs for various engineering applications.
4. Analyze the deflection of beams for various engineering applications.
5. Analyze the thin and thick shells and principal stresses in beam for various engineering applications.

TEXT BOOKS:

1. Bansal, R.K., Strength of Materials, Laxmi Publications (P) Ltd., 2007
2. Jindal U.C., Strength of Materials, Asian Books Pvt. Ltd., New Delhi, 2007

REFERENCES:

1. Egor. P.Popov " Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2001
2. Ferdinand P. Beer, Russell Johnson, J.r. and John J. Dewole Mechanics of Materials, Tata McGraw Hill publishing 'co. Ltd., New Delhi.
3. Hibbeler, R.C., Mechanics of Materials, Pearson Education, Low Price Edition, 2007.
4. Subramanian R., Strength of Materials, oxford University Press, Oxford Higher Education Series, 2007.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	0.9	0.9	0.9										0.9	0.6	
CO2	0.9	0.9	0.9										0.9	0.6	
CO3	0.9	0.9	0.9										0.9	0.6	
CO4	0.9	0.9	0.9										0.9	0.6	
CO5	0.9	0.9	0.9										0.9	0.6	

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AG5306 **GEOLOGY FOR MINING-I** **L T P C**
3 0 0 3

COURSE OBJECTIVE:
To familiarize the students with the fundamental concepts of geology and its role in mining Engineering.

UNIT I GENERAL GEOLOGY 9
Geology in mining engineering: branches, scope and applications – internal structure of earth and composition –weathering processes, types and grades and relevance to mining -plate tectonics and its relevance to earthquakes, volcanoes and mineralization - Groundwater: origin, occurrence, distribution and movement – role of groundwater in mining.

UNIT II LANDFORMS & STRATIGRAPHY 9
Fluvial, Marine, Glacial and Aeolian: processes and landforms – sea bottom profile and deposits in ocean - Introduction to Geological time scale – distribution of mineral resources and economic importance of Archaen, Paleozoic, Mesozoic and Cenozoic rocks in India. Geology of Tamil Nadu.

UNIT III MINERALOGY 9
Classification of minerals - Physical properties of minerals - properties, composition and uses of Quartz, Feldspar, Pyroxene, Amphibole, Mica, Olivine, Calcite and Garnet group of minerals -Clay minerals and their importance.

UNIT IV PETROLOGY 9
Classification of rocks – Origin and mode of occurrence of igneous, sedimentary and metamorphic rocks - Description of Igneous rocks: granite, syenite, dolerite, basalt, gabbro, anorthosite and dunite – Description of sedimentary rocks: conglomerate, breccia, sandstone, limestone and shale - Description of metamorphic rocks: slate, phyllite, quartzite, marble, charnockite, gneiss and schist. - Engineering properties of rocks: field and laboratory tests.

UNIT V STRUCTURAL GEOLOGY 9
Introduction to geological structures – attitudes of beds: strike and dip – Description and classifications of folds, faults, joints and unconformities - recognition of geological structures in the field and their significance in mineral occurrence and exploration.

TOTAL= 45 PERIODS

COURSE OUTCOME:
To lay emphasis on the study of minerals, rocks and structures. At the end of the course the students will have an understanding of geological formations and structural features.

REFERENCES:

1. Billings, M.P. Structural Geology, Third Edition, Pearson Education Limited, 2016.
2. Nanda, H. Indian Stratigraphy, Anmol Publications Pvt. Ltd, 2014
3. Winter J.D. Principles of Igneous and Metamorphic Petrology, Second edition, Pearson Education Limited, 2014.
4. Parbin Singh. Text book of Engineering and General Geology, S. K. Kataria & Sons, 2013
5. Ford, W.E. Dana's Textbook of Mineralogy (4th edition), CBS Publishers, 2006.
6. Bell F.G. Engineering Geology, Elsevier Publications, 2007
7. Arthur Holmes. Principles of Physical Geology, Thomas Nelson and Sons, USA, 1964.

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CE5251 FLUID MECHANICS AND MACHINERY

L	T	P	C
3	0	0	3

COURSE OBJECTIVE:

To introduce the students about properties of the fluids, behaviour of fluids under static conditions and to impart basic knowledge of the dynamics of fluids and to expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on pipe bends with an exposure to the significance of boundary layer theory and its thicknesses with expose to basic principles of working of hydraulic machineries and to design Pelton wheel, Francis and Kaplan turbine, centrifugal and reciprocating pumps..

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS 10

Properties of fluids- Pressure Measurements-Buoyancy and floatation-Flow characteristics- Eulerian and Lagrangian Principle of fluid flow– concept of control volume and system – Reynold's transportation theorem- continuity equation, energy equation and momentum equation-Applications.

UNIT II FLOW THROUGH PIPES AND BOUNDARY LAYER 9

Reynold's Experiment- Laminar flow through circular conduits- Darcy Weisbach equation – friction factor- Moody diagram- minor losses- Hydraulic and energy gradient – Pipes in series and parallel- Boundary layer concepts – types of boundary layer thickness.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 7

Fundamental dimensions - Dimensional homogeneity - Rayleigh's method and Buckingham Pi theorem - Dimensionless parameters - Similitude and model studies - Distorted and undistorted models.

UNIT IV TURBINES 10

Impact of jets - Velocity triangles - Theory of roto-dynamic machines - Classification of turbines – Pelton wheel, Francis turbine (inward and outward) and Kaplan turbine- Working principles - Work done by water on the runner - Efficiencies – Draft tube - Specific speed - Performance curves for turbines – Governing of turbines.

UNIT V PUMPS 9

Classification of pumps- Centrifugal pumps– working principle - Heads and efficiencies– Velocity triangles- Work done by the impeller - performance curves - Reciprocating pump working principle – indicator diagram and it's variations – work saved by fitting air vessels.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

- CO1 Understand the difference between solid and fluid, its properties and behaviour in static conditions.
- CO2 Understand the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.
- CO3 Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies.
- CO4 Estimate losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.
- CO5 Understand the concept of boundary layer and its application to find the drag force excreted by the fluid on the flat solid surface.

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TEXT BOOKS:

1. Modi P.N. and Seth, S.M. Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, (2017)
2. Jain A. K. Fluid Mechanics including Hydraulic Machines, Khanna Publishers, New Delhi, 2014.

REFERENCES:

1. Narayana Pillai N. Principles of Fluid Mechanics and Fluid Machines, (3rd Ed.), University Press (India) Pvt. Ltd. 2009.
2. S K Som; Gautam Biswas and S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education Pvt. Ltd., 2012
3. Subramanya, K. Fluid Mechanics and Hydraulic Machines, Tata McGraw- Hill Pub. Co., New Delhi, 2011
4. Yunus A. Cengel ; John M. Cimbala, Fluid Mechanics, McGraw Hill Education Pvt. Ltd.,2014
5. Streeter, V. L. and Wylie E. B., Fluid Mechanics, McGraw Hill Publishing Co.(2010)

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	H	H	H	H	H	H
PO2	Problem analysis	H	H	H	H	H	H
PO3	Design / development of solutions	M	H	H	H	H	H
PO4	Investigation	M	M	H	H	H	H
PO5	Modern Tool Usage	L	L	L	L	L	L
PO6	Individual and Team work	L	L	L	M	M	H
PO7	Communication	L	L	L	L	L	L
PO8	Engineer and Society	M	M	M	M	M	M
PO9	Ethics	L	L	L	L	L	L
PO10	Environment and Sustainability	M	M	M	M	M	M
PO11	Project Management and Finance	L	L	L	L	L	L
PO12	Life Long Learning	M	M	M	H	H	H
PSO1	Knowledge of Civil Engineering discipline	H	H	H	H	H	H
PSO2	Critical analysis of Civil Engineering problems and innovation	M	M	H	M	M	M
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	H	H	H	M	M	H

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EE5305 **ELECTRICAL DRIVES AND CONTROL** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

To impart knowledge on

- Basics of electric drives
- Different speed control methods
- Various motor starters and controllers
- Applications

UNIT I INTRODUCTION **9**

Basic elements of electric drives – classification of electric drives- different types of mechanical loads – choice of electric drive – status of AC and DC drives – Four quadrant operation of drives-control circuit components: Fuses, switches, circuit breakers, contactors. Relay – control transformers.

UNIT II SPEED CONTROL OF DC MACHINES **9**

Thyrister based bridge rectifier circuits – chopper circuits - DC shunt motors and series motor: typical and modified speed torque characteristics - Ward Leonard method – applications of modified characteristics - solid state DC drives – electrical braking.

UNIT III SPEED CONTROL OF AC MACHINES **9**

Induction motor – speed torque characteristics – pole changing, stator frequency variation – stator voltage variations - slip-ring induction motor: rotor resistance variation, slip power recovery scheme – basic inverter circuits- variable voltage frequency control - constant torque and constant power mode of operation.

UNIT IV MOTOR STARTERS AND CONTROLLERS **9**

DC motor starters using voltage sensing relays, current sensing relays and time delay relays - wound rotor induction motor starters – starters using frequency sensing relays -DOL –starter

UNIT V HEATING AND POWER RATING OF DRIVE MOTORS **9**

Load diagram, over load capacity, insulating materials, heating and cooling of motors, service condition of electric drive – classes of duty – industrial application of DC and AC drives in mining.

TOTAL: 45 PERIODS

COURSE OUTCOME:

- Upon completion of this subject, the student will be able to explain different types of electrical machines and their performance in various electric drives applications.

TEXT BOOKS:

1. S. K. Pillai, ‘A first Course on Electrical Drives’, New Age International Publishers, New Delhi, Second Edition, Reprint, 2004
2. Vedam Subramanian, ‘Electric Drives: Concepts and Applications’ Tata McGraw Hil, New Delhi, Second Edition, Reprint, 2017.
3. Gopal K.Dubey. ’Fundamentals of Electrical Drives’ Alpha Science International Ltd., Second Edition, 2010.

REFERENCES:

1. S.K Bhattacharya, Brinjinder Singh ‘Control of Electrical Machines’ New Age International Publishers, Reprint, 2018.
2. John Bird ‘Electrical Circuit theory and technology’ Elsevier, Fifth Edition, 2014.
3. R. Krishnan, Electric Motor & Drives: Modeling, Analysis and Control, Prentice hall of India, 2015.

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CE5313	FLUID MECHANICS AND MACHINERY LABORATORY	L T P C 0 0 4 2

COURSE OBJECTIVE:

To provide hands on experience on verification of energy and momentum conservation laws, calibration of flow meters, performance characteristics of pumps and turbines.

LIST OF EXPERIMENTS

A. FLOW MEASUREMENT

1. Verification of Bernoulli's theorem
2. Flow through orifice/venturi meter
3. Friction factor for flow through pipes
4. Impact of jet on fixed plate

B. METACENTER

5. Determination of metacentric height

C. PUMPS

6. Characteristics of centrifugal pumps
7. Characteristics of gear pump
8. Characteristics of submersible pump
9. Characteristics of reciprocating pump

D. TURBINES

10. Characteristics of Pelton wheel turbine

TOTAL : 60 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

CO1	Verify and apply Bernoulli equation for flow measurement like orifice/venturi meter.
CO2	Measure friction factor in pipes and compare with Moody diagram and verify momentum conservation law.
CO3	Determine the performance characteristics of rotodynamic pumps.
CO4	Determine the performance characteristics of positive displacement pumps.
CO5	Determine the performance characteristics of turbine.

REFERENCES:

1. Hydraulic Laboratory Manual, Centre for Water Resources, Anna University, 2015.
2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House. NewDelhi, 2017.
3. Subramanya K, Fluid Mechanics and Hydraulic Machines, Tata McGraw Hill Edu. Pvt. Ltd., 2011

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PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	M	H	H	H	H	H
PO2	Problem analysis	M	M	H	H	H	H
PO3	Design / development of solutions	L	L	M	M	M	M
PO4	Investigation	H	H	H	H	H	H
PO5	Modern Tool Usage	L	L	L	L	L	L
PO6	Individual and Team work	M	M	H	H	H	H
PO7	Communication	L	L	L	L	L	L
PO8	Engineer and Society	M	M	M	M	M	M
PO9	Ethics	L	L	L	L	L	L
PO10	Environment and Sustainability	M	M	M	M	M	M
PO11	Project Management and Finance	L	L	L	L	L	L
PO12	Life Long Learning	M	M	M	M	M	M
PSO1	Knowledge of Civil Engineering discipline	M	H	H	H	H	H
PSO2	Critical analysis of Civil Engineering problems and innovation	L	L	M	M	M	M
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	L	L	L	L	L	L

L - Low, M – Medium, H - High

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AG5313 **GEOLOGY LABORATORY - I** **L T P C**
0 0 2 1

COURSE OBJECTIVE:
To familiarize the students with practical techniques of geological mapping and field work

UNIT I IDENTIFICATION OF MINERALS 6
Identification and study of physical properties of quartz, feldspars, mica and their varieties, of talc, hornblende, augite, diopside, hypersthene, calcite, fluorite, topaz, tourmaline, corundum, gypsum, kyanite, and silimanite,. Study of minerals in Moh's scale of hardness.

UNIT II IDENTIFICATION OF ROCKS 6
Identification and description of igneous rocks - plutonic, hypabyssal and volcanic: granite, syenite, dolerite, basalt, gabbro and dunite – Sedimentary rocks: conglomerate, breccia, sandstone, limestone and shale - Metamorphic rocks: slate, phyllite, quartzite, marble, charnockite, gneiss and schist.

UNIT III STRUCTURAL GEOLOGY PROBLEMS 6
Strike dip and calculations - Exercises on structural maps of geological site and interpretation of geological conditions - 3 point and 4 point borehole problems to decipher the subsurface geological conditions for mining of resources - Determination of stratal thickness – true width calculations from borehole data. .

UNIT IV GEOLOGICAL MAPPING TECHNIQUES 6
Measurements using Brunton compass and Clinometer – Toposheets and their uses - Map scale and types, calculations - preparation and interpretation of contour maps and drainage maps – symbols in geological maps – representation of geological features.

UNIT V GEOLOGICAL FIELD WORK 6
Measurement of Strike and Dip in the field using Brunton Compass and Clinometer. Visit to important geological sites and industries.

TOTAL= 30 PERIODS

COURSE OUTCOME:
At the end of the course the students will have an understanding of minerals and rocks, handling of geological field equipments and geological mapping.

REFERENCES:

1. Parbin Singh. Text book of Engineering and General Geology, S. K. Kataria & Sons, 2013.
2. Ford, W.E. Dana's Textbook of Mineralogy (4th edition), CBS Publishers, 2006.
3. Gokhale,N. W., Manual of Geological maps CBS publishers, N. Delhi, 2008
4. Lahee, F.H., Field Geology, CBS publishers, N. Delhi, 2002.

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MI5311	PRACTICAL TRAINING - I	L T P C 0 0 0 1

COURSE OBJECTIVES:

1. To learn various unit operations carried out in the surface mine.
2. To expose the basic operations of different heavy earth moving machinery (HEMM) deployed in the surface mine.
3. To impart practical experience to the student for gaining deeper understanding of the various activities and principles of surface mining.

Gaining practical experience is an important aspect of the mining engineering programme having many characteristic features of its own. The students have to undergo training in surface coal mines/highly mechanized open pit mines of metalliferous deposits **during the summer vacation at the end of the II Semester for a period of 2 to 3 weeks** and obtain a valid certificate from the competent authority of the organization provide training. The students have to submit a report on the training which would be evaluated during the ensuing III Semester. This carries a total of one credit during the III Semester. Evaluation would be done by a faculty or a group of faculties on different marking heads such as training, viva voce report etc., or other approved evaluation systems as per the approved regulations.

Normally a student is not permitted to withdraw from the practical training. In case of any unforeseen circumstances / valid reasons if he could not undergo the training as scheduled, on the recommendation of the Head of the Department and approval by the competent authority the student may be permitted to undergo Practical Training-I subsequently without affecting the academic schedule before undergoing Practical Training-II. The decision of the competent authority is final.

COURSE OUTCOMES:

The students will be able to

1. Understand the geology of the deposit amenable for surface mining.
2. Learn the preparation of various plans and design of the surface mine.
3. Acquire adequate knowledge on bench geometry and other significant parameters associated with mine construction.
4. Comprehend the knowledge on working of various HEMM deployed for different unit operations in the surface mines.
5. Understand the methods of stockpiling, dumping and reclamation techniques,mine dewatering, processing facilities and safety aspects related to mining.

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AG5401 **GEOLOGY FOR MINING - II** **L T P C**

3 0 0 3

COURSE OBJECTIVE:

To study about the origin, distribution of economic mineral deposits and various techniques available for their exploration.

UNIT I FORMATION OF ORE DEPOSITS 9

Processes of formation of ore minerals: deposits formed from magmatic, hydrothermal, residual, volcanic, sedimentation, mechanical concentration, oxidation and supergene enrichment and evaporation processes – ore-suites and types.

UNIT II ORE GEOLOGY 9

Metallic deposits: Properties and varieties of iron ores, copper ores, lead ores, zinc ores, aluminum ores, chromium ores and manganese ores and their distribution in India. Gold, silver and molybdenum deposits and their distribution in India. Study of non-metallic and industrial minerals: minerals used in ceramic, refractory, abrasive, glass, fertilizer, paint and electric industries- study of gemstones and their occurrences.

UNIT III FUEL GEOLOGY 9

Origin, physical properties, process of formation of coal deposits – classification and rank of coal – origin and process of formation of petroleum deposits - migration and accumulation of oil and natural gas, different types of traps – Introduction to gas hydrates and nuclear mineral deposits - occurrence and distribution of coal, hydrocarbon and nuclear fuels in India.

UNIT IV GEOPROSPECTING 9

Exploration techniques: geological mapping, trenching, pitting, drilling and 3-D modeling - Geophysical prospecting methods – electrical, seismic, magnetic, gravity and radioactive methods of exploration – Subsurface logging and their importance in exploration: GPR surveying.

UNIT V REMOTE SENSING AND GIS 9

Introduction to aerial photography and satellite remote sensing: components of remote sensing and EMR - photo recognition elements and interpretation of satellite imagery for geological mapping – Geographical Information System: components, raster and vector GIS, overlay and buffering techniques for geological mapping and mineral exploration.

TOTAL = 45 PERIODS

COURSE OUTCOME

To familiarize the students with the economic mineral deposits, and the techniques used to explore such deposits.

REFERENCES

1. Umeshwar Prasad, Economic Geology, second edition, CBS Publishers, 2010.
2. Robb, L. Introduction to ore-forming processes, Blackwell publishing, U.K., 2005.
3. Anthony Evans, Ore Geology and Industrial Mineral, 3rd edition, Wiley & Blackwell, 2013
4. Arogyaswamy, R.N.P. Courses in Mining Geology, Oxford and IBH Co., New Delhi,1988.
5. Bateman, A.M., Economic Mineral Deposits, John Wiley and Sons, 1956.

ME5404	BASIC MECHANICAL ENGINEERING FOR MINING	L T P C 2 0 2 3

COURSE OBJECTIVES:

To give an overall understanding on prime areas of mechanical engineering like Thermodynamics, Heat transfer, IC engines, Power Transmission and Machine elements for Mining Engineering students.

UNIT I BASIC CONCEPTS OF THERMODYNAMICS AND HEAT TRANSFER 6

Basic concept – properties – point and path functions – systems – processes – thermodynamic equilibrium - laws of thermodynamics – Steady Flow Energy Equation (SFEE) - first law applied to open and closed systems – Second law of thermodynamics – heat engines and heat pumps Heat transfer – conduction – general conduction equation in Cartesian coordinates – conduction in composite walls. Convection – free and forced convection – simple empirical correlations. Radiation – laws – black body and grey body radiation.

UNIT II IC ENGINES AND AIR CONDITIONING 6

I C engines – classification - construction and working principles of two and four stroke engines – S I and C.I. engines. Air conditioning – air standard cycles, Otto and Diesel cycle. Introduction to Air conditioning, vapour compression cycle – vapour absorption cycle – psychrometric processes..

UNIT III POWER TRANSMISSION 6

Friction in screw threads, bearings, mechanical and hydraulic clutches. Rope, belt and chain. Gears – nomenclature, laws of gearing, types of gears including rack and pinion, interference, gear trains, power calculation in couplings, clutches and brakes.

UNIT IV KINEMATICS OF MACHINES 6

Mechanisms – basics – kinematic concepts and definitions – degree of freedom, mechanical advantage – transmission angle – description of common mechanisms – quick return mechanisms, straight line generators, dwell mechanisms, ratchets and escapements – universal joints. Cams and followers – terminology and definitions, displacement diagrams – uniform velocity, parabolic and simple harmonic motions.

UNIT V ROTODYNAMIC AND VIBRATORY MACHINES 6

Fans and compressors – types, construction, working principle, characteristics and applications. Single stage and multistage air compressors – inter cooling. Simple calculations for output and efficiency. Vibration – free and forced vibration. Vibrators and shakers – construction, working principle, applications and limitations.

*** Approved HEAT and Mass Transfer and PSG Design Data Book is permitted to use in the examinations.**

TOTAL: 30 PERIODS

COURSE OUTCOMES:

(i) ability to use of thermal experiments related to IC and refrigeration and airconditioning
(ii) ability to use of various engineering design experiments

TEXT BOOKS:

1. Nag, P.K. Basic and Applied Thermodynamics, 8th Edition, Tata McGraw Hill, 2008.
2. Rajput, R.K. Thermal Engineering, 6th Edition, Laxmi Publications,2007
3. Ballaney, P.L. Thermal Engineering, Khanna Publishers, 24th Edition,2003.
4. Shigley J.E., Pennock G.R. and Uicker J.J. Theory of Machines and Mechanisms, Oxford University Press, 2003.

REFERENCES:

1. Bhandari V.B. Design of Machine Elements, 7th Edition, tata McGraw- Hill,2009
2. SundrarajaMoorthy T. V and Shanmugam N. Machine Design, 9th Edition, Anuradha Publishers,2003.
3. Khurmi R. S. and Gupta J. K. Theory of Machines, Eurasia Publishing House,2005.
4. Rattan S. S. Theory of Machines, tata McGraw- Hill Education,2009.

PRACTICALS:

THERMAL EXPERIMENTS

1. Study of I.C. engines and components
2. Performance test on 4 S diesel engine
3. Performance test on reciprocating air-compressor

ENGINEERING DESIGN

1. Cam displacement and velocity analysis
2. Whirling of shaft-determination of critical speed of shaft with concentrated loads
3. Determination of moment of inertia by oscillation method for connecting rod and flywheel.
4. Vibrating system – spring mass system – determination of damping co-efficient of single degree of freedom system.
5. Transverse vibration – free – beam, determination of natural frequency and deflection of beam.

15 PERIODS

TOTAL (30 + 15): 45 PERIODS

MI5401 MINING MACHINERY - I

L	T	P	C
2	0	2	3

OBJECTIVES:

1. To understand the electrical layouts and power distribution in mine.
2. To study the rope haulage layouts, technical details and applications.
3. To study the various modes of transport means and electrical circuits.
4. To study the types of pumps, installations and design calculations.

UNIT I INTRODUCTION 5

Different types of motive power used in mines – their fields of application, relative merits and demerits; transmission and distribution of compressed air in mines, compressed air drills. Elements of the transport system, classification and techno-economic indices.

UNIT II ROPE HAULAGE 8

Wire ropes – classification, construction, fields of application, rope capping and splicing; deterioration of rope in use and its prevention; testing of ropes, selection and maintenance, rope calculations. Rail Track and tubs– gauge; layout, curves, turnouts and cross-over, track maintenance, main features of rolling stock like tubs, mine cars man riding cars and tipplers; Types of rope haulages – merits, demerits and fields of application, constructional features, safety appliances and rope haulage calculations.

UNIT III OTHER TRANSPORT SYSTEMS 8

Locomotives – diesel, trolley-wire, battery locomotives, constructional features and safety devices and comparison of different types; underground and surface battery charging stations and safety measures, locomotive calculations; shuttle cars, underground trucks, load-haul- dumpers, SDL vehicles, aerial rope ways, gravity transport, principles of hydraulic & pneumatic transportation and their fields of application, electric layouts, man-riding systems.

UNIT IV PUMPING & CONVEYING 8

Different types of drives, installation and maintenance of pumps and pipes in shafts and roadways, electrical layouts, various sources of water in mines, design of sumps.

Face haulage and conveyors - Scraper chain conveyors, AFCs, belt conveyors, shaking and vibrating conveyors, armoured flexible conveyors, high angle conveying, electrical layouts.

UNIT V MINE ELECTRICAL ENGINEERING 6

Distribution of electric power in mines, types of mine cables and their fields of applications, mining switch gears and their installation in hazardous atmosphere, flame proof enclosures, intrinsically safe circuits, (examples) safety aspects and signalling. Mine telephone system and latest development in mine communications.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

The students will be able to

1. Obtain basic knowledge on motive power used in mines, pumping,
2. Understand the basic concepts related to rope haulage and face haulage.
3. Learn the design and constructional features of primary equipments used for loading and transportation in the underground mines.
4. Enhance the knowledge on concepts related to pumping & conveying transport systems.
5. Learn fundamental knowledge about mine electrical engineering in all statutory aspects.

TEXT BOOKS

1. Cherkassky, B.M., Pumps, Fans, Compressors, MIR Publishers, 1980.
2. Deshmukh, D.J., Elements of Mining Technology, Vol. I and II EMDEE Publishers, Nagpur,1989.

REFERENCES:

1. Walker, S.C., Mine Winding and Transport, Elsevier, 1988.
2. Karelin N.T., Mine Transport, Orient Longmans, N. Delhi.
3. Mason, E., Coal Mining Series, Mining Machinery, Virtue and Company Ltd., London.
4. Statham, I.C.F., Coal Mining, Vol. I, II, III and IV, Caxton Eastern Agencies, Calcutta.

PRACTICALS

1. Study and construction of different types of wire ropes and types of rope cappels used forrope haulages & winding,
2. Study of Construction of compressed air operated drill.
3. Study of Tensioning arrangement in endless haulage and different types of haulage clips and other means of attachment of tubs to the rope.
4. Study of haulage track, curves, diamond crossing, construction of mine tubs and cars along with their couplings.
5. Study of safety devices provided on rope haulage roads and locomotives, roadways - Exhaust conditioner and flame traps & underground battery charging station layout
6. Study of Electrical power distribution in mines, electrical layout for rope haulages and pumps, Electrical and hydraulic layouts for longwall faces.
7. Study of aerial rope ways – driving/tensioning/loading/unloading and angle stations their carriages and tightness.

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MI5402 **MINE ENVIRONMENT AND VENTILATION** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. Introduce the components of underground mine atmosphere and measurement methods and instrumentation.
2. To impart knowledge on various factors affecting mine environment.
3. To deal with principal laws governing mine ventilation and various ventilation systems.
4. To study with various ventilation control systems

UNIT I MINE GASES 12

Occurrence, properties, physiological effects, detection – types of instruments, construction, measurement and analysis, methane layering, methane drainage. Methods of ventilation survey, Instruments required for ventilation survey,

UNIT II MINE CLIMATE AND CONTROL 9

Psychometric properties of air, Sources of heat and humidity in mines and their effects, cooling power of mine air and methods of improving cooling power including air conditioning.

UNIT III PRINCIPAL LAWS OF AIR MOVEMENT IN UNDERGROUND 9

Fundamentals of fluid flow and its application in mine ventilation with special reference to Bernoulli's Equation, Reynolds number, Poiseuille's equation, Atkinson's equation, Karman-Brandt equation for rough flows, resistance of mine roadways, friction and shock resistance,

UNIT IV NATURAL VENTILATION AND AIR CURRENT DISTRIBUTION IN MINES 9

Natural ventilation, effect of depth, temperature, pressure, etc. distribution of air current in mines – splitting, stopping, regulators, ventilation doors, air crossings, controlled recirculation, etc. boundary, accessional, decensional, homotropal and antitropal ventilation systems, Ventilation in deep and hot mines, remedial measures.

UNIT V MECHANICAL VENTILATION & VENTILATION PLANNING 9

Main mechanical ventilators, booster fans and auxiliary fans, and their selection, installation, fan performance, characteristics and testing, fans in series and parallel, fan drifts and evasees, reversal of air current, forcing versus exhaust ventilation, ventilation of long headings including overlap systems. Calculation of pressure and quantity requirements, economic analysis, ventilation standards, network analysis, monitoring of mine environment.

TOTAL 45 PERIODS

COURSE OUTCOMES:

1. The students will obtain a basic knowledge about mine gases their properties and effects.
2. The students will have basic knowledge of underground mine atmosphere, ventilation methods, parameters influencing mine environment, measurement methods and instrumentation.
3. They will have knowledge about the principal laws governing mine ventilation systems.
4. The students will get adequate knowledge about natural ventilation and air distribution in mines.
5. The students will obtain a knowledge about ventilation monitoring and planning.

TEXT BOOKS:

1. Mishra, G.B. Mine Environment and Ventilation, Oxford University Press, 1992.
2. Hartman, H.L. and Mutmansky, J.M., Mine Ventilation and Air Conditioning, Wiley Interscience publication, 1997.
3. Ramlu, M.A., Elements of Mine Ventilation, White Falcon Publishing, 2018.

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REFERENCES:

1. Hall, C.J., Mine Ventilation Engineering, Society of Mining Engineers, New Engineers, New York, Second Edition, 1992.
2. Vutukuri, V.S., Mine Environment Engineering, Trans Tech Publishers, 1986.
3. McPherson, M.J., Subsurface Ventilation and Environmental Engineering, Chapman and Hall Publication, London, 1993.
4. Panigrahi, D.C., Mine Environment and Ventilation, CRC Press, 2001.

CE5451 PLANE AND GEODETIC SURVEYING L T P C
3 0 0 3

COURSE OBJECTVE:

- To learn the various methods of plane and geodetic surveying for solve the real world problems.

UNIT I FUNDAMENTALS OF SURVEYING 9

Classifications and basic principles of surveying – Equipment and accessories for ranging and chaining – Basic principles Compass surveying - Plane Table Surveying accessories and methods - Levels and staves - Methods of levelling - Booking - Reduction – Curvature and refraction correction – Contouring.

UNIT II THEODOLITE SURVEYING AND COMPUTATIONS 9

Horizontal and vertical angle measurements by Theodolite – Heights and distances– Tacheometric surveying – Trigonometric levelling - Computation of cross sectional areas and volumes - Earthwork calculations - Mass haul diagrams.

UNIT III CONTROL SURVEYING AND ADJUSTMENT 9

Horizontal and vertical control- Methods – Triangulation - Traversing - Gale‘s table - Trilateration - Concepts of measurements and errors – error propagation and linearization – adjustment methods – least square methods – angles, lengths and levelling network.

UNIT IV MODERN SURVEYING 9

Total Station: Digital Theodolite, EDM, Electronic field book - Advantages – Parts and accessories - working principle – Observables – Errors - COGO functions – Field procedure and applications.

GPS: Advantages - System components – Signal structure – Selective availability and antispoofing – receiver components and antenna – Planning and data acquisition – Data processing - Errors in GPS – Field procedure and applications.

UNIT V MISCELLANY 9

Route Surveying - Reconnaissance - Route surveys for highways, railways and waterways - Simple curves – Compound and reverse curves – Transition curves - Setting out different methods of simple curve - Vertical curves - Hydrographic surveying – Tides - MSL - Sounding methods - Three-point problem – Determination of depth and position using multi-beam sounder and GPS - Astronomical terms and definitions - Celestial coordinate systems – different time systems - Field observations and determination of azimuth by altitude and hour angle method.

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TOTAL: 45 PERIODS

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COURSE OUTCOMES:

CO1 Introduce the rudiments of various surveying and its principles.

CO2 Imparts concepts of Theodolite Surveying and computation of area and volume calculation.

CO3 Understand the procedure for establishing horizontal and vertical control and its adjustment procedure.

CO4 Introduce the basics of Electronic Surveying

CO5 Initiate the knowledge in Route surveying, Hydrographic surveying and Field Astronomical surveying.

TEXT BOOKS:

1. T.P.Kanetkar and S.V.Kulkarni, Surveying and Levelling, Parts1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008
2. Dr.B.C.Punmia, Ashok K.Jain and Arun K Jain, Surveying Vol.I & II, Lakshmi Publications Pvt Ltd, New Delhi, 2005.

REFERENCES:

1. R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
2. Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004
3. S.K. Roy, Fundamentals of Surveying, Second Edition, Prentice‘ Hall of India 2004
4. K.R. Arora, Surveying Vol I & II, Standard Book house , Twelfth Edition. 2013

CO – PO Mapping – Plane and Geodetic Surveying

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	M	H	H	H	L	H
PO2	Problem analysis	M	H	M	M	H	M
PO3	Design / development of solutions	L	M	L	M	M	M
PO4	Investigation	L	L	L	M	M	L
PO5	Modern Tool Usage	M	M	H	H	H	H
PO6	Individual and Team work	M	M	L	H	M	M
PO7	Communication						
PO8	Engineer and Society	M	M	L	M	M	M
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning	L	L	M	M	M	M
PSO1	Knowledge of Civil Engineering discipline						
PSO2	Critical analysis of Civil Engineering problems and innovation						
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues						

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AG5412	GEOLOGY LABORATORY - II AND FIELD WORK	L	T	P	C
		0	0	2	1

COURSE OBJECTIVE:

To familiarize the students with practical techniques of Ore mineral identification, ore reserve estimation.

UNIT I ORE GEOLOGY 6

Identification and description of various ores: iron ores, manganese ores, lead ores, zinc ores, copper ores, chrome ores and aluminum ores. Identification and description of non-metallic deposits: talc, magnesite, limestone, gypsum, asbestos, barite, beryl and coal.

UNIT II GEOPHYSICS AND APPLIED GEOLOGY 6

Electrical resistivity problems: Wenner and Schlumberger method problems - seismic survey – Reflection and refraction - 2 and 3 layer problems. Preparation of panel diagrams. Preparation of weathering profile, RMR, RQD calculations.

UNIT III REMOTE SENSING 6

Interpretation of aerial photographs and satellite imageries. Stereoscopes and their applications in interpretation - Preparation of lithological and structural maps.

UNIT IV ORE RESERVE ESTIMATION 6

Surface and sub-surface deposits - Ore reserve estimation – ore assaying & reserve calculations.

UNIT V GEOLOGICAL FIELD WORK 6

Recognition of geological structures such as faults, folds, joints, shear zones etc. in the field- Geological mapping in different geological terrains- Identification of Minerals, rocks and ores in the field site.– Report preparation and submission.

TOTAL: 30 PERIODS

COURSE OUTCOME:

At the end of the course the students will have an understanding of prospecting techniques for ores and minerals, their interpretation and geological mapping.

REFERENCES

1. Umeshwar Prasad, Economic Geology, second edition, CBS Publishers, 2010.
2. Gokhale,N. W., Manual of Geological maps CBS publishers, N. Delhi, 2008.
3. Lahee, F.H., Field Geology, CBS publishers, N. Delhi, 2002.
4. Bell F.G. Engineering Geology*, Second edition* Elsevier Publications, 2006.

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CE5461	PLANE AND GEODETIC SURVEYING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE:

- To familiarize with the various surveying instruments and methods.

EXERCISES

1. Finding Pace Value of Surveyor using Chaining and Ranging
2. Computation of Included Angle after adjustment of Local Attraction
3. Planimetric Mapping of an Area using Plane Table Surveying (Radiation, Intersection)
4. Fly leveling using dumpy level.
5. Fly leveling using tilting level.
6. Transfer of Bench Mark using Check Levelling.
7. Contour Mapping using Grid Levelling.
8. Study of Theodolite and Angle Observations by Repetition.
9. Observation of Angles by method of Reiteration and Station Adjustment.
10. Establishment of Horizontal Control Points by Traversing.
11. Preparation of Planimetric Map using Stadia Tacheometry.
12. Determination of horizontal distance and height difference between two points by Tangential Tacheometry.
13. Estimation of Sun Rise/ Sun Set time using Sun Observations
14. Determination of Azimuth by Ex-Meridian observation.

COURSE OUTCOMES:

- On completion of the course, the student is expected to be able to

CO1	use conventional surveying tools such as chain/tape, compass, plane table in the field of civil engineering applications
CO2	Prepare planimetric map contour map
CO3	Imparts knowledge in computation of Distance and Elevation using horizontal and vertical angles
CO4	Establish horizontal and vertical control points.
CO5	Determination of Azimuth by Astronomical observation.

REFERENCES:

1. T.P.Kanetkar and S.V.Kulkarni, Surveying and Levelling, Parts1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008
2. Dr.B.C.Punmia, Ashok K.Jain and Arun K Jain, Surveying Vol.I & II, Lakshmi Publications Pvt Ltd, New Delhi, 2005
3. James M.Anderson and Edward M. Mikhail, Surveying Theory and Practice, Tata McGraw Hill Education Private Limited, New Delhi, 2012
4. Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004

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CO – PO Mapping – PLANE AND GEODETIC SURVEYING LABORATORY

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	L	M	L	M	L	L
PO2	Problem analysis	L	M	L	M	L	L
PO3	Design / development of solutions	L	L	M	M	M	M
PO4	Investigation						
PO5	Modern Tool Usage	M	H	H	M	M	H
PO6	Individual and Team work	M	H	H	M	M	M
PO7	Communication						
PO8	Engineer and Society	L	M	M	M	L	M
PO9	Ethics						
PO10	Environment and Sustainability						
PO11	Project Management and Finance						
PO12	Life Long Learning	L	L	M	L	L	L
PSO1	Knowledge of Civil Engineering discipline						
PSO2	Critical analysis of Civil Engineering problems and innovation						
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues						

GE5552 **ENGINEERING MANAGEMENT** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

1. Explaining basic concepts of management; approaches to management; contributors to management studies; various forms of business organization and trade unions function in professional organizations.
2. Applying various functions of management in professional organization.
3. Applying organizational theory in professional organization.
4. Applying the principles of productivity and operations management in professional organization.
5. Applying modern concepts and marketing in management in professional organization.

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UNIT I INTRODUCTION TO MANAGEMENT 9

Definition and functions of Management - Approaches to the study of Management – Mintzberg's Ten Managerial Roles – Principles of Taylor; Fayol; Weber; Parker – Forms of Organization: Sole Proprietorship; Partnership; Company (Private and Public); Cooperative – Public Sector Vs Corporate Organization – Business Environment: Economic; Social; Political; Legal – Trade Union: Definition; Functions; Pros and cons.

UNIT II FUNCTIONS OF MANAGEMENT 9

Planning: Characteristics; Nature; Importance; Steps; Limitation – Organizing: Features; Process; Principles; Types – Departmentalization: Functional – Divisional (Product; Customer; Geographic) – Staffing: Systems Approach; Recruiting and Selection Process – Directing (Leading): Traits; Style; Managerial Grid (Blake-Mounton, Reddin) – Communication: Purpose; Model; Barriers – Controlling: Types; Audit (External, Internal, Merits) – Decision Making: Elements; Characteristics; Process; Classification – Controlling techniques.

UNIT III ORGANIZATION THEORY 9

Human Resource Development (HRD): Goals – Organizational Conflict: Positive Aspects; Individual; Role; Interpersonal; Intra Group; Inter Group; Conflict Management – Need and Motivation Theories: Maslow's Hierarchy of Needs Theory; Herzberg's Motivation-Hygiene Theory; McClelland's Needs Theory of Motivation – Change Management: Concept of Change; Lewin's Process of Change Model; Sources of Resistance; Overcoming Resistance; Guidelines to managing Conflict.

UNIT IV PRODUCTIVITY AND OPERATIONS MANAGEMENT 9

Productivity: Concept; Measurements; Affecting Factors; Methods to Improve – Operations Management Tools: (Simple problems in) Transportation Model (Balanced); Assignment Model (Hungarian); Network Model (Shortest path); Critical Path Method; Decision Trees.

UNIT V MODERN CONCEPTS AND MARKETING MANAGEMENT 9

Concept, features, merits and demerits of: SWOT Analysis; Business Process Re-engineering (BPR); Supply Chain Management (SCM) – Marketing: Concept; Functions; Importance; Segmentation; Mix; Problems of Marketing in Small Enterprise; Competitive Analysis and Advantage – E-marketing.

TOTAL = 45 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:

1. Explain basic concepts of management; approaches to management; contributors to management studies; various forms of business organization and trade unions function in professional organizations.
2. Apply various functions of management in professional organization.
3. Apply organizational theory in professional organization.
4. Apply the principles of productivity and operations management in professional organization.
5. Apply modern concepts and marketing in management in professional organization.

TEXT BOOKS:

1. Koontz. H. and Weihrich. H., Essentials of Management: An International Perspective, 8th Edition, Tata McGrawhill, New Delhi, 2010.
2. M. Govindarajan and S. Natarajan, Principles of Management, Prentice Hall of India, New Delhi, 2009.

REFERENCES:

1. Joseph J, Massie, 'Essentials of Management' Prentice Hall of India Pvt. Ltd., 1985.
2. M. Govindarajan, Marketing Management, Prentice Hall of India, New Delhi, 2010.
3. R. Panneerselvam, Operations Research, Prentice Hall of India, New Delhi, 2013.
4. S.Chandran, Organizational Behaviours, Vikas Publishing House Pvt. Ltd., 1994.
5. Saxena, P.K., Principles of Management: A Modern Approach, Global India Publications, 2009.

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CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1						0.6		0.6				0.3	0.3		
2						0.6		0.6				0.3	0.3		
3						0.6		0.6	0.9	0.9		0.3	0.3		
4	0.9	0.9	0.9	0.9		0.6		0.3			0.9	0.3	0.6		
5						0.6		0.6			0.3	0.3	0.6		

MI5501 **SURFACE MINING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To impart fundamental knowledge to design safe, efficient and environmentally responsible surface mining operations.
2. To enable students to the ground preparation techniques, excavation and transportation technology adopted in the surface mining.
3. To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars being covered under this course.

UNIT I INTRODUCTION **9**

Surface mining – status, concept, applicability, advantages and disadvantages, Surface Mining Systems vis equipment system – classification, applicability, advantages and disadvantages; Stripping ratio – concepts, types and applicability; Concept of ultimate pit limits; Haul roads in surface mines – constructional and safety features.

UNIT II DESIGN AND DEVELOPMENT OF SURFACE MINES **9**

Surface mine planning – Different systems of opening of deposits, Boxcut – objective, factors affecting the selection of boxcut site; Production benches – formation, parameters and factors affecting their selection. Slopes in surface mines – Highwall and waste dumps; Working pit slope and ultimate pit slope, common modes of slope failures, factors influencing stability of slopes, Slope protection, stabilization and monitoring. Development of opencast mine layouts for various mode of deposit with respect to its occurrence.

UNIT III GROUND PREPARATION METHODS **9**

Preparation of the site – Ripping, Drilling and Blasting; Types, operation, selection, method and cycle of operation, applications of ground preparation equipments – Rippers-Dozers, Blasthole drills and rock breakers, Determining number of drill machines; Concept of Rippability, Estimation of ripper's output, Design of blasts in surface mines.

UNIT IV EXCAVATION SYSTEM IN SURFACE MINES **9**

Selection criteria for excavation and transport equipments used in surface mines. Classification, application and limitations of different types of excavating equipments used in surface mining projects; Cycle time and productivity calculation; Dragline - calculation of required bucket capacity for a given handling requirement, Method and cycle of operations of Draglines, Front end loaders, Scrapers, Bucket wheel and bucket chain excavators, Continuous Surface miners. Determining the capacity and number of shovels and dumpers for planned production.

Attested

UNIT V TRANSPORT AND WASTE DUMPS 9

Scope and application of different modes of transport system in surface mines – Trucks, Synchronization of shovel and dumper capacity for required production; Conveyors (shiftable and high-angle) – mode of operation, applicability and limitations, Scope and application of in-pit crushers in surface mines. Illumination and surface mine drainage in surface mines. Surface mining over underground workings.

Types of waste dump – internal and external; dump formation methods and corresponding equipment; Dump slope - stabilization and monitoring.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

The students will have ability

1. To understand various modes of opening up of deposits amenable to surface mining.
2. To plan and design the basic components of a typical surface mine including benches and haulroads according to the deposit formation.
3. To identify the salient points that dictate which is the safest, most efficient, and most versatile extraction method to employ classify and select the suitable surface mining methods and equipment based on site conditions.
4. To understand the concept of waste dump formations and slope failures in surface mines.
5. To discuss the impacts that social and environmental issues have on surface mining from the pre-exploration phase to end-of-mine issues, and how to manage these two increasingly important factors to the benefit of both the mining company and the society.

TEXT BOOKS:

1. Kennedy, B.A., Surface Mining – 2nd Edition, SME, New York, 1990.
2. Hartman H.L., Introductory Mining Engineering, John Wiley and Sons, 2002.

REFERENCES:

1. Hartman, H.L. (Ed.), SME Mining Engg. Handbook Vol. I and II, 3rd Edition, Society for Mining, Metallurgy, and Exploration, Inc., Colorado, 2011.
2. Mishra G.B., Surface Mining, 2nd Edition, Lovely Prakashan Publishers, Dhanbad, 2006.
3. Rozgonyi, G Tibor, Continuous Surface Mining, 1st Edition, A.A.Balkema, Rotterdam, 1988.
4. Rzhevsky V., Open pit Mining Operations, Mir Publications, 1971.
5. Amitosh De, Heavy Earth Moving Machinery, Lovely Prakashan, Dhanbad, 2000.
6. Hustrulid, W. and Kuchta, M, Open Pit Mine Planning & Design, Vol. 1, Fundamentals, 3rd Edition, A.A.Balkema, Rotterdam, 2013.
7. Hustrulid, W. A., Mccarter, M. K., And Van Zyl, D. J. A., Ed., Slope Stability in Surface Mining, Littleton, 2000.
8. Das, S.K., Surface Mining Technology, Lovely Prakashan, Dhanbad, 1994.
9. Rasim Latifovic, Mining and the Environment, VDM Verlag, 2009.

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MI5502	UNDERGROUND MINING METHODS - COAL	L T P C 3 0 0 3

COURSE OBJECTIVES:

1. To study the conventional and advance systematic coal extraction methods
2. To study and update of the mine criteria as per various legislation of India.
3. To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars related to this course.

UNIT I INTRODUCTION 7

Global and national status of coal industry and energy demands, theories of coal formation, Indian coalfields and its reserves, factors affecting choice of mining methods, classification of coal mining methods, grading and analysis of coal.

UNIT II BORD AND PILLAR METHOD-DEVELOPMENT 9

Design and development of a district / panel, sizes and shapes of galleries and pillars, bord and pillar, room and pillar methods, with conventional and continuous mining techniques with various equipment.

UNIT III BORD AND PILLAR METHOD – EXTRACTION 8

Pillar extraction by caving and stowing methods; mechanised extraction of pillars, shaft pillar extraction, systematic supports, surface, underground and face arrangements for stowing, partial extraction.

UNIT IV LONGWALL METHOD 8

Advance and retreat methods, continuous and cyclic systems, extraction with different machines-ploughs, shearers, design of longwall workings, optimum length of face, size of panel, gates, support system, personnel, organisation and safety measures, salvaging and relocations of equipment, Punch longwall.

UNIT V SPECIAL METHODS OF WORKING 13

Problems of working thick & thin seams, multi slices, sublevel caving, horizon mining, gallery blasting method, contiguous seam working, working steeply inclined seams, working under surface structures and seams liable to spontaneous heating, outburst and bumps, etc. hydraulic mining, Wongawalli, shortwall, highwall mining, underground coal gasification, coal bed methane, shield mining. Support designing and various types of support.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

The students will be able to

1. Gain exposure on Global and National level demand of coal production and reserves availability
2. Acquire the scientific design skill on coal district development of Bord and Pillar method
3. Get the safety manner of planning skill on coal district depillaring of Bord and Pillar method
4. Gain the knowledge continuous and cyclic manner of coal extraction with different capacity and cutting-edge technology machineries
5. Explore the novel methods of coal winning in order to tackle the problems associated with thick and thin seams extraction methods.

TEXT BOOKS:

1. Singh, R.D. Principles and Practices of Modern Coal Mining, New Age International (P) Ltd., Chennai, 1994.
2. Peng S.S., and Chiang, H.S., Longwall Mining, John Willey and Sons, New York, 1992.

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REFERENCES

1. Singh, T.N. Singh, Underground Winning of Coal – Oxford & IBH Publishing Co. Ltd.,1992.
2. Mathur, S.P., Coal Mining in India, M.S. Enterprises, Bilaspur, 1999.
3. Das S.K., Modern Coal Mining technology, Lovely Prakashan, Dhanbad 1994.
4. Singh T.N., Dhar, B.B. Thick Seam Mining, Problems and Issues, Oxford & IBH Publishers, 1992.
5. Mathur, S.P., Mining Planning for Coal., M.G. Consultants, Bilaspur, 1993.
6. Szwilski and Richards M.J., Underground Mining Methods and Technology, 1987.

MI5503	ROCK MECHANICS AND GROUND CONTROL	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

1. To study about application of Rock Mechanics in mining and allied engineering.
2. To study Physico-Mechanical properties of rocks, non-destructive testing methods, time dependent properties of rock
3. To study different types of underground supports, etc.
4. To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars related to this course**.**

UNIT I INTRODUCTION 12

Definition of some important terms used in rock mechanics, application of rock mechanics in mining, introduction to stress analysis, stresses in two and three dimensions, Mohr's circle.

UNIT II PHYSICAL PROPERTIES OF ROCKS ANDROCK INDICES 6

Physical properties of rocks — density, porosity, moisture content, permeability, water absorption various indices of rocks like swell index, slake durability index, impact strength index, protodynakov index, etc., thermal conductivity, hardness, durability, rock mass classification.

UNIT III MECHANICAL PROPERTIES OF ROCKS 12

Preparation of test specimens, laboratory determination of mechanical properties of rocks — compressive strength, tensile strength, flexural strength, shear and triaxial strength, modulus of elasticity, Poisson's ratio, Mohr's envelope, effect of various parameters on the strength of rocks, in-situ strength, post failure behaviour of rocks.

UNIT IV NON-DESTRUCTIVE TESTING METHODS AND TIME DEPENDENT PROPERTIES OF ROCKS 6

Dynamic wave velocities, dynamic elastic constants, their determination in the laboratory, application in mining, time dependent properties of rocks, creep, mechanism of creep of rocks — different stages, rheological models.

UNIT V UNDERGROUND SUPPORTS 9

Various methods of roof examination, objectives and limitations of supports, ground forces and in situ stresses, pressure arch theory, evolution of supports , conventional supports — timber and steel supports, arches, yielding supports; rock and cable bolting, shotcreting, roof stitching, support of shaft bottoms, galleries, junctions and places of roof falls, freshly exposed roof supports, design of supports, longwall powered supports. Design of systematic support rules for B & P and longwall - development, depillaring, etc.

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TOTAL (45 + 15): 60 PERIODS

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COURSE OUTCOMES:

1. The students will have fundamental knowledge on rock mechanics.
2. The students will have basic knowledge aboutphysico- mechanical properties of rocks.
3. The students will obtain a adequate knowledge about mechanical properties of rock.
4. Enhance the knowledge in non-destructive tests and creep mechanisms.
5. The students will learn about different types of underground supports.

TEXT BOOKS:

1. Vutukuri, V.S., and Lama, R.D., Handbook on Mechanical Properties of Rocks, Vol. I, II, III and IV, Transtech Publication, Berlin, 1974/78.
2. Peng, S.S., Ground Control, Wiley Interscience, New York, 1987.

REFERENCES:

1. Obert, L. and Duvall, W.I., Rock Mechanics and Design of Structure in Rock John Wiley and Sons Inc., New York, 1967.
2. Brady, B.H.G. and Brown, S.T., Rock Mechanics, Wiley Interscience, 1985.
3. Hoek, E., and Brown, S.T., Underground Excavations in Rocks, Institute of Mining Metallurgy, London, 1980.

MI5504 MINE SURVEYING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To study methods of underground traversing and surveys.
2. To study the various modern surveying techniques and instrumentation.
3. To study methods of contouring and curves, layouts.
4. To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars related to this course.

UNIT I UNDERGROUND SURVEY 10

Special features of Underground Mining surveying, Mine correlation of mine surveys to national grid, Underground traversing and its constraints, Correlation of underground and surface surveys by different methods, by traversing through shafts, assumed bearing, Weiss quadrilateral, Weiss triangle methods, estimation of errors,; Illustrative examples: Measurement of shaft depth.

UNIT II ALIGNMENT SURVEYANDTACHOMETRY 12

Alignment / Gradient control of vertical and inclined shafts sinking and raising shafts; gradient control in development openings; Holing surveys; Fixing centre lines for shafts, Alignment in Headgears, machinery foundation etc.Illustrative examples: Tachometry –principles, equipment, methods (stadia, substance, tangent), accuracy of stadia work, booking, computations. Transfer of levels to different horizons.

Dip/ Strike / Fault interpretation from inclined angle vertical borehole data in dipping and plunging formations; interpretations of borehole maps; borehole deviation; calculation of plunge in folded terrain

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UNIT III STOPE & SUBSIDENCE SURVEYS AND MINEPLANS 8

Stope survey – objectives, methods- Tape triangulation, Tying In, Traversing, Radiation, preparation of stope plan, preparation of mine plan subsidence survey, guidelines for subsidence in laying out monitoring stations, methods of subsidence survey, statutory provisions and circulars, Preparation of Mine plans and sections; stepped plan; Allay plan; Joint Survey, Offset survey, extension of centerlines, determination of partition thickness between the sections. Duties and responsibilities of mine surveyor under Mines Act and connected legislations.

UNIT IV CONTOURING ANDCURVE SETTING 8

Methods of Contouring; contour gradient; uses of contours; Reservoir / Catchment area calculations Illustrative examples: setting out underground of curves; need for curves; types of curves; methods of curve setting.

UNIT V MODERN SURVEYING METHODS 7

Application of Remote sensing and photogrammetry in exploration and mining; EDM; Electronic theodolite, Electronic Tachometer (Total station); Laser Theodolite; GPS; GIS; DTM Applicability and limitations, GPR application in surveying, Laser Scanning, introduction to surveying softwares and use.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

1. The students will have knowledge on methods of underground traversing.
2. The students will learn about alignment of survey and tachometry surveying.
3. The students will have knowledge about methods of stope and subsidence surveys. They will have a confident about preparation of mine plans and section.
4. The students will understand the methods of contouring and curve setting.
5. The students will have knowledge on EDM, GPS, DTM, Total station, etc.

TEXT BOOKS:

1. Punmia, B.C., Surveying Vol I and II, Laxmi Publication, New Delhi,1991
2. Kenetkar, T.P., Surveying and Levelling, Vol I and Vol II, United Book Corporation, Poona, 1991.

REFERENCES

1. Winniberg, F., Metalliferous MineSurveying
2. Mason,E., Coal Mining Series, Surveying ,Vol I And Vol II, Virtue And Company Limited, London.
3. Clark, D., Plane And Geodetic Surveying,Vol I And Vol II, CBS Publishing Co.,1986.
4. Assur,V.L.AndPilatov,A.M., Practical Guide To Surveying MIR Publishers, Moscow1988.
5. Borshch,V., Komponiets,A., Navitny, G.AndKnysh., Mine Surveying MIR Publishers Moscow,1989.
6. Sahni, Advanced Surveying, Lovely Prakashan, Dhanbad,1992.
7. Alam Chand., Modern Concept Of Mine Survey, Lovely Prakashan,Dhanbad,1992.
8. Ghatak., Mining Surveying, LovelyPrakashan,Dhanbad,1990

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MI5511 ROCK MECHANICS AND GROUND CONTROL LABORATORY

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

1. To study the various of methods to determine the properties of rocks
2. To study the operation of various instruments and equipment used in rock mechanics.

DETERMINATION OF

1. Moisture content of rock sample by ISRM standard method
2. Protodyaknov index of rocks.
3. Point load index strength of rocks
4. Porosity of rocks.
5. Uni-axial compressive strength of dry and water saturated rock samples.
6. Tensile strength of rock using Brazilian test method.
7. Shear strength of rocks.
8. Tri-axial strength of rock and drawing of Mohr's envelope.
9. Slake durability index of rocks.
10. Determination of longitudinal wave velocities of rocks using NDT.
11. Time dependent properties of rocks
12. Drillability index of rocks.
13. Young's Modulus of Elasticity and Poisson's ratio.
14. Determination of shear strength of soil
15. Determination of tri-axial strength of soil.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

The students will be able

1. To gain knowledge on strength and deformation characteristics of rock using different methods.
2. To select the suitable equipment to determine various characteristics of rock such as testing the rock strength and other material properties in the Rock testing laboratory.
3. To provide hands on experience in handling different types of rock testing equipments.

REFERENCES:

1. Vutukuri, V.S., and Lama, R.D., Handbook on Mechanical Properties of Rocks, Vol. I, II, III andIV, Transtech Publication, Berlin,1974/78.
2. Peng, S.S., Ground Control, Wiley Interscience, New York,1987.
3. Hoek, E and Brown, E.T., Underground Excavations in Rocks, Institute of Mining Metallurgy, London, 1980

MI5512	MINE VENTILATION LABORATORY	L T P C 0 0 2 1

COURSE OBJECTIVES:

1. To determine the psychrometric properties, gas percentage in atmosphere.
2. To study the principles and characteristics governing mine fans.

EXPERIMENTS:

1. Determination of psychrometric properties of air.
2. Study of mine flame safety lamp, gas testing with flame safety lamp.
3. Mine air sampling and detection of various mine gasses, like, methane, carbon monoxide (CO), etc.
4. Determination of percentage of mine gasses using chromatograph and other methods.
5. Measurement of cooling power by Kata thermometer.
6. Study of installation of centrifugal flow fans.
7. Study of installation and positioning of booster fan.
8. Study of characteristics curve of different and its composition.
9. Study of axial flow fan and fan characteristics.
10. Study of central and boundary ventilation system.
11. Study of pressure survey and quantity survey in mines using velometer, anemometer and barometer.
12. Study of mine air-conditioning plant.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

1. The students will have knowledge on practical significance of a ventilation system in an underground mine environment.
2. The students can handle some instruments and devices used in ventilation system.

MI5513	PRACTICAL TRAINING - II	L T P C 0 0 0 1

COURSE OBJECTIVES:

1. To learn various unit operations carried out in the underground mine.
2. To expose the basic operations of various equipments deployed in the underground mine.
3. To impart practical experience to the student for gaining deeper understanding of the various activities and principles of underground mining.

Gaining practical experience is an important aspect of the mining engineering programme having many characteristic features of its own. The students have to undergo training in underground coal or metal mines/allied industry/research institute during the summer vacation **at the end of the IV Semester for a period of 2 to 3 weeks** and obtain a valid certificate from the competent authority of the organization provide training. The students have to submit a report on the training which would be evaluated during the ensuing V Semester. This carries a total of one credit during the V Semester. Evaluation would be done by a faculty or a group of faculties on different marking heads such as training, viva voce report etc., or other approved evaluation systems.

Normally a student is not permitted to withdraw from the practical training. In case of any unforeseen circumstances / valid reasons if he could not undergo the training as scheduled, on the recommendation of the Head of the Department and approval by the competent authority the student may be permitted to undergo Practical Training-II subsequently without affecting the academic schedule before undergoing Practical Training-III. The decision of the competent authority is final.

COURSE OUTCOMES:

The students will be able to

1. Understand the geology of the deposit amenable for underground mining.
2. Understand the site selection and method for assessing the deposit (shaft/incline/adit).
3. Acquire adequate knowledge on mine development, ground control and other significant parameters associated with mine construction.
4. Comprehend the knowledge on working of various equipments deployed for different unit operations in the underground mines along with its safety aspects.
5. Understand the methods of stockpiling and transportation techniques, mine dewatering, mineral handling/processing facilities.

GE5251 ENVIRONMENTAL SCIENCES L T P C
3 0 0 3

COURSE OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and non-renewable resources, causes of their degradation and measures to preserve them.
- To familiarize the influence of societal use of resources on the environment and introduce the legal provisions, National and International laws and conventions for environmental protection.
- To inculcate the effect of population dynamics on human and environmental health and inform about human right, value education and role of technology in monitoring human and environmental issues.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – bio geographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds Field study of simple ecosystems – pond, river, hill slopes, etc.

Attested

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land 47 degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
- To identify the causes, effects and environmental pollution and natural disasters and contribute to the preventive measures in the immediate society.
- To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
- To recognize different forms of energy and apply them for suitable applications in for technological advancement and societal development.
- To demonstrate the knowledge of societal activity on the long and short term environmental issues and abide by the legal provisions, National and International laws and conventions in professional and personal activities and to identify and analyse effect of population dynamics on human value education, consumerism and role of technology in environmental issues.

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TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers (2018).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2016).
3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).

REFERENCES:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005).
5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. (2013).

MI5601 UNDERGROUND MINING METHODS - METAL

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To introduce concepts of metal mining and metal mining terminology.
2. To study development and operations of metal mines.
3. To study about special methods of metal mining methods.

UNIT I BASICS **8**

Metal Mining Terminology; Typical modern metal mine features; exploration, estimation of block wise and mine wise reserves and actual production, typical prestoping ore block constructional features; classification of methods;

UNIT II GENERAL MINE DESIGN **8**

Mode of mine and stope entry; Layouts; Determination of optimum production level; sequence of extraction, production scheduling; Basic design – Level Intervals, ore pass, common ore pass, size of blocks ore handling in stope and other openings, overview of constructional features – X cuts, Raises, Winzes etc.

UNIT III STOPING – GENERAL DESCRIPTION **8**

Techno economic characteristics impacting choice of method; Typical unit cost parameters; optimum size of mine and stope. Stope layout, design, equipment selection; Preparing a stoping block; sequence of stoping; organization; production cycle; unit cost calculation; comparison of various methods and costs

UNIT IV STOPING METHODS **12**

Unsupported methods – Stope and pillar, shrinkage, sublevel stoping etc. Supported stopes– Cut and fill, stull, square set etc. Caving methods – Top slicing, sublevel caving, block caving.Case studies of Indian and foreign underground metal mines. Comparison of various methods of stoping and costs.

Attested

UNIT V NOVEL INNOVATIVE TECHNIQUES & SPECIAL APPLICATIONS 9

Hydraulic mining, slurry mining, solution mining, nuclear mining; Rapid excavation; Radial – axial splitter; Thermal fragmentation; shock wave breaking; Deep mining; narrow contiguous veins; shaft and remnant pillars; VCR; Ring drilling; Large Blast hole stoping.

Note: All the above are to be studied with emphasis on MMR and the relevant circulars

TOTAL: 45 PERIODS

COURSE OUTCOMES:

1. The students will have basic concept on metal mining methods.
2. Enhance the knowledge on mine design, development and operations of metal mines.
3. The students will get basic knowledge about stoping techniques.
4. The students will understand the concepts of methods of stoping.
5. They will also know about novel methods of metal mining and its applications.

REFERENCES:

1. Cummings, A.B. and Given, I, V., SME Mining Engg. Handbook Vol. I And II, Society of Mining Engineers Of American Institute Of Mining, Metallurgical, Petroleum Engineers Inc., New York 1992.
2. Hartman, H.L., Introductory Mining Engineering, John Wiley and Sons, New York, 1987.
3. Hustrulid, W.A. Ed., Underground Mining Methods Handbook Society of Mining Engineering, AMIE, New York, 1990.

MI5602 MINING MACHINERY - II

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

1. To understand the functioning of winding engines and other winding accessories
2. To study surface and pit bottom layouts, various coal face machinery
3. To study the design and construction details of excavating & transporting equipments used in surface mines.
4. To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars being covered under this course.

UNIT I WINDING ENGINES 9

Winding systems, drum winders, drives, mechanical braking of winders, safety devices in winding, over wind and over speed protection, Koepe and multi-rope friction winding, electrical layouts. Duty cycles of drum winders of different drum cross sections. Special problems of deep shaft winding.

UNIT II WINDING ACCESSORIES AND LAYOUTS 9

Head gear and their design, head sheave, cages and skips, suspension gear, shaft fittings and appliances – guides, keps, etc., signalling system, winding calculations relating to rope size & numbers, capacity & power requirement for cage, skip, drum and Koepe winding systems.

Surface and Pit-bottom layouts - Mine car circuits at the surface and pit bottom, creepers, skip winding – loading and discharge arrangements. Case studies, railway sidings and layouts.

UNIT III COAL FACE MACHINERY 9

Construction, salient mechanical and electrical features and operations of coal drills and their control panels, coal cutters, different types of mechanical loaders coal ploughs, cutter loaders and continuous miners; development road headers in face mechanisation, longwall mining equipment, electrical and hydraulic layouts; condition monitoring of mining machinery for underground and opencast miens and ore handling plants, modern concepts in underground mine mechanisation.

UNIT IV EXCAVATION AND LOADING MACHINERY IN SURFACE MINES 9

Classification. Hydraulic system diagram. Under carriage. Design and Construction details of Front end loaders, hydraulic excavators and Electric Rope shovel, Dragline, Bucket Wheel Excavator. Bucket Chain Excavator and Surface Miners.

UNIT V OTHER MACHINERY IN SURFACE MINES 9

Classification of transport equipments; Understanding of construction and technical specifications of Dumpers of different types including multi-axial dumpers,, Tractor-trailers, Rippers (types), Motor Graders, Bull Dozers, Rock breakers, Road Compacters, Water Tankers.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

The students will be able

1. To learn the function of winding engines, winding accessories, pit-top and bottom mine circuits.
2. To know about working of various coal face machinery and understand the concept of underground transport system
3. To learn the application and features of cutting and mining machines
4. To enhance the knowledge on constructional features, operation, applicability and limitations of various excavating and loading equipments used in surface mines.
5. To obtain knowledge on the design & construction details of other prominent machinery used in surface mines.

TEXT BOOKS:

1. Amitosh Dey, Heavy Earth Moving Machinery, Lovely Prakashan Publications, Dhanbad, 2000.
2. Walker, S.C., Mine Winding and Transport, Elsevier, 1988.

REFERENCES:

1. Cummings, A.B. and Given, I.V., SME Mining Engg. Handbook Vol .I and II, New York, 1992.
2. Cherkassky, B.M., Pumps, Fans, Compressors, MIR Publishers, 1980.
3. Deshmukh, D.J., Elements of Mining Technology, Vol. I, II and III, EMDEEE Publishers, Nagpur, 1979.
4. Alemgren G., Kumar U., and Vagenas N., Mine Mechanisation and Automation, A.A., Balkema Publication, 1993.
5. Mason, E., Coal Mining Series, Surveying, Vol I and II Virtue and Company Limited, London, 1985.

PRACTICALS:

1. Study of various types of head gear, fleet angle, study of shaft fittings, suspension gear, safety hooks used in winding, protective roofing, guides– methods of support and tensioning arrangements.
2. Construction of cages, skips & their fittings and brakes of winders & haulers
3. Study of different types of conveyors (components & safety devices) like armoured face conveyors, belt conveyors, gate belt conveyors, shaker & vibrating conveyors, high angle conveyors
4. Study of rotary-percussive drill and its hammer used in surface mines
5. Study of pit top & pit bottom layouts in shaft and inclines.
6. Study of different types of loading machines
7. Study of cool plough and shearer.
8. Study of continuous miner and road headers.
9. Study of electric rope shovel and hydraulic excavators.
10. Study of Bucket Wheel Excavators and Draglines.
11. Study of Haul Trucks (Dumper).
12. Study of Dozers and Front-end Loaders.

Attested

15 PERIODS

TOTAL (45 + 15): 60 PERIODS

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MI5603 **MINERAL PROCESSING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. The students will possess the knowledge needed to design a mineral processing operation that ensures maximum profitability for a mining company while achieving the required product quality specifications.
2. The students will understand the methodology used to select the appropriate unit operations, determine the optimum operating conditions and select the required size of the unit.
3. The students will acquire adequate knowledge of product quality assurance programs that includes the monitoring of plant efficiency.

UNIT I INTRODUCTION 6

Scope, objectives, minerals/ores for mineral processing, methods of treatment, choice of methods, sequence of operations, product, flow sheets, ore sorting – hand mechanical, electronic, removal of harmful materials, ore transportation.

UNIT II COMMINUTION 8

Introduction to comminution, reduction ratio, primary/secondary/tertiary crushing, purpose, duty, theory of crushing, types of crushers and comparison, general crushing flow sheet, wet/dry grinding, mechanism and various affecting parameters. Power consumption for crushing & grinding.

UNIT III LABORATORY & INDUSTRIAL SIZING AND SAMPLING 9

Objectives of sizing and scale of sizing, factors governing particle behaviour, laboratory and industrial screens, trommels, vibrating screens, etc. wet and dry screening, classification and classifiers. Laboratory size analysis and interpretation. Metallurgical accounting and control - sampling and its significance, methods of sampling practiced in mills, automatic control in mineral processing.

UNIT IV SEPARATION / CONCENTRATION 12

Newton's and Stoke's Laws of particle settlement, different concentration techniques-gravity, chemical froth flotation, wet &dry magnetic separation, electromagnetic, amalgamation, heavy media, jigging, shaking tables, sluicing, spirals, thickeners, filtration, etc.; Colour based sorting of minerals – optical sorter; Coal washing and washability curves.

UNIT V SPECIAL METHODS 10

Chemical extraction, cyanide process, leaching, use of ion exchange, solvent extraction, pilot plant studies on ores, tailing dams – mode of disposal, construction and design & other solid-waste (other than overburden) management in mines; flow sheets for coal and typical ores of copper, aluminum, lead, zinc, gold, uranium, iron, limestone, magnesite and beach sand minerals with special reference to Indian deposits.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

The students will be able to

1. Know the basic principles of mineral processing.
2. Obtain adequate knowledge for the typical process circuits used to treat aggregates and ores containing one or more valuable minerals.
3. Comprehend the basic concepts on various separation/concentration techniques and special methods adopted to process the minerals.
4. Develop processing flow sheets for the production of aggregates and mineral concentrates from raw ore material.
5. Identify the suitable site and adequate area for constructing the tailing dams for storing the refuse coming out of a typical processing plant.

TEXT BOOKS

1. Wills, B.A, Mineral Processing Technology, 8th edition, Butterworth Press, 2015, 512p.
2. Jain, S.K, Ore Dressing, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1986, 518p.

REFERENCES

1. Gaudin, A.M, Principles of Mineral Dressing, Tata McGraw - Hill Publishing Co. Ltd., New Delhi, 2003.
2. Leonard, J. W. and Hardinge, B. C., Coal Preparation, Society for Mining, Metallurgy and Exploration, Inc., Littleton, 1991.
3. Maurice C. Fuerstenauand Kenneth N. Han (Editor), Principles of Mineral Processing, Society for Mining, Metallurgy, and Exploration, 573p, 2003.
4. Prayor, E.J, (1974), Mineral Processing, 3rd Edition, Applied Science Publishers, London, p.844.
5. Richards, R.H, Charles E. Locke, S.B and Schuhmann, R, (1953), Textbook of Ore Dressing, McGraw-Hill Book Company Inc, Newyork, p.608.
6. Taggert, A.F, Handbook of Mineral Dressing, Chapman and Hall, New York, 1945.
7. Vijayendra, H.G, Handbook on Mineral Dressing, Vikas Publishing House Pvt. Ltd., New Delhi, 2001.
8. Weiss, N. L., SME Mineral Processing Handbook, Volumes I &II, Society for Mining, Metallurgy and Exploration, Inc., Littleton, 1985.
9. Morrell S, Morrison R D & Kojovic T, Mineral Comminution Circuits: Their Operation and Optimisation. (Series: JKMRC Monograph Series in Mining and Mineral Processing No. 2). Series Editor, T J Napier-Munn, published by Julius Kruttschnitt Mineral Research Centre, University of Queensland, 1996.

MI5611 MINERAL PROCESSING LABORATORY

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

1. To study various mineral processing technique to enrich minerals.
2. To study about the devices used for mineral processing techniques.

EXPERIMENTS

1	Study of grab sampling and different sample division techniques like coning and Quartering, riffle sampling techniques, etc.
2	Determination of crushing characteristics of a given mineral sample using jaw crusher
3	Determination of the grinding characteristics of a given mineral sample using ball mill
4.	Sieve analysis of a given sample and to calculate (a) percentage sample retained on screens (b) average size of sample material and (c) to plot sizing curves
5	Concentration of a given mineral sample using mineral jig
6	Concentration of a given mineral using Wilfley table
7	Concentration of a given mineral using froth flotation cell
8	Concentration of a given mineral using magnetic separator
9	Study of washability characteristic of a coal sample using float and sink test.
10	Study of flow sheets for various mineral concentration techniques.
11	Study of various pollution control measures adopted in the beneficiation plants.
12	Study of coal preparation flow sheets.

Attested

TOTAL: 30 PERIODS

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COURSE OUTCOMES:

The student will be able

1. To reduce the size of feed into the required product sizes.
2. To carry out the screening to classify the products according to its size.
3. To understand the various concentration techniques used in the processing
4. To enrich the product by improving the recovery
5. To understand the performance of various sampling practiced in the processing plants.

REFERENCES:

1. Wills, B.A, Mineral Processing Technology, Pergamon Press, Oxford,2006.
2. Jain, S.K, Ore Dressing, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi,1986.
3. Gaudin, A.M, Principles of Mineral Dressing, Tata McGraw - Hill Publishing Co. Ltd., New Delhi,2003.

MI5612	ROCK BLASTING LABORATORY	L T P C 0 0 2 1

COURSE OBJECTIVES:

1. To study the various properties of explosives for designing the blasts according to the field conditions.
2. To monitor the ground vibration induced due to blasting & operation of HEMM.

LIST OF EXPERIMENTS:

1. Measurement of ground vibration produced due to blasting by seismograph
2. Measurement of body vibration of HEMM used in the mines
3. Development of predictor equation from the recorded data
4. Measurement of VOD by VOD mate and its analysis
5. Study of various fragmentation assessment techniques
6. Handling of WIPFRAG software
7. Design of blast for coal face
8. Design of blast for underground metal mine
9. Design of blast for bench blasting
10. Study of various blasting accessories
11. Study of High Speed Video Camera used for blasting.
12. Study of magazine constructed for storage of explosives and accessories

TOTAL: 30 PERIODS

COURSE OUTCOMES:

The student will be able

1. To understand the characteristics and applications of various explosives and accessories used in the mines.
2. To design the blasts in surface and underground mines
3. To monitor the environmental impacts produced due to blasting such as flyrock.
4. To monitor, measure and predict the blast-induced ground vibrations created in surface and underground mines.
5. To assess the fragmentation of blasted muck by using various tools and techniques

REFERENCES:

1. Bhandari, Sushil, Engineering Rock Blasting Operations, A. A. Balkema, Rotterdam, 1997.
2. Pradhan, G.K., and Sandhu, G.S., Manual of Rock Blasting, IME Publications, 1996.
3. Jimeno, C.L., Jimeno, E.L, Carcedo, E.J. Drilling and Blasting of Rocks, A. A. Balkema, Rotterdam, 1995.

MI5613 **SURVEY CAMP** **L T P C**
0 0 0 1

COURSE OBJECTIVE:

To learn survey practice adopted in underground mines in confined and restricted environment.

The course of mine surveying is sharply demarcated into general principles and surveying practices in mines. The subject of Surveying is applied in nature and is best learnt in an operating mine. This is done during the mine survey camp organized in an open pit or underground coal/metal mine or suitable place as part of the curriculum.

The students have to undergo the survey camp during the winter holidays at the end of the V semester or during the VI semester depending on the permission granted by the respective mining companies **for a period of 10 days** and submit a report which will be evaluated during the ensuing VI semester. This carries one credit in during VI semester. Evaluation would be done by one or more faculty of different aspects surveying in mines.

Normally a student is not permitted to withdraw from the survey camp. In case of any unforeseen circumstances / valid reasons if he / she could not undergo the survey camp as scheduled, on the recommendation of the Head of the Department and approval by the competent authority the student may be permitted to undergo survey camp along with subsequent batch(es) of students when organized. The decision of the competent authority is final in this regard.

COURSE OUTCOME:

The students will be able to understand the difficulties of carrying out survey practice in the field.

MI5701 **MINE LEGISLATION AND SAFETY** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To study various acts, rules and regulations relating to the mineral industry
2. To study accidents, diseases & their prevention and mine safety

UNIT I INTRODUCTION TO MINING LAWS AND LEGISLATION **6**

General principles of mining laws, development of mining legislation of India. Overview of enactment of various statutes and Bye-laws, State laws pertaining to Minor Minerals.

UNIT II ACTS, RULES APPLICABLE TO MINING - I (SAFETY) 9

Mines Act, 1952 and Regulations framed under Mines Act (The Coal Mines Regulations, 1957, The Metalliferous Mines Regulations, 1961, The Oil Mines Regulations, 1984, The Mines Rules, 1955, The Coal Mines Pithead Bath Rules, 1959, Coal Mines Special Provisions Act 2015, The Mine Crèche Rules, 1966, The Mines Vocational Training Rules, 1966, The Mines Rescue Rules, 1985, Bylaws, DGMS Circulars, standing orders (Except the ones which are collected in course Drilling & Blasting, Surface Mining, Mining Machinery I & II, Mine Environmental Engineering, Underground Mining methods (Coal & Metal)

UNIT III ACTS, RULES APPLICABLE TO MINING - II 15

General provisions of Mines and Minerals Regulation and Development Act, Coal mines (conservation and development) Act & Rules, Mineral Concession (Other than Hydrocarbon Energy Minerals) Rules, MCDR 2017, Mineral Auction Rules 2016, Mineral's (Evidence of Mineral Content) Rules 2015, Environmental Protection Act, EIA Notification 2006, Explosives Act & Rules, The Indian electricity Act 1910 & Rules, Factories Act, Workman's compensation act., Payment of Wages Act, Gratuity and P.F. Rules,

UNIT IV ACCIDENTS AND DISEASES 10

Classification of accidents, causes and prevention of accidents, accident enquiry reports, cost of accidents, occupational diseases and their social effects.

UNIT V MINE SAFETY 5

Role of management, labour and government, Safety audit, instrumentation, Safety management system – risk identification and management; organisation for disaster management in mines, safety conferences, Pit safety committee.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

The students will able

1. To provide an insight to various laws, rules and Acts related to Mines Safety and mining legislation applicable to the mineral industry.
2. To learn the procedures to obtain necessary permission from the regulatory agencies for opening, operation and closure of mines in respect of mine safety.
3. To analyze the accidents and prepare the accident enquiry reports
4. To understand the significance of mine diseases affecting the health of persons working in the mine.
5. To carry out the risk assessment, safety audit process and prepare the safety management plan for the mines.
6. To get prepared for the DGMS certification for qualifying in the exam of Mines Manager.

REFERENCES

1. MinesAct 1952, Lovely Prakashan, Dhanbad, 1995.
2. Coal Mines Regulations, 1961, Lovely Prakashan, Dhanbad, 1995.
3. Metal Mines Regulations, 1961, Lovely Prakashan, Dhanbad, 1995.
4. DGMS Circulars, By National Council of Safety in Mines, Dhanbad, 1995.
5. Mines rules, 1955, Lovely Prakashan, Dhanbad, 1995.
6. The Mines Rescue Rules, 1986, Lovely Prakashan, Dhanbad, 1995.
7. The Indian Electricity Rules, 1995, Lovely Prakashan, Dhanbad, 1995.
8. The Payment of WagesAct, 1936, Ram NarainLalBeni Prasad, 1995.
9. VocationalTraining Rules, Lovely Prakashan, Dhanbad, 1995.
10. TheWorkmen'scompensationAct,1923,Ram Narainlal Beni Prasad, Allahabad, 1995.
11. Kejriwal, B.K., Safety in Mines, Gyan Khan Prakashan, Dhanbad, 1994

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MI5702	MINE PLANNING AND DESIGN	L T P C
		3 0 0 3

COURSE OBJECTIVES:

1. To understand the planning of opencast mining, underground mining and equipment utilization
2. To study project implementation and monitoring

UNIT I INTRODUCTION **7**

Technical factors in mine planning, methodology of mine planning, short range & long range, Optimization Techniques in Mine Planning; mine plan preparation; Choice between surface and underground mining.

UNIT II OPENCAST MINING **12**

Development of Ultimate Pit Configuration (open pit limits) and its determination – hand method, floating cone technique, Lerchs-Grossmann algorithm and computer assisted hand method; Selection of initial mine cuts and geometrical considerations; location of surface structures, division of mining area into blocks, mine design, Impact of various parameters like depth, dip, stripping ratio, geology and strength of mineral and overburden on mine planning; Selection of Mining Systems; Determination of optimum mine size and sequencing by nested pits; Lanes algorithm for estimation of optimum mill grade and production planning; calendar plan, production scheduling, economic productivity indices. Quality Control-Ore Blending; Planning for mine closure.

UNIT III UNDERGROUND MINING **10**

Design of mine entries – shafts, inclines, design of stopes – size, level interval, etc, design of coal mining district, mine boundaries; design of shaft pillars and protective pillars, planning of production capacity , optimization of mine size – mine production capacity, layout of development drives / raises / winzes etc, length of faces, etc, planning of support systems, ventilation, lay out of drainage system; Production planning & Production scheduling, selection of depillaring / stoping method, manpower management economic/ productivity indices, Productivity and quality control; Techno-economic analysis, Planning for mine closure.

UNIT IV EQUIPMENT PLANNING **8**

Latest technological developments in increase in both types and capacities of equipment used in mining operations. Planning and selection of equipment, their capacities and population for different mining conditions. Maintenance planning and scheduling including spare management; Equipment information – performance monitoring and expert systems.

UNIT V PROJECT IMPLEMENTATION AND MONITORING **8**

Pre-project activities – feasibility report, environmental clearance, detailed project report, sources of funds, import of technology, selection of contracts and contract administration, time management, cost control material management system, project quality assurance, social responsibility, government orders and guidelines. Environmental impact assessment and preparation of environmental management plan.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

The students will be able

1. To gain knowledge on concept of mine planning process is required for the student for developing surface as well as underground metal mining project.
2. To understand different methods of extraction applicable to different types of mineral deposits.
3. To select proper types of equipment for improving the productivity in surface mining operations,

4. To optimize the production capacities in surface mining operations covering different types of mineral deposits.
5. To understand project implementation and monitoring methods adopted in the mineral industry.

TEXT BOOKS

1. Jayanth Bhattacharya, Principles of Mine Planning-Allied Publishers, Delhi 2003.
2. Hustrulid, W. and Kuchta, M., (eds)., Fundamentals of Open pit Mine Planning and Design, Elsevier, 1995.

REFERENCES

1. Ehrenburger, V and Fajkos, A., Mining Modelling, Elsevier, 1995.
2. Bawden, W.F., and Archibald., J.F., Innovative Mine Design for the 21st Century Elsevier, 1993.
3. Christoper J. Bise, Mining Engineering Analysis, 2nd Edition, Society for Mining, Metallurgy, and Exploration, 313p, 2003.
4. Pazdziora, J., Design of Underground Hard Coal Mines, Elsevier, 1988.
5. Swilski, and Richards, Underground Hard Coal Mines, Elsevier, 1986.
6. Singh, B. and Pal Roy, P., Blasting in Underground excavations and mines, CMRS Dhanbad, 1993.
7. Peng, S.S. and Chaing, H.S., Longwall Mining, John Wiley & Sons, New York, 1984.
8. Rzhevsky, V.V., Opencast Mining – Technology and Integrated Mechanisation, MIR Publishers, Moscow, 1987.
   Rzhevsky, V.V., Opencast Mining – Unit Operations, MIR Publishers, Moscow, 1987.

MI5703 MINE ENVIRONMENTAL ENGINEERING

L	T	P	C
2	0	2	3

COURSE OBJECTIVES:

1. To study about spontaneous heating, mine fires, inundation and explosions
2. To study about mine rescue and first aid

UNIT I SPONTANEOUS HEATING AND MINE FIRES 12

Causes, detection, incubation period, precautions against spontaneous heating in underground and surface coal mines including coal benches, surface coal stocks, and dumps. Detection, prevention and control of underground fires, fire fighting, study of atmosphere behind sealed- off fire areas for reopening, methods of reopening sealed off fire areas.

UNIT II EXPLOSIONS 8

Causes, prevention and control of underground fire-damp and coal dust explosions including stone dusting, stone dust barriers, water barriers and triggered barriers, investigation after an explosion.

UNIT III INUNDATION 9

Surface and underground inundation, their causes and preventive measures, precautions to be taken while approaching old waterlogged workings, safety boring apparatus, design and construction of water dams and barriers, recovery of flooded mines, dewatering of old workings, layout of drainage systems and sumps.

UNIT IV MINE RESCUE AND FIRST AID SAFETY 9

Classification of rescue apparatus including self rescuer, various types of rescue and escape apparatus, rescue organisation of a mining company, layout of a modern rescue station including personnel, first aid to the persons injured in mine-accidents, electric shock, asphyxiation, different methods of artificial respiration, rescue and recovery work in mines including through boreholes, rescue rules; Miner's diseases and their social impact.

UNIT V MINE ILLUMINATION 7

Electric safety lamps, their maintenance and examination, lamp room design and organisation, lighting from mains, lighting on mechanised longwall faces and gassy mines, photometry and illumination survey, legislations related to illumination survey.

Note: All the above are to be studied with emphasis on CMR and the relevant DGMS circulars

COURSE OUTCOMES:

1. The students will have knowledge on spontaneous heating, mine fires, etc.
2. The students will learn about explosions, their causes prevention and control measures.
3. The students will get knowledge about mine inundation, their causes and preventive measures.
4. They will also know about mine rescue and first aid.
5. Obtain adequate knowledge about mine illuminaton.

TEXT BOOKS:

1. Ramlu, M.A., Mines Fires, Explosion, Rescue, Recovery and Inundations, Mukhertu Publishers, Kharagpur, 1989.
2. Ramlu, M.A., Mine Disasters and Mine Rescue, Oxford and IBH Publishers, 1991.

REFERENCES:

1. Misra, G.B., Mine Environment and Ventilation, Oxford University Press, 1993.
2. The Mine Rescue Rules, 1986, Lovely Prakashan, Dhanbad, 1992.
3. Cummings A.B., and Given, I.V., SME Mining Engg. Hand Book Vol. I and II, New York, 1994.
4. Sarkar, S.K. and Sarkar, S., State of Environment and Development in Indian Coalfields, Oxford and IBH, 1996.
5. Classified Circulars by D.G.M.S., Dhanbad.
6. Ghatak, S., Mine Management, Legislation & General Safety.
7. Kaku, L.C. Fires in Coal Mines.
8. McPherson, M.J., Subsurface Ventilation and Environmental Engineering, Chapman & Hall Publication, London, 1993.

PRACTICAL:

1. Determination of air born dust by gravimetric dust sampler, personal dust sampler and by high volume sampler.
2. Noise survey.
3. Determination of crossing point temperature and index of inflammability.
4. Study of self rescuers of different types.
5. Study of self contained breathing apparatus
6. Proximate analysis of coal
7. Measurement of vibrations due to various sources.
8. Determination of pH, TDS, TSS, dissolved oxygen and chemical oxygen demand of water.
9. Determination of organic carbon of soil sample
10. Illumination survey.

15 PERIODS

TOTAL (45 + 15): 60 PERIODS.

MI5711	COMPUTER AIDED MINE PLANNING AND DESIGN (CAMPAD) LABORATORY	L T P C 0 0 2 1

COURSE OBJECTIVES:

1. To study the computer programming for mining problems, mine ventilation network analysis.
2. To study the software used for modelling of surface and underground workings.

LIST OF EXPERIMENTS:

1. Design of pillars
2. Blast design
3. Subsidence prediction.
4. Mine ventilation network analysis.
5. Modelling of airflow through underground workings using CFD.
6. Ore body modelling.
7. Slope stability analysis in soil and rocks.
8. Fragmentation Analysis
9. Truck dispatch system optimization
10. Digital Terrain and Wire-frame modelling
11. Surface Mine Design using MPD Software
12. Underground Mine Design using MPD Software
13. Pit optimization using MPD Software
14. Production Scheduling for grade control
15. Design of experiments.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

The students will gain knowledge on

1. Designing of the pillars in underground mines
2. Designing of surface mine (both coal and metal)
3. Designing of underground mine (both coal and metal)
4. Modelling the ore body to carry out effective planning in the mines.
5. Scheduling the different unit operations to achieve maximum productivity.

MI5712	PRACTICAL TRAINING – III	L T P C 0 0 0 1

COURSE OBJECTIVES:

1. To learn various unit operations carried out in the underground mine.
2. To expose the basic operations of various equipments deployed in the underground mine.
3. To impart practical experience to the student for gaining deeper understanding of the various activities and principles of underground mining.

Gaining practical experience is an important aspect of the mining engineering programme having many characteristic features of its own. The students have to undergo training in underground coal or metal mines/allied industry/research institute during the summer vacation **at the end of the VI Semester for a period of 2 to 3 weeks** and obtain a valid certificate from the competent authority of the organization provide training. The students have to submit a report on the training which would be evaluated during the ensuing VII Semester. This carries a total of one credit during the VII Semester. Evaluation would be done by a faculty or a group of faculties on different marking heads such as training, viva voce report etc., or other approved evaluation systems.

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Normally a student is not permitted to withdraw from the practical training. In case of any unforeseen circumstances / valid reasons if he could not undergo the training as scheduled, on the recommendation of the Head of the Department and approval by the competent authority the student may be permitted to undergo Practical Training-III subsequently without affecting the academic schedule. The decision of the competent authority is final.

COURSE OUTCOMES:

The students will be able to

1. Understand the geology of the deposit suitable for underground mining.
2. Understand the site selection and method for assessing the deposit (shaft/incline/adit).
3. Acquire adequate knowledge on mine development, ground control and other significant parameters associated with mine construction in an underground mine.
4. Comprehend the knowledge on working of various equipments deployed for different unit operations in the underground mines along with its safety aspects.
5. Understand the methods of stockpiling and transportation techniques, mine dewatering, mineral handling/processing facilities pertaining to the underground mine.

		L T P C
MI5713	**PROJECT I**	**0 0 6 3**

COURSE OBJECTIVE:

To carry out a study or to solve a practical problem of the mining industry

A project topic must be selected either from published lists or the students themselves may propose suitable topics in consultation with their guides. The aim of the mini project work is to comprehend the principles by applying them to a new problem which may be a design and manufacture of a device, a research investigation, a computer or management project or a design problem.

The progress of the mini project is evaluated based on minimum of three reviews. The review committee may be constituted by the Head of the Department to monitor the progress of the project.

A mini project report is required to be submitted at the end of the semester. The mini project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

COURSE OUTCOME:

1. The students will be able to carry out a project and write a report related to mining or allied field of engineering.

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MI5811	PROJECT II	L T P C 0 0 16 8

COURSE OBJECTIVE:

To carry out a study or to solve a practical problem of the mining industry

A project topic must be selected either from published lists or the students themselves may propose suitable topics in consultation with their guides. The aim of the mini project work is to comprehend the principles by applying them to a new problem which may be a design and manufacture of a device, a research investigation, a computer or management project or a design problem.
The progress of the project is evaluated based on minimum of three reviews. The review committee may be constituted by the Head of the Department to monitor the progress of the project.
A project report is required to be submitted at the end of the semester. The project work is evaluated jointly by team of external and internal examiners constituted by the Head of the Department with approval of Chairman based on oral presentation and the project report.

COURSE OUTCOME:

1. The students will be able to carry out a project and write a report related to mining or allied field of engineering.

MI5001	APPLIED ROCK ENGINEERING (RMGC-II)	L T P C 3 0 0 3

COURSE OBJECTIVES:

1. Introducing the various instrumentation and measurement methods.
2. To study the theories of failure and approaches used for open pit and underground designs.
3. To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars related to this course.

UNIT I ROCK MECHANICS INSTRUMENTATION 6

Convergence indicators, load cells, strain gauges, flat jacks, LVDT, dial gauges, pressure cells and recorder, anchorage testing equipment, laboratory and in situ measurements, hydraulic fracturing rock mechanics instrumentation for B & P and longwall workings

UNIT II PIT SLOPE STABILITY& SUBSIDENCE 10

Approach to slope stability, slope parameters, different types of slope failures, factors affecting slope stability, introduction to methods of failure, analysis, determination of factor of safety,. Introduction to different rock slope stabilsation techniques.
Theories of subsidence, factors affecting subsidence, subsidence surveys, subsidence prediction techniques, subsidence control – surface and underground measures, pseudo- mining damage.

UNIT III THEORIES OF FAILURE OF ROCKS & PILLAR DESIGN AND ROCK BURS 12

Different theories of failure of rocks, modes of failure - Griffith, Coulumb-Navier, Mohr's, Hoek-Brown, empirical criteria, etc. and their field of applications.
Strength of pillars, barrier and shaft pillar design – load estimation, factor of safety, various formulae, rock burst and bumps — phenomena, causes, prediction, monitoring and control, gas outbursts

UNIT IV DESIGN OFUNDERGROUND WORKINGS 9

Stress distribution in underground workings including bord and pillar and longwall workings, rock load assessment, introduction to numerical methods of geomechanics; scaled model studies – principles of modeling.

UNIT V STOWING/FILLING 8

Selection and preparation of stowing materials, principal methods of stowing, collection, fields of application and limitations, preparation and transport of materials, surface, underground and face arrangements, design of stowing plants.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

1. The students will have knowledge on rock mechanics instrumentation.
2. The students will learn about pit slope stability, theories of subsidence.
3. The students will understand the theories of failure of rocks, rock burst and pillar design.
4. They will also know about design of underground openings and numerical methods of Geo mechanics.
5. The students will learn about methods of stowing.

TEXT BOOKS:

1. Obert,L.and Duvall,W.I.,Rock Mechanics and Design of Structure in Rock John Wiley and Sons Inc., New York, 1967.
2. Vutukuri, V.S. and Lama, R.D., Handbook on Mechanical Properties of Rocks, Vol.I, II, III and IV, Transtech Publication Berlin,1974/78.

REFERENCES:

1. Brady, B.H.G. and Brown, S.T., Rock Mechanics, Wiley Interscience,1985.
2. Hoek, E and Brown, E.T., Underground Excavations in Rocks, Institute of Mining Metallurgy, London,1980.
3. Peng, S.S. Ground Control, Wiley Interscience, New York,1987.
4. Jumkis, A.R. Rock Mechanics, Transtech Publications, Berlin, 1983.
5. Stacey,T.R.andPage,C.H.,PracticalHandbookforUndergroundRockMechanicsTranstech Publications, Berlin, 1986.
6. Whittaker, B.N. and Reddish, D.J., Subsidence – Occurrence, Prediction and Control – Elsevier Science Publishers, the Netherlands,1989

MI5002 SUBSIDENCE ENGINEERING L T P C
3 0 0 3

COURSE OBJECTIVES:

1. To know the basic subsidence mechanics and its influencing parameters
2. To study the control measures of subsidence and its impact on structure

UNIT I INTRODUCTION 9

Strata movement at the mining horizon, convergence in mine working, factors influencing convergence in mine workings.

UNIT II SUBSIDENCE MECHANISM 9

Zones of movement in the overlying beds, vertical and horizontal movement, subsidence trough, angle of draw, angle of break, sub-surface subsidence.

UNIT III SUBSIDENCE PREDICTION 9

Different methods of surface subsidence prediction – graphical, analytical, profile function, empirical and theoretical models.

UNIT IV TIME INFLUENCE AND IMPACTON STRUCTURES 9

Influence of time on subsidence, example from longwall and bord and pillar workings. Calculation of ground movement over time.Types of stress on structures, stress-strain behaviour of soils, mining damage to buildings, industrial installations, railway lines, pipes, canals, etc.

UNIT V SUBSIDENCE CONTROL, GOVERNING LAWSANDSTANDARDS 9

Measures to reduce mining damage, mining methods to minimise damage, laws governing mining damage, different standards suggested for mining and building ground in respect of subsidence.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

1. The students will understand the basic concepts of strata movement, convergence, etc.
2. The students will have knowledge about the subsidence mechanism.
3. The students will learn about subsidence prediction and influencing parameters.
4. The students will obtain a knowledge about influence of time and subsidence impacts on structures.
5. They will know about subsidence control, governing norms and regulations.

TEXT BOOKS:

1 Kratzsch, H., Mining Subsidence Engineering, Springer Verlag Publications, Berlin,1983
2 Singh, B. (Ed)., Mine Subsidence, Parijat Mudranalaya Publications, Dhanbad,1982.

REFERENCES

1. Whittaker, B.N., and Reddish, D.J. Subsidence, Occurrence, Prediction and Control, Elsvier Publications, Amsterdam, 1989.
2. Brauner, G., Subsidence Due to Underground Mining, Part I, II and III, U.S. Department of Interior, Bureau of Mines,1973.
3. Peng, S., Surface Subsidence Engineering, SME, New York, 1992.

MI5003 ROCK REINFORCEMENT ENGINEERING L T P C
3 0 0 3

COURSE OBJECTIVES:

1. To introduce the rockmass classification and mechanism of rock reinforcement
2. To learn the typical and special methods of rock reinforcement

UNIT I ROCKMASS CLASSIFICATION 12

Basic concepts of rockmass classification; Rock Quality Designation (RQD); Norwegian Geomechanics Classification i.e. Q-system; Rock Mass Rating (RMR); CMRI system; Application of rockmass classification in assessing the support requirement for underground caverns.

UNIT II GROUTING, GUNITING AND SHOTCRETING 6

Mechanisms of rock reinforcement by grouting; selection of optimum pressure and water-cement ratio for grouting; layout for grouting, working principle and field of application for grouting; Guniting and shotcreting operations and their field of application; fibre reinforced shotcreting.

UNIT III ROCK BOLTS 10

Elements of rock bolts; types of rock bolts and their fields of application; rock bolting machines and installation of rock bolts; pre-tensioning of rock bolts; principles of rock bolting; anchorage test and factors affecting anchorage strength of bolts; modes of failure; Design of rock bolting system for underground excavation i.e. determination of bolt length and bolt pattern.

UNIT IV CABLE BOLTS ANDROCKANCHORS 8

Classification of cable bolts; installation and testing; modes of failure; different type of grouting materials; types of anchors; use of anchors for stabilising rock slope, dam etc. ; testing of anchors.

UNIT V SPECIAL METHODS OFROCKREINFORCEMENT 9

Ground freezing for slope stabilisation; berms for slope stabilisation; fore-poling; resin grouted rock bolts of fibre glass; geo-textiles and it's area of application; water drainage and rock reinforcement; dump stabilisation by vegetation.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

1. The students will have the concept about the rockmass classification.
2. The students will learn about mechanism of rock reinforcement, grouting, etc.
3. The students will get a basic knowledge on rock bolts and their applications.
4. The students will learn about cable bolts and rock anchors.
5. The students will know about special methods of rock reinforcement.

TEXT BOOKS:

1. Schach, R., Garshael, K. and Heltzen, A. M., Rock Bolting – A Practical Handbook, Pergamon Press,1979.
2 Peng, S.S. Ground Control, Wiley Interscience, New York,1987

REFERENCES:

1. Brady, B.H.G. and Brown, S.T., Rock Mechanics, Wiley Interscience,1985.
2. Hoek, E and Brown, E.T., Underground Excavations in Rocks, Institute of Mining Metallurgy, London, 1980.

GE5451 TOTAL QUALITY MANAGEMENT L T P C

3 0 0 3

COURSE OBJECTIVES:

- Teach the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- Explain the TQM Principles for application.
- Define the basics of Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.
- Describe Taguchi's Quality Loss Function, Performance Measures and apply Techniques like QFD, TPM, COQ and BPR.
- Illustrate and apply QMS and EMS in any organization.

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality –Definition of TQM-- Basic concepts of TQM –-Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM –Benefits of TQM.

UNIT II TQM PRINCIPLES 9

Leadership - Deming Philosophy, Quality Council, Quality statements and Strategic planning-Customer Satisfaction –Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention – Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition & Reward and Performance Appraisal--Continuous process improvement –Juran Trilogy, PDSA cycle, 5S and Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating and Relationship development.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality - New management tools - Six-sigma Process Capability-Bench marking - Reasons to benchmark, Benchmarking process, What to Bench Mark, Understanding Current Performance, Planning, Studying Others, Learning from the data, Using the findings, Pitfalls and Criticisms of Benchmarking - FMEA - Intent , Documentation, Stages: Design FMEA and Process FMEA.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) - Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures- Cost of Quality - BPR.

UNIT V QUALITY MANAGEMENT SYSTEM 9

Introduction-Benefits of ISO Registration-ISO 9000 Series of Standards-Sector-Specific Standards - AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements-Implementation-Documentation-Internal Audits-Registration-ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001-Benefits of EMS.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: Ability to apply TQM concepts in a selected enterprise.
CO2: Ability to apply TQM principles in a selected enterprise.
CO3: Ability to understand Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.
CO4: Ability to understand Taguchi's Quality Loss Function, Performance Measures and apply QFD, TPM, COQ and BPR.
CO5: Ability to apply QMS and EMS in any organization.

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

TEXT BOOK:

1. Dale H.Besterfiled, Carol B.Michna,Glen H. Bester field,MaryB.Sacre,HemantUrdhwareshe and RashmiUrdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression,2013.

REFERENCES:

1. Joel.E. Ross, “Total Quality Management – Text and Cases”,Routledge.,2017.
2. Kiran.D.R, “Total Quality Management: Key concepts and case studies, Butterworth – Heinemann Ltd, 2016.
3. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, Third Edition, 2003.
4. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd., 2006 .

MI5004 **COMPUTER APPLICATIONS IN MINING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To impart knowledge on hardware and software issues concerned with computers in mining industry.
2. To develop algorithms and programs on various mining related problems
3. To impart knowledge on high-end simulation methodologies
4. To study modern techniques on solving mining problems.

UNIT I INTRODUTION TOCOMPUTERS 9

Configuration of computers and servers, evolution of operating systems; Networking Concepts, MIS Concepts – Cloud computing / grid computing in mining, Big Data analytics.

UNIT II PROGRAMMING & DBMS CONCEPTS 9

Algorithm, flow charts and Programming of mining application like pillar design, blast design, subsidence, - Database and Relational database - development of software packages for mining companies – forms, queries and reports, Enterprise resource planning for material managements

UNIT III COMPUTERISED MINE PLANNING 9

Introduction of Geostatistics, Reserve Estimation, kriging, block modeling and orebody modelling, Optimization and mine design, mine scheduling.

UNIT IV PROBLEM SOLVING – APPLICATIONS IN MINING 10

Ventilation network analysis; support design, Applications of CAD in mining, GIS in Mining, online and offline monitoring and control, TDS, FEM and CFD Concepts and basics of modeling and simulation.

UNITV RECENT TRENDS & MINING SOFTWARE 8

Artificial intelligence, expert system, neural networks, robotics and their applications in mining Functionalities of mine planning software, fragmentation software, and numerical software applicable to mining. Case studies of mining applications

TOTAL: 45 PERIODS

COURSE OUTCOMES:

1. The students will have basic programming knowledge and its applications on various mining related problems.
2. The students will have familiarity with hardware and software issues during development of programs.
3. The students will understand about geostatics, kriging, orebody modelling, mine optimization, etc
4. The students will have a perspective on high-end simulation methodologies and modern techniques to solve mining problems.
5. The students will learn about recent numerical software applicable to mining industries.

TEXT BOOKS:

1. KadriDagdelen, Editor, Computer Applications in the Minerals Industries, Colorado School of Mines,1999.
2. Ramani R.V., et al. Computers in Mineral Industry, Oxford and IBH Publishers,1994.

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REFERENCES:

1. R.V.Ramani – Editor, APCOM Proceedings Application of Computers and Operations Research in the Mineral Industry, The Society of Mining, Metallurgy and Exploration,Inc.,1996
2. Fytas, K. and Singhal, R.K. Computers Applications in Mineral Industry, A.A.Balkema Publication, 1988.
3. E Balagurusamy , Fundamentals of Computers , McGraw Hills Publication,2004
4. Basandra S K, Computers Today Fourth Edition, Galgotia Publications Pvt. Ltd,2004

MI5005 NUMERICAL METHODS IN MINING ENGINEERING

L	T	P	C
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COURSE OBJECTIVES:

1. To study the finite element methods, finite difference methods and boundary element methods
2. To understand the practical applications of numerical methods in mining field

UNIT I INTRODUCTION TO ELASTIC ANDPLASTIC MODELS 9

Fundamentals, elastic, plastic, homogeneous and isotropic, non-linear elastic and elasto-plastic models.

UNIT II FINITE DIFFERENCE METHODS 9

Concept, formation of mesh element, finite difference patterns, solutions, application to mining.

UNIT III FINITE ELEMENTMETHODS 9

Concept, discretisation, element configuration, element stiffness, assemblage and solutions, two and three dimensional solutions, linear and non-linear analysis, applications in geomechanics; simulation of joints in strata.

UNIT IV BOUNDARY ELEMENT METHOD 9

Concept, discretisation, different methods of solution for isotropic and infinite media.

UNIT V PRACTICAL APPLICATIONS IN MINING ANDROCK MECHANICS 9

Practical Applications in stress analysis, slope stability, subsidence prediction, pillar design, rock burst, etc.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

1. The students will have the fundamentals of elastic and plastic models.
2. The students will understand finite difference methods, mesh elements, patterns, etc.
3. The students will get the concept about finite element models, methods, dimensional solutions, etc.
4. The students will learn about boundary elements methods.
5. They will also know about the practical applications of these methods in mining and rock mechanics

TEXT BOOKS:

1 Desai, C.S. and Abel, J.F., Introduction to the finite Element Method, Van Nostrand Riehokl Co., New York,1983.

2 Zienkiewicz,O.C.,The Finite ElementMethodinEngineeringScience,TataMcGrawHill1972.

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REFERENCES
1 Segerlind, L.J., Applied Finite Element Analysis, John Wiley and Sons, New York,1987.
2. Mukhopadyay, M., Matrix Finite Element – Computer and Structural Analysis, Oxford and IBH Publishing co., 1984
3 Brown, E.T., (Ed) Analytical and Computational Methods in Engineering and Rock Mechanics, Allen and Unwin, London,1987.

MI5006 ENGINEERING MATERIALS, FUELS AND ASSAYING L T P C
3 0 0 3

UNIT I ENGINEERING MATERIALS 9

Cement – properties, grouting, guniting, bricks, tiles, fiber glass, rubber and timber.

UNIT II ENGINEERING PROPERTIES AND USES 10

Engineering properties and use of wrought iron, steel alloys, aluminium, copper, lead, zinc, tin and non-ferrous alloys; phase equilibrium diagram of binary alloys, iron carbon diagram; microstructure of metals and alloys, methods of corrosion control.

UNIT III CLASSIFICATION OF FUELS 10

Source of energy, resources, classification and types, solid fuels, wood, peat, lignite, bituminous coal and anthracite; proximate and ultimate analysis of coal, coking properties, coal storage and transportation, low and high temperature carbonisation

.

UNIT IV LIQUID AND GASEOUS FUELS 8

Liquid fuels, petroleum and its products, by-product recovery, gaseous fuel, natural gas, producer gas and water gas.

UNIT V ASSAYING 8

Sampling of ores, metallurgical products, fire methods of assaying of iron, aluminium, copper, lead, zinc, tin, manganese, chromium ores.

TOTAL: 45 PERIODS

REFERENCES

1. Himus, G.W., Fuel testing, Leon and Hill Limited, London.
2. Shaw, A.K., Combustion Engineering and Fuel technology, Oxford and IBH Publishing Company, New Delhi
3. Burton, M.S., Applied Metallurgy for Engineering, McGraw Hill Book Company, London, 1956
4. Histler, M.S., Wood Energy, Ann-Arbor Science, Michigan, 1978
5. Guy, A.G., Element of Physical Metallurgy, Oxford and IBH Publishing Company, New Delhi.
6. Peng, S.S., and Chiang, H.S., Longwall Mining, John Wiley and Sons, New York, 1984
7. Cummings, A.B., and Given, I.V., SME Mining Engg. Handbook, Vol.I and II, SME – AIME Inc, New York, 1973

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MI5007 **SYSTEM ENGINEERING IN MINING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To know basic of system engineering concept and analysis
2. To study the various techniques of operations research, simulation and network analysis

UNIT I INTRODUCTION 9

Introduction to systems engineering, systems concept and analysis, models in systems analysis, tools and methodology of system analysis.

UNIT II OPERATIONS RESEARCH 9

Introduction to operations research, introduction to linear programming, application to mineral industry.

UNIT III SIMULATION TECHNIQUES 9

Introduction to Monto-carlo sampling and deterministic simulation of different mining subsystems and total system, simulation application for equipment selection and production scheduling. Transportation and assignment model, Queuing theory.

UNIT IV NETWORK ANALYSIS 9

Network analysis, monitoring and control of developmental activities in mining project by CPM and PERT.

UNIT V MISCELLANEOUS 9

Inventory of mineral resources, basic models and optimization, introduction to statistical decision theory and its application in mineral industry.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

1. The students will learn the concept of system engineering and applicability in mining field.
2. The students will learn the concept of operational research and applicability in mining field.
3. The students will learn about simulation techniques.
4. The students will have knowledge about CPM, PERT, etc.
5. They will also know about basic models, statistical theory, etc.

TEXT BOOKS:

1. Hartman, H. L. (Editor), SME Mining Engineering Handbook, 3rd edition, Vol I & II, Society of Mining Engineers, New York, 2011.
2. Zambo, J., and Kiado, A., Optimum Location of Mining facilities, Springer Verlag, Budapest, 1968.

REFERENCES

1. Syal, I.C., and Gupta, B.P., Computer Programming and Engineering Analysis, A.B., Wheeler and Company, Madras 1986.
2. Anon., Management by Network Analysis, The Institution of Engineers (India), 1976.
   Rao, S.S., Finite Element Methods in Engineering, Pergamon Press, 1982.

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MI5008 SMALL SCALE MINING AND MARINE MINING L T P C
3 0 0 3

COURSE OBJECTIVES:

1. To introduce the small scale mining methods with case studies
2. To introduce the marine geology and its exploitation techniques

UNIT I INTRODUCTION TO SMALL SCALE MINING 9

Concept of small scale mining, small scale mines – world wide, Indian Policy in small scale mines – practices, policies and perspectives, problems of small scale mines – finance, legislative support, technical expertise, environmental obligations, safety, health and training, environmental impacts and protection.

UNIT II SMALL SCALE MINING METHODS 9

Classification and mode of occurrence of granite and other minor minerals, physical, mechanical and chemical properties, geological aspects of mining, granite and dimensional stone mining – manual, semi-mechanised and mechanised mining methods, conventional & novel techniques, recent trends, processing, finishing, quality control, marketing & export of minerals. Case studies of mining of other minerals like sandstone, marble, beach sands, alluvial mining, mica, barytes, diamond and gemstones, etc.

UNIT III INTRODUCTION TO MARINE MINING 9

Introduction to marine environment, development & status of ocean resources of mining in India and other parts of the world, Ocean profile, ocean floor topography, economic exclusive zone & fundamentals of law of the sea, oastal zone & its characteristics.

UNIT IV MARINE GEOLOGY AND RESOURCES 9

Physical and chemical properties of seawater, overview of marine mineral deposits, beach placers, deep-sea bed mineral resources, polymetallic nodules, polymetallic sulphides, Cobalt rich crust, chemicals from the ocean, dissolved and undissolved mineral deposits, sea water as resource

UNIT V EXPLOITATION OF MARINE DEPOSTS 9

Shallow and deep sea bed, oceanographic instruments, mining of polymetallic nodules, polymetallic sulphides, 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.

TOTAL:45 PERIODS

COURSE OUTCOMES:

1. The students will have basic knowledge on small scale mining.
2. The students will have adequate knowledge on methods of small scale mining.
3. The students will have basic knowledge on marine mining.
4. The students will get knowledge about physical and chemical properties of sea water.
5. The students will understand about exploitation of marine deposits, machineries used, etc.

REFERENCES

1. Chatterjee, S.K., An Introduction to Mineral Resources, Wiley Eastern Ltd., 1983.
2. Ghose, A.K., (Ed). Small Scale Mining – A Global Overview, Oxford - IBH Publishers, 1991
3. Shepherd, F.P., Sub-marine Geology, Harper and Row, New York, 1963.
4. Graff, W.J., Introduction to Offshore Structures: Design, Fabrication and Installation, Gulf Publishing Company, London, 1961.
5. Herbich, J.B., Coastal and Deep Ocean Dredging, Gulf Publishing Co. Houston, 1975.
6. Murthy, T.K.S., Mining the Ocean, CSIR Golden Jubilee Series, CSIR Publications, New Delhi, 1995.
7. Rahul Sharma Deep-Sea Mining: Resource Potential, Technical and Environmental Considerations, Springer, 2017

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MI5009 ENERGY CONSERVATION AND MANAGEMENT L T P C
3 0 0 3

AIM :

To instruct the importance of energy conservation in both thermal and electrical energy and its management for the better utilization of resources.

COURSE OBJECTIVES :

At the end of the course, the student expected to do

1. Understand and analyze the plant energy data
2. Energy audit and suggest methodologies for energy savings
3. Energy accounting and balance and
4. Able to utilize the available resources in optimal way

UNIT I IMPORTANCE OF ENERGY CONSERVATION AND MANAGEMENT 8

World, national Energy consumption – environmental aspects – Energy prices, policies – Energy auditing : methodology, analysis, energy accounting – Measurements – Thermal and Electrical.

UNIT II ELECTRICAL SYSTEMS 12

AC / DC current systems, Demand control, power factor correction, load management, Motor drives : motor efficiency testing, energy efficient motors, motor speed control – Lighting : lighting levels, efficient options, daylighting, timers, Energy efficient windows – electrical distribution systems – Transformers – Power quality – harmonic distortion.

UNIT III THERMAL SYSTEMS 10

Boiler – efficiency testing, excess air control, Steam distribution & use – steam traps, condensate recovery, flash steam utilization, Thermal Insulation. Heat exchanger networking – concept of pinch, target settling, problem table approach.

UNIT IV ENERGY CONSERVATION 8

Energy conservation in Pumps, Fans (flow control) and blowers, Compressed Air Systems, Refrigeration and air conditioning systems – Waste heat recovery recuperators, heat sheets, heat pipes, heat pumps.

UNIT V ENERGY MANAGEMENT, ECONOMICS 7

Energy resource management – Energy Management information systems – Computerized energy management – Energy economics – discount rate, payback period, internal rate of Return, life cycle costing – Financing energy conservation Projects.

TOTAL: 45 PERIODS

COURSE OUTCOMES

1. The students will understand the importance of energy conservation and management.
2. The students will have knowledge about AC /DC current systems, distribution systems, etc.
3. The students will understand about thermal systems.
4. The students will learn about techniques of energy conservation.
5. They will also learn about computational energy management including life cycle costing.

TEXT BOOKS:

1. L.C. Witte, P.S. Schmidt, D.R. Brown, “Industrial Energy Management and Utilisation” Hemisphere Publ, Washington, 1988.
2. O. Callaghn, P.W. “Design and Management for Energy Conservation”, Pergamon Press, Oxford, 1981.

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REFERENCES

1. I.G.C. Dryden, “The Efficient Use of Energy” Butterworths, London, 1982
2. W.C. turner, “Energy Management Hand book” Wiley, New York, 1982.
3. W.R. Murphy and G. Mc KAY “Energy Management” Butterworths, London 1987

MI5010 DRILLING AND BLASTING ENGINEERING L T P C
3 0 0 3

COURSE OBJECTIVES:

1. To understand the principles and mechanism of different drilling methods, novel drilling techniques.
2. To learn the basic mechanism of rock fragmentation by blasting
3. To know the various types of explosives and accessories used in the blasting operation
4. To learn the different methods of blasting adopted in surface and underground coal / non-coal mines.
5. To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars being covered under this course.

UNIT I EXPLORATION AND PRODUCTION DRILLING 11

Exploratory drilling – drills, core recovery and Interpretation of borehole data; Production drilling; Operating variables; Various methods of drilling - percussive, rotary, rotary percussive; mechanics of different methods of drilling; Down-the-hole drilling & Top hammer drilling; Inclined Drilling; Factors affecting drilling & drillability studies - micro-bit drilling; selection of drilling equipment; different types of bit & selection of drill bits; bits wear; Introduction to novel and special drilling techniques.

UNIT II EXPLOSIVES, ACCESSORIES AND TOOLS 9

Various type of explosives and Blasting Agents - ANFO, slurry, emulsion, permitted explosives and their development; Bulk explosives; Selection of explosives; Initiation systems, Blasting accessories, Testing of explosives; Storage, transportation and handling of explosives; Destruction of explosives and accessories. Mechanics of rock fragmentation by explosive action.

UNIT III BLASTING IN UNDERGROUND MINES 7

Blasting techniques for coal and metal Underground mines – VCR, gallery blasting, solid blasting and its evaluation. Drilling pattern for tunneling and shaft sinking; controlled blasting techniques. Blasting in underground coal mining – Present status & future trends.

UNIT IV BLAST DESIGN IN SURFACE MINES 8

Methods of blasting in surface mines - Primary and secondary blasting, Blast design for surface mines; Alternatives to blasting; Rock fragmentation studies, Controlled blasting techniques.

UNIT V ADVERSE EFFECTS OF BLASTING AND INSTRUMENTATION 10

Dangers associated with blasting in opencast mines and underground mines – misfires, blown out shots, incomplete detonation; Environmental impacts due to blasting - fly rock, ground vibrations, air blast and air & water pollution and its controlling measures; Introduction to instrumentation in blasting –V.O.D probe, vibration monitoring, high speed video camera, etc; Introduction to blasting software; Introduction to blasting concepts related to road constructions, trench cutting, demolition of buildings, dimensional stone quarries, underwater blasting.

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COURSE OUTCOMES:

The students will able to

1. Understand the principles and basic mechanism of different drilling methods and novel drilling techniques.
2. Select the suitable explosives and accessories in mining and construction projects.
3. Design the blasting pattern for surface mines, dimensional stones, road constructions and underground mines.
4. Use modern tools for providing solutions for optimum fragmentation.
5. Understand the environmental effects due to blasting and to adopt the required controlling measures involving modern monitoring tools during the blasting as per the statutory provisions.

TEXT BOOKS:

1. Gokhale, B.V., Rotary Drilling and Blasting in Large Surface Mines, 2nd Edition, CRC Press, 2011.
2. Jimeno, C.L., Jimeno, E.L, Carcedo, E.J. Drilling and Blasting of Rocks, A.A.Balkema, Rotterdam, 1995.
3. Rao, K.U.M, and Misra, B., Principles of Rock Drilling, Oxford & IBH Publications, New Delhi, 1998.

REFERENCES:

1. Antipas Massawe, Drilling and Blasting Part I: Blasting Lectures and Tutorials, 1st Edition, LAP Lambert Academic Publishing, 2010.
2. Antipas Massawe, Drilling and Blasting Part II: Drilling Manual, 1st Edition, LAP Lambert Academic Publishing, 2010.
3. Bhandari,Sushil, Engineering Rock Blasting Operations, A.A.Balkema, Rotterdam, 1997.
4. Clark, G.B., Principles of Rock fragmentation, Wiley Interscience Publication, 1987.
5. Chugh, C.P., Diamond Drilling, Oxford & IBH Publications New Delhi, 1999.
6. Hustrulid, W.A. Blasting Principles of Open Pit Mining,Vol.1- General Design Concept, A.A. Balkema, Rotterdam, 1999.
7. Janusz Reś, Krzysztof Wladzielczyk and Ajoy K. Ghose., Environment-friendly Techniques of rock breaking, CRC Press, 2003.
8. Konya, C.J. and Walter, E.J. Surface Blast Design, New Jersey, 1990.
9. Langefors, U., and Kihlstrom, (1973), B., The Modern Techniques of Rock Blasting, URMO Publications.
10. Per-Anders Persson, Roger Holmberg, and Jaimin Lee. Rock Blasting and Explosives Engineering, CRC Press, 1994.
11. Pradhan, G.K., and Sandhu, G.S., Manual of Rock Blasting, IME Publications, 1996.

MI5011 **ROCK EXCAVATION ENGINEERING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To understand the rock mechanics, rock cutting technology.
2. To learn about the rock cutting tools and rock excavating machine.

UNIT I INTRODUCTION **9**

Concepts, 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 **9**

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 **9**

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 cuttability index of rocks.

UNIT IV ROCK CUTTINGTOOLS **9**

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 **9**

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

TOTAL: 45 PERIODS

COURSE OUTCOMES:

1. The students will have basic knowledge about factors affecting rock fragmentation, breakage and fracture.
2. The students will have knowledge about mechanism of rock excavation process, influences of rock properties in excavation, etc.
3. The students will learn about rock cutting technology and mechanics of rock cutting, etc.
4. The students will get adequate knowledge about rock cutting tool materials, different types, relative applications, etc.
5. They will also learn about the different types of excavating machines.

TEXT BOOKS:

1. Hartman,H.L.,IntroductoryMiningEngineering,JohnWileyandSons,NewYork,1987.
2. Clark, G.B., Principles of Rock Fragmentation, John Wiley and Sons, New York,1987

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MI5012	ADVANCED ROCK BLASTING TECHNOLOGY	L T P C 3 0 0 3

COURSE OBJECTIVES:

1. To familiar with the recent developments in various blasting technology used in surface and underground mines.
2. To learn the various theories of rock fragmentation by blasting and use the suitable modern tools for predicting fragmentation in the blasting operation.
3. To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars being covered under this course.

UNIT – I EXPLOSIVES AND ACCESSORIES 7

Emerging trends in explosives, initiating system and blasting techniques; Bulk Blasting agents & Mode of Bulk Delivery System; Performance testing of explosives and accessories; Scattering in Delay timing of delay detonator.

UNIT – II TRENDS IN SURFACE AND UNDERGROUND BLASTING TECHNIQUES 10

Theories of rock breakage - Mechanics of rock fragmentation due to blasting; Recent advances in blasting techniques in both underground and surface mines; Cast blasting for improved mine economics; Blast optimization in surface mines. Blasting in opencast coal mines of developed galleries. Economic evaluation of blasting operations. Tunnel blast designs, Tunnel breakthrough under water.

UNIT – III INSTRUMENTATION FOR BLAST PERFORMANCE MONITORING 9

Fragmentation prediction and assessment, Instrumentation and software application for design of blast round, Deep hole blasting and Hot hole blasting. Instrumentation in Blasting – V.O.D probe, Laser Profiler, Vibration monitoring, High speed video camera, Stemming plug etc.

UNIT – IV ENVIRONMENTAL CONTROL AND SAFETY IN BLASTING 9

Blasting damages – Micro and macro level damages due to blasting; Ground vibrations, flyrock and air over pressure. Influence of Blasting on surface structures and underground workings; Safety during blasting

UNIT – V EMERGING BLASTING TECHNIQUES 10

Special Blasting techniques – Road Construction, Dimension stone blasting, Underwater Blasting; Air-Decking & Baby-decking techniques; Novel Blasting Techniques in Surface and underground construction; Demolition blasting; Shaft sinking in Populated area (City), Underground storage construction. Intelligent blast design, blast economics, computer applications in blasting.

COURSE OUTCOMES:

The students will able to

1. Understand the recent developments in blasting techniques adopted in surface and underground mines.
2. The students will learn about theories of rock breakage, meachanics of rock fragmentation, etc.
3. Learn the usage of modern instrumentation and software for monitoring and analyzing the blast performance.
4. Control the environmental effects due to blasting and design the blast accordingly as per the statutory provisions.
5. Understand the basic concepts of novel blasting techniques adopted surface and underground construction projects.

Attested

TOTAL: 45 PERIODS

TEXT BOOKS

1. Agne Rustan, Claude Cunningham, William Fourney, Alex Spathis, K.R.Y. Simha, Mining and Rock Construction Technology Desk Reference: Rock Mechanics, Drilling & Blasting, CRC Press, 2010.
2. Johansen, John and Mathiesen, C.F., Modern Trends in Tunnelling and Blast Design, AA Balkema, 154p, 2000.
3. Pal Roy, Piyush, Rock Blasting: Effects and Operations, CRC Press, 380p, 3rd Edition, 2015.

REFERENCES

1. William A, Hustrulid, Blasting Principles for Open pit mining, 3rd Edition, A.A.Balkema, 2005.
2. Bhandari S., Engineering Rock Blasting Operations,AA Balkema Rotterdam, Netherlands, 1997.
3. Dowding, C.H., Blast Vibration Monitoring and Control, Prentice-Hall International London, 1985.
4. Dowding, C.H., Construction Vibrations, 2nd, Edition, ISEE Publications, 2000.
5. Ghose, A.K and Joshi, A (Ed), (2013), Blasting in Mining – New Trends, CRC Press, 2013.
6. Jha, Ajay Kumar, Impact of Surface Blasting on Underground Workings and Structures, LAP Lambert Academic Publishing, 2015.
7. Morhard, R.C., Explosives and rock blasting. 1987: Atlas Powder Company.
8. Per-Anders Persson,Roger Holmberg,Jaimin Lee, Rock blasting and explosives Engineering, CRC Press, 1993.
9. Richard A. Dick, Larry R. Fletcher, Dennis V. D'Andrea, Explosives and Blasting Procedures Manual, Schunnesson, Hakan and Johansson, Daniel (Ed), Rock fragmentation by blasting (FRAGBLAST 12), Lulea University of Technology, 2018.

MI5013 ENVIRONMENTAL MANAGEMENT FOR SUSTAINABLE MINING

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COURSE OBJECTIVES:

1. To study the various environmental pollution occurring in mineral industry.
2. To study various methods of managing environmental pollution.
3. To study various statute related to environment.

UNIT I ENVIRONMENT & ECOLOGY **9**

Concept of Ecology, ecological principle, nature of the environment ecology and man. Goals, strategies and tools for environmental management – systems approach to environmental management – environmental guidelines – National Policies on environment with respects to mining activities – Global and Local environmental issues – resource degradation – desertification – Industrialization, Objectives of Sustainable Development.

UNIT II ENVIRONMENTAL POLLUTION-I **9**

Environmental Pollutants due to surface and underground mining – Air, Water, Noise, Sources and Classification of pollutants including dust and their effect on human health, Sources, hazards, sampling and analysis, standards, instrumentation and measurement of pollutants including dust, Control and preventive measure for air pollution including for dust, Structure of the atmosphere – ozone layer depletion – Acid rain – Green house gases and global warming Ambient Air quality and emission standards, Air quality Sampling and monitoring, Dispersion of air pollutants

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UNIT III ENVIRONMENTAL POLLUTION-II 9

Environmental Pollution due to Water – Sources, Classification and measurements of pollutants and their effect on human health, hazards, sampling and analysis, Water pollution, measurement standards, Noise standards – Measurement – Noise Impact Index assessment, Control and preventive measures for water, noise pollution. Pollution due to equipment vibrations & their monitoring, prevention and control, Land pollution, land for alternation dealing with mind outland

, re-vegetation, land use plan, Textural classification and properties of soil. Impact of pollution on human health,

UNIT IV ENVIRONMENTAL MANAGEMENT 9

Environmental quality objectives, Emission and ambient standards – Minimum National standards – International environmental standards – ISO 14000 – EIA Notification – Siting of Industries – Environmental management plans, Environmental impact assessment, Environmental management system audits, Environmental economics – Principles of cost benefit analysis – Valuingthe Environment – Environmental Accounting, Environmental administration- training awareness and competence

UNIT V ENVIRONMENTAL LEGISLATIONS 9

Environmental laws, the Environmental (Protective) Act, 2004, The Water Act (1974), The Air act (1981), The Forest Act 1927, The forest conservation act 1980, Power and responsibilities of regularity agencies and occupation consent to establish and operate wild life protection act and rules , Environmental clearance procedure for a mining Project.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

1. The students will have basic knowledge on concepts of ecology.
2. The students will have knowledge about various pollutants including acid rain, green house gases, etc
3. The students will have knowledge about impacts of pollution.
4. The students will have adequate knowledge on cost benefit analysis, environmental administration, etc.
5. The students will have knowledge on, pollution its control and ecological systems along with related laws

TEXT BOOKS:

1. Mackenthun, K.M. Basic Concepts in Environmental Management, Lewis Publications, London, 1998.
2. Shyam Divan and Armin Rosencranz, Environmental Law and Policy in India, Oxford University Press, New Delhi.(2001)

REFERENCES:

1 Hartman, H.L. Mine Ventilation and Air Conditioning, Wiley Interscience publication, 1999.

2 Mishra, G.B. Mine Environment and Ventilation, Oxford University Press,1992.

3. McPherson, M.J. Subsurface Ventilation and Environmental Engineering, Chapman & Hall Publication, London, 1993.

4 Manahan S.E. Environmental Science andTechnology.

5 Gregor I. Mcgregor. Environmental Law and Enforcement, Lewis Publishers, London,1994.

6 Noel de Nevers, Air Pollution Control Engg., McGraw Hill, New York,1995

7 Anjaneyulu,Y. Air Pollution & Control Technologies, Allied Publishers (P) Ltd, India,2002.

8. Nick Hanley, Jaison F. Shogren and Ben White.Environmental Economics – In Theory and Practice, Macmillan India Ltd, New Delhi, 1999.

10 Roger Perman, Yue Ma and James McGilvray. Natural Resources and Environmental Economics, Second edition, Addision Wesley Longman Ltd, Singapore,1997.
11 Christopher Sheldon and Mark Yoxon, Installing Environmental Management System –a step by step guide, Earthsecan Publications Ltd, London,1999.
12 Lee Kuhre, ISO 14001 Certification –Environmental Management Systems, Prentice

ME5751 FINITE ELEMENT ANALYSIS L T P C
3 0 0 3

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

1. Developing mathematical models for Boundary Value Problems and their numerical solution.
2. Applying concepts of Finite Element Analysis to solve one dimensional problem.
3. Determining field variables for two dimensional scalar variable problems.
4. Determining field variables for two dimensional vector variable problems.
5. Applying the need for Isoparametric transformation and the use of numerical integration.

UNIT I INTRODUCTION 9

Historical Background – Mathematical Modeling of field problems in Engineering –Governing Equations – Discrete and continuous models – Boundary, Initial and Eigen Value problems– Weighted Residual Methods – Variational Formulation of Boundary Value Problems – Ritz Technique – Basic concepts of the Finite Element Method.

UNIT II ONE-DIMENSIONAL PROBLEMS 9

One Dimensional Second Order Equations – Discretization – Element types- Linear and Higher order Elements – Derivation of Shape functions and Stiffness matrices and force vectors-Assembly of Matrices - Solution of problems from solid mechanics including thermal stresses-heat transfer. Natural frequencies of longitudinal vibration and mode shapes. Fourth Order Beam Equation – Transverse deflections and Transverse Natural frequencies of beams.

UNIT III TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS 9

Second Order 2D Equations involving Scalar Variable Functions – Variational formulation –Finite Element formulation – Triangular elements and Quadrilateral elements- Shape functions and element matrices and vectors. Application to Field Problems - Thermal problems – Torsion of Non circular shafts.

UNIT IV TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS 9

Equations of elasticity – Plane stress, plane strain and axisymmetric problems – Constitutive matrices and Strain displacement matrices – Stiffness matrix – Stress calculations - Plate and shell elements.

UNIT V ISOPARAMETRIC FORMULATION AND ADVANCED TOPICS 9

Natural co-ordinate systems – Isoparametric elements – Shape functions for isoparametric elements – One and two dimensions – Serendipity elements – Numerical integration - Matrix solution techniques – Solutions Techniques to Dynamic problems – Introduction to Analysis Software- Introduction to Non Linearity.

TOTAL = 45 PERIODS

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COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

1. Develop mathematical models for Boundary Value Problems and their numerical solution
2. Apply concepts of Finite Element Analysis to solve one dimensional problems
3. Determine field variables for two dimensional scalar variable problems
4. Determine field variables for two dimensional vector variable problems
5. Apply the need for Isoparametric transformation and the use of numerical integration

TEXT BOOKS:

1. Rao, S.S., "The Finite Element Method in Engineering", 6th Edition, Butterworth-Heinemann,2018.
2. Reddy,J.N. "Introduction to the Finite Element Method", 4th Edition, Tata McGrawHill,2018.

REFERENCES:

1. David Hutton, "Fundamentals of Finite Element Analysis", Tata McGrawHill, 2005
2. Dhanaraj. R and Prabhakaran Nair. K, "Finite Element Analysis", Oxford Publications, 2015.
3. Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, "Concepts and Applications of Finite Element Analysis", 4th Edition, Wiley Student Edition, 2004.
4. Seshu.P, "Text Book of Finite Element Analysis", PHI Learning Pvt. Ltd., NewDelhi, 2012.
5. TirupathiR.Chandrupatla and Ashok D.Belegundu, "Introduction to Finite Elements in Engineering", International Edition, Pearson Education Limited, 2014.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	0.6												0.9		
2		0.9											0.9		
3			0.6										0.9		
4		0.9											0.9		
5					0.6										0.3

MI5014 NON-DESTRUCTIVE TESTING L T P C
3 0 0 3

COURSE OBJECTIVES:

On completion of this course, the students are expected to be conversant with

1. Principles of various NDT techniques
2. The equipment required for the NDT
3. The mechanism involved in there NDT techniques
4. Applications of NDT and recent trends in NDT

UNIT I LIQUID PENETRANT AND MAGNETIC PARTICLE INSPECTION 9

Liquid penetrant systems – processing cycles – inspection of surface defects – Generation of Magnetic fields – Magnetic particle inspection equipments – Demagnetization – Applications and limitations.

UNIT II RADIOGRAPHY 11

Production of x-rays – Characteristic rays and white ray – Tube current and Voltage – Sources of 8 rays – Half life period – Penetrating power – Absorption of x and y rays – Radiation contrast and film contrast – exposure charts – pentameters and sensitivity – Safety.

UNIT III EDDY CURRENT INSPECTION 7

Eddy current production – Impedance concepts – Inspection of magnetic materials – Inspection of non magnetic materials – influences of various parameters – Advantages and limitations.

UNIT IV ULTRASONIC TESTING 10

Production of ultrasonic waves – Different types of waves – normal beam inspection – Angle beam inspection – thickness measurements – Applications.

UNIT V RECENT TECHNIQUES 8

Non destructive inspection– Instrumentation for non destructive testing – Principles of holography- Principle of acoustic emission – Applications of holographic techniques– advantages and limitations – Other techniques.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

1. The students will have knowledge about liquid penetrant systems, magnetic fields, etc.
2. The students will have basic understanding of characteristics of rays, half life period, etc.
3. The students will have knowledge about eddy current, their advantages and limitations, etc.
4. The students will have adequate knowledge about ultrasonic waves their types and applications.
5. They will also learn about recent techniques of non-destructive testing.

TEXT BOOK:

1. Barry Hull and Vernon John, “Non Destructive Testing”, MacMillan, 1988.

REFERENCES:

1. Americal Society of Metals, Metals Hand Book, 9th Edition, Volume 11 (1980)
2. Birchan, D, “Non Destructive Testing”, Oxford University Press, 1977.
3. Proceedings of the 10th International Acoustic Emission Symposium, Japanese Society for Non Destructive Inspection, Sendai, 1990.
4. Holler, P., “New Procedures in Non Destructive Testing” Springer Verlag, 1983

GE5003 MINE ECONOMICS AND INVESTMENT L T P C

3 0 0 3

COURSE OBJECTIVES:

- Study of estimation and valuation of mineral deposits
- Study of project appraisal
- Study of finance and accounting

UNIT I INTRODUCTION 4

Mineral industry and its role in national economy; world and national mineral resources; Mining - A unique investment environment; special risk factors in mine investment and evaluation; national mineral policy.

UNIT II ORE RESERVE ESTIMATION 9

Methods of sampling, sampling frequency; analysis of sampling data, estimation of reserves, introduction to geo-statistical methods, classification of reserves.

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UNIT III MINEVALUATION 12

Time value of money; annuity; redemption of capital, net present value; depletion allowance; depreciation;inflation;escalation;ratesofreturn;Hoskold'sTworatemethod;capitaland operating cost including wages, incentives, material, etc.; assets; liabilities; cash flows and discounted cash flow – their implications in mine economic evaluation.

UNIT IV PROJECTAPPRAISAL 12

Methodsofprojectevaluation–payback,annualvalue,benefit/costratio,ARRandIRR, NPV, Profitability Index etc., Cost-Volume-Profit Analysis; evaluation of exploratory mining areas and operating mines; mine project financing, its risks and constraints; mine taxation; critical impact of depreciation, depletion, type offunding, reserves, life, etc. on mine profitability.

UNIT V FINANCE AND ACCOUNTING 8

Sourcesofminefunds–shares,debentures,fixeddeposit,sinkingfund,capitalgearing, Trading Account, P & L account, balance sheet, Income Statement, Cash flow and Funds low statement; typical case studies of mine feasibility. Cost estimation of individual mining operations and overall mining cost, cost control methods.

TOTAL: 45 PERIODS

COURSE OUTCOME:

- The students will have knowledge on estimation and valuation of mineral deposits. They will possess about project appraisal, finance and accounting.

TEXT BOOKS:

1 Deshmukh, R.T., Mineral and Mine Economics, Mira Publications, Nagpur, 1986.
2 Arogyaswamy, R.N.P. Courses in Mining Geology, Oxford and IBH Publishing Co.,1994.
3. I M. Pandey Financial Management, Vikas Publishing House Pvt. Ltd., 11th edition, 2018

REFERENCES

1 Sloan, D.A., Mine Management, Chapman and Hall, London, 1983.
2 Chatterjee, K.K., Mineral economics, Wiley Eastern, 1992.
3 Park, R.J., Examination and Valuation of mineral property
4 How to read a balance sheet ILO 1992.
5 Indian MiningYear Book 1994 – MMRDAct and Mineral Concession Rules.
6. M.Y. Khan and P.K.Jain Financial management, Text, Problems and cases Tata McGraw Hill, 8th edition, 2017
7. T.S. Reddy & A. Murthy, Financial Accounting, Margham Publications, 2014

MI5015 ROCK SLOPE ENGINEERING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To introduce the basic mechanics of rock slope failures
2. To learn the types of rock failure and its influencing parameters

UNIT I BASIC MECHANICS OF ROCK SLOPE FAILURE 8

Rock slope economics; continuum mechanics approach to slope stability; slope parameters; effect of water pressure; factor of safety of slopes; slope height vs slope angle; design of slopes.

UNIT II GEOLOGICAL AND ROCK STRENGTH PROPERTIES 12

Geological parameters affecting slope stability; graphical representation of geological data; plotting and analysis of field measurements; physico-mechanical properties affecting slope stability, shearing on incline plane, determination of shear strength of rock and rock discontinuities; Ground water flow in rock masses; field measurement of permeability; measurement of water pressure.

UNIT III PLANE FAILURE AND WEDGE FAILURE 10

Plane failure analysis; graphical analysis of stability; influence of ground water on stability; influence of tension crack; analysis of failure on a rough plane; rock reinforcement of slopes; Analysis of wedge failure; wedge analysis including cohesion and water pressure; Wedge stability charts for friction only; case studies. Numerical problems.

UNIT IV CIRCULAR AND TOPPLING FAILURE 10

Conditions for circular failure; derivation of circular failure analysis; effect of ground water; circular failure charts; Bishop's and Janbu's methods of failure analysis; case studies. Types of toppling failure; secondary toppling modes; analysis of toppling failure; limit equilibrium analysis of toppling failures; Influence of slope curvature on stability; slope depressurisation; protection of slopes; control of rock falls; measurement and monitoring and interpretation of slope displacements. Numerical problems.

UNIT V ROCK SLOPE FAILURE MONITORING AND SLOPE STABILIZATION 5

Types of slope movement, Surface and Sub-surface monitoring methods including instrumentation and techniques & Guidelines for monitoring programs. Causes of rock falls; Rock slope stabilization programs – stabilization by rock reinforcement & rock removal; protection measures against rock falls.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

1. The students will know the fundamental mechanics of rock slope failure, types of failure and its influencing parameters.
2. The students will know about parameters affecting rock slope stability.
3. The students will have adequate knowledge on plane and wedge failure.
4. The students will have enhanced knowledge on circular and toppling failure.
5. They will also know about techniques & Guidelines for monitoring programs.

TEXT BOOKS:

1. Duncan C.Wylie and Christopher W. Mah, Rock Slope Engineering, 4th Edition, 4th Edition, CRC Press, 456p, 2004.
2. Hoek, E and Bray, J.W., Rock Slope Engineering, Institution of Mining and Metallurgy, 1991.

REFERENCES

1. John Read and Peter Stacey, Guidelines for Open Pit Slope Design, 1st Edition, CRC Press, 510p, 2009.
2. William A. Hustrulid (Ed), Michael K. McCarter (Ed) and Dirk J. A. Van Zyl (Ed), Slope stability in Surface Mining, Society for Mining, Metallurgy, and Exploration, 442p, 2001.
3. John Jaeger, N. G. Cook and Robert Zimmerman, Fundamentals of Rock Mechanics, 4th Edition, Wiley-Blackwell; 4 edition, 488p, 2007.
4. Goodman, R.E., Rock Mechanics, John Wiley and Sons, 1989.
   Singh, R.N. and Ghose, A.K., Engineered Rock Structures in Mining and Civil Construction, A.A. Balkema, Netherlands, 2006

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MI5016 **MATERIAL HANDLING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To introduce the basic principles in material handling
2. To study the conveyor system and its advancement
3. To study various material handling methods and its applications in the mines.

UNIT I BULK HANDLING SYSTEMS 9

Basic principles in material handling and its benefits. Classification of material handling equipment. Stacking, blending, reclaiming and wagon loading, machinery and systems used at the stack yards; stock piles, silos, bunkers – their design, reclamation from them, various types of weigh bridges. Segregation - size wise and grade wise, Railway sidings.

UNIT II SHORT CONVEYORS AND HAULAGE SYSTEMS 9

Roller conveyor, overhead conveyor, screw conveyor, auger conveyor, apron feeder, bucket elevators, scraper haulage, conveyors in steep gradient, Armoured face conveyor, Off-highway Trucks, haul roads, In-pit crushers and modular conveyors, electric trolley assisted haulage, shuttle cars, skip hoist, winders, LHD's, pneumatic conveying, hydraulic transport.

UNIT III BELT CONVEYOR SYSTEM 9

Design, capacity, calculations with respect to the size, speed, troughing, power requirement, tension requirement, belt selection, factor of safety; developments in the design, of various components of belt conveyor systems such as; structures, rollers, gear boxes and motors, drums and pulleys, belting, ancillary components and safety gadgets.

UNIT IV NEW TYPES OF BELT CONVEYOR SYSTEMS 9

Curved conveyors, cable belts, pipe conveyors, rock belts – mine-run-rock conveyor, steel belt conveyors, steel slot conveyor, chain belt conveyors, etc., and other new developments, High Angle Conveyors (HAC); New inventions in HAC , Mobile or fixed installations; Woven wire belts, En Masse conveyor, Vibrating conveyor, gravity bucket conveyor.

UNIT V MATERIAL HANDLING IN MINES, PLANTS AND WORKSHOPS 9

Mobile cranes, derrick cranes, pillar cranes, tower cranes, radial cranes, bridge cranes, fork lifters, over head gantry material handling in workshops. Mineral handling in dimensional stone quarries, Mineral handling plants (coal, etc.,) Locomotives, rail tracks, rail cars, railways wagons; Aerial ropeways, gravity ropeways; Containers and shipping; Rope haulage - different types.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

The students will get adequate knowledge on

1. Design and application of hoisting system
2. Application of men and material transport system
3. Design concept of scraper haulage, aerial ropeway and belt conveyor system in mines.
4. Design and constructional features of existing and modern belt conveyors
5. Material handling methods and systems and its principle to convey the minerals or materials from mines, plants and workshops.

TEXT BOOKS:

1. Allegri (Sr.), T.H., Material Handling – Principles and Practices, CBS Publishers and Distributors, Delhi, 1987.
2. Siddharta Ray, Introduction to Materials Handling, New Age International Publishers

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REFERENCES:

1. Deshmukh, D.J., Elements of Mining Technology, Vol.I, II and III, EMDEE Publishers, Nagpur, 1979.
2. Hartman, H.L., (Ed.), SME Mining Engg. Handbook Vol.I and II, Society for Mining, Metallurgy, and Exploration, Inc., Colorado, 1992.
3. Vorobjev, B.M., and Deshmukh, R.T. Advanced coal Mining, Vol.I and II, Mrs KusumDeshmukh, P.O. Indian School of Mines, 1966.
4. Sinclair, J., Winding and Transport in Mines, Sir Isaac Pitman and Sons, Ltd., London, 1959.
5. Jacob Fruchtbaum, Bulk Materials Handling Handbook, CBS Publishers and Distributors, New Delhi,1997

MI5017 ADVANCED SURFACE MINING TECHNOLOGY

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To introduce the various techniques for mine planning, geotechnical investigation and equipment management.
2. To appreciate the modern trends in opencast mines, safety and environment

UNIT I PIT PLANNING 10

Development of economic block model; Pit cut-off grade and its estimation; Ultimate pit configuration and its determination – hand method, floating cone technique, Lerchs-Grossmann algorithm, and computer assisted hand method. Addition of haulroad on pit plan; Pit layouts. Open-pit optimisation techniques for mine geometry and output, mine development phases, quality control Output and manpower planning; calendar planning, mine scheduling, production scheduling, truck dispatch system; Feasibility Report, DPR-contents and preparation.

UNIT II GEOTECHNICAL PARAMETERS 7

Influence of pit slope on mine economics; Highwall slope stability analysis and design methodology; stability analysis and design methodology for waste dumps; Application of geotechnical investigation for design of ultimate pit slope and other design parameters. Numerical problems on slope stability analysis including mine waste rock dumps and tailing dumps .

UNIT III P R O D U C T I O N A N D EQUIPMENT PLANNING 10

Determination of mine size and sequencing by nested pits; Cash flow calculations; Mine and mill plant sizing; Production scheduling. Stockpiling and blending, Spreaders and Reclaimers; computerized truck dispatch. Selection of mining system vis-à-vis equipment system; Computations for the capacity and number of machines vis-à-vis mine production. Machine availability, productivity, maintenance scheduling, preventive maintenance, control and monitoring inventory. Workshops for HEMM. Power supply arrangements in opencast mines.

UNIT IV HEALTH, SAFETY AND ENVIRONMENTAL MANAGEMENT 9

Occupational health hazards due to mine dust, poor lighting and ventilation, noise and vibration, radioactive emission; Impact of surface subsidence; Accidents in Surface mining and their prevention; Sources of water, assessment of drainage requirements, sump design and drainage patterns - pumping systems. Pre-drainage through diversion channels and boreholes; Water pollution, Methods of reclamation of mined out areas, dumps and tailing ponds, environmental audit. Socio-economic factors in surface mines.

UNIT V MODERN TRENDS IN OPENCAST MINES 9

Recent developments in mining methods and layouts. In pit crushing & conveying, continuous surface mining. Selective extraction and dumping. Extraction of seams developed/extracted by underground methods. Deep Open pit Mining; Placer mining and solution mining – scope of applicability, sequence of development and machinery; Closure of surface mines.

TOTAL :45 PERIODS

COURSE OUTCOMES:

The students will be able to

1. have insight about the advanced techniques for mine planning, geotechnical investigation and equipment management.
2. Know about mine scheduling and production scheduling.
3. Know about the maintanence of equipments and availability of equipments
4. Understand health, safety and environmental management in surface mines
5. Update the modern trends related to opencast mines.

TEXT BOOKS

1. Cummings, A.B. and Given, I.V., SME Mining Engg. Hand book Vol.I and II, New York, 1994
2. Hustrulid, W. and Kuchta, M., (eds)., Fundamentals of Open Pit Mine Planning & Design, Elsevier, 1995

REFERENCES

1. Proceedings of National Seminar on Surface Mining, IME Publications/ Calcutta, 1995
2. Das, S.K., Surface Mining Technology, Lovely Prakashan, Dhanbad, 1994
3. Das, S.K., Modern Coal Mining Technology, Lovely Prakashan, Dhanbad, 1994
4. Kennedy, B.A., Surface Mining – 2nd Edition, SME, New York, 1990

AD5091 CONSTITUTION OF INDIA L T P C
3 0 0 0

COURSE OBJECTIVES:

- Teach history and philosophy of Indian Constitution.
- Describe the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- Summarize powers and functions of Indian government.
- Explain emergency rule.
- Explain structure and functions of local administration.

UNIT I INTRODUCTION 9

History of Making of the Indian Constitution-Drafting Committee- (Composition & Working) -Philosophy of the Indian Constitution-Preamble-Salient Features

UNIT II CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES 9

Fundamental Rights-Right to Equality-Right to Freedom-Right against Exploitation Right to Freedom of Religion-Cultural and Educational Rights-Right to Constitutional Remedies Directive Principles of State Policy-Fundamental Duties

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UNIT III ORGANS OF GOVERNANCE 9

Parliament-Composition-Qualifications and Disqualifications-Powers and Functions-Executive President-Governor-Council of Ministers-Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions

UNIT IV EMERGENCY PROVISIONS 9

Emergency Provisions - National Emergency, President Rule, Financial Emergency

UNIT V LOCAL ADMINISTRATION 9

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

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: Able to understand history and philosophy of Indian Constitution.
CO2: Able to understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
CO3: Able to understand powers and functions of Indian government.
CO4: Able to understand emergency rule.
CO5: Able to understand structure and functions of local administration.

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

TEXT BOOKS:

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

AD5092 VALUE EDUCATION

L T P C
3 0 0 0

COURSE OBJECTIVES:

- Develop knowledge of self-development
- Explain the importance of Human values
- Develop the overall personality through value education
- Overcome the self destructive habits with value education
- Interpret social empowerment with value education

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UNIT I INTRODUCTION TO VALUE EDUCATION 9

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

UNIT II IMPORTANCE OF VALUES 9

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

UNIT III INFLUENCE OF VALUE EDUCATION 9

Personality and Behaviour development - Soul and Scientific attitude. Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship Happiness Vs suffering, love for truth.

UNIT IV REINCARNATION THROUGH VALUE EDUCATION 9

Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of reincarnation

UNIT V VALUE EDUCATION IN SOCIAL EMPOWERMENT 9

Equality, Non violence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1 – Gain knowledge of self-development
CO2 – Learn the importance of Human values
CO3 – Develop the overall personality through value education
CO4 – Overcome the self destructive habits with value education
CO5 – Interpret social empowerment with value education

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

REFERENCES:

1. Chakroborty , S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press ,New Delhi

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AD5093 **PEDAGOGY STUDIES** **L T P C**
3 0 0 0

COURSE OBJECTIVES:

- Understand the methodology of pedagogy.
- Compare pedagogical practices used by teachers in formal and informal classrooms in developing countries.
- Infer how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
- Illustrate the factors necessary for professional development.
- Identify the Research gaps in pedagogy.

UNIT I INTRODUCTION AND METHODOLOGY: 9

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

UNIT II THEMATIC OVERVIEW 9

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

UNIT III EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES 9

Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT IV PROFESSIONAL DEVELOPMENT 9

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

UNIT V RESEARCH GAPS AND FUTURE DIRECTIONS 9

Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Understand the methodology of pedagogy.
- Understand Pedagogical practices used by teachers in formal and informal classrooms in developing countries.
- Find how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
- Know the factors necessary for professional development.
- Identify the Research gaps in pedagogy.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												✓
CO2												✓
CO3												✓

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CO4												✓
CO5												✓

REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.

AD5094 STRESS MANAGEMENT BY YOGA

L	T	P	C
3	0	0	0

COURSE OBJECTIVES:

- Develop healthy mind in a healthy body thus improving social health also improve efficiency
- Invent Do's and Don't's in life through Yam
- Categorize Do's and Don't's in life through Niyam
- Develop a healthy mind and body through Yog Asans
- Invent breathing techniques through Pranayam

UNIT I INTRODUCTION TO YOGA **9**

Definitions of Eight parts of yog. (Ashtanga)

UNIT II YAM **9**

Do`s and Don't's in life.
Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT III NIYAM **9**

Do`s and Don't's in life.
Ahinsa, satya, astheya, bramhacharya and aparigraha

UNIT IV ASAN **9**

Various yog poses and their benefits for mind & body

UNIT V PRANAYAM **9**

Regularization of breathing techniques and its effects-Types of pranayam

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1 – Develop healthy mind in a healthy body thus improving social health also improve efficiency
CO2 – Learn Do's and Don't's in life through Yam
CO3 – Learn Do's and Don't's in life through Niyam
CO4 – Develop a healthy mind and body through Yog Asans
CO5 – Learn breathing techniques through Pranayam

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

REFERENCES:

1. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata
2. 'Yogic Asanas for Group Tarining-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur

AD5095 PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

L T P C
3 0 0 0

COURSE OBJECTIVES:

- Develop basic personality skills holistically
- Develop deep personality skills holistically to achieve happy goals
- Rewrite the responsibilities
- Reframe a person with stable mind, pleasing personality and determination
- Discover wisdom in students

UNIT I NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - I 9

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

UNIT II NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - II 9

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

UNIT III APPROACH TO DAY TO DAY WORK AND DUTIES 9

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

UNIT IV STATEMENTS OF BASIC KNOWLEDGE – I 9

Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 - Verses 13, 14, 15, 16,17, 18

UNIT V PERSONALITY OF ROLE MODEL - SHRIMAD BHAGWADGEETA 9

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

TOTAL: 45PERIODS

COURSE OUTCOMES:

CO1: To develop basic personality skills holistically
CO2: To develop deep personality skills holistically to achieve happy goals
CO3: To rewrite the responsibilities
CO4: To reframe a person with stable mind, pleasing personality and determination
CO5: To awaken wisdom in students

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

REFERENCES:

1. Gopinath,Rashtriya Sanskrit Sansthanam P, Bhartrihari's ThreeSatakam , Niti-sringar-vairagya, New Delhi,2010
2. Swami Swarupananda , Srimad Bhagavad Gita, Advaita Ashram,Publication Department, Kolkata,2016

AD5097 ESSENCE OF INDIAN KNOWLEDGE TRADITION L T P C
3 0 0 0

COURSE OBJECTIVES

The course will introduce the students to

- get a knowledge about Indian Culture
- Know Indian Languages and Literature religion and philosophy and the fine arts in India
- Explore the Science and Scientists of Ancient, Medieval and Modern India
- Understand education systems in India

UNIT I INTRODUCTION TO CULTURE 9

Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.

UNIT II INDIAN LANGUAGES AND LITERATURE 9

Indian Languages and Literature – I: Languages and Literature of South India, – Indian Languages and Literature – II: Northern Indian Languages & Literature

UNIT III RELIGION AND PHILOSOPHY 9

Major religions practiced in India and Understanding their Philosophy – religious movements in Modern India (Selected movements only)

UNIT IV FINE ARTS IN INDIA (ART, TECHNOLOGY& ENGINEERING) 9

Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT V EDUCATION SYSTEM IN INDIA 9

Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

TOTAL: 45 PERIODS

COURSE OUTCOMES

After successful completion of the course the students will be able to

- Understand philosophy of Indian culture.
- Distinguish the Indian languages and literature.
- Learn the philosophy of ancient, medieval and modern India.
- Acquire the information about the fine arts in India.
- Know the contribution of scientists of different eras.
- Understand education systems in India

REFERENCES:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition",ISBN: 81246033375, 2005
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN 13: 978-8187276333, 2007
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450 494-X, 200
4. Narain, "Examinations in ancient India", Arya Book Depot, 1993
5. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989
6. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN 13: 978-8120810990, 2014

AD5098 SANGA TAMIL LITERATURE APPRECIATION L T P C
3 0 0 0

COURSE OBJECTIVES:

The main learning objective of this course is to make the students an appreciation for:

1. Introduction to Sanga Tamil Literature.
2. 'Agathinai' and 'Purathinai' in Sanga Tamil Literature.
3. 'Attruppadai' in Sanga Tamil Literature.
4. 'Puranaanuru' in Sanga Tamil Literature.
5. 'Pathitrupaththu' in Sanga Tamil Literature.

UNIT I SANGA TAMIL LITERATURE AN INTRODUCTION 9

Introduction to Tamil Sangam – History of Tamil Three Sangams – Introduction to Tamil Sangam Literature – Special Branches in Tamil Sangam Literature - Tamil Sangam Literature's Grammar - Tamil Sangam Literature's parables.

UNIT II 'AGATHINAI' AND 'PURATHINAI' 9

Tholkappiyar's Meaningful Verses – Three literature materials – Agathinai's message - History of Culture from Agathinai – Purathinai – Classification – Mesaage to Society from Purathinai.

UNIT III 'ATTRUPPADAI'. 9

Attruppadai Literature – Attruppadai in 'Puranaanuru' - Attruppadai in 'Pathitrupaththu' – Attruppadai in 'Paththupaattu'.

UNIT IV 'PURANAANURU' 9

Puranaanuru on Good Administration, Ruler and Subjects – Emotion & its Effect in Puranaanuru.

UNIT V 'PATHITRUPATHTHU' 9

Pathitrupaththu in 'Ettuthogai' – Pathitrupaththu's Parables – Tamil dynasty: Valor, Administration, Charity in Pathitrupaththu - Mesaage to Society from Pathitrupaththu.

Attested

TOTAL (L: 45) = 45 PERIODS

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COURSE OUTCOMES: Upon completion of this course, the students will be able to:

1. Appreciate and apply the messages in Sanga Tamil Literature in their life.
2. Differentiate 'Agathinai' and 'Purathinai' in their personal and societal life.
3. Appreciate and apply the messages in 'Attruppadai' in their personal and societal life.
4. Appreciate and apply the messages in 'Puranaanuru' in their personal and societal life.
5. Appreciate and apply the messages in 'Pathitrupaththu' in their personal and societal life.

REFERENCES:

1. Sivaraja Pillai, The Chronology of the Early Tamils, Sagwan Press, 2018.
2. Hank Heifetz and George L. Hart, The Purananuru, Penguin Books, 2002.
3. Kamil Zvelebil, The Smile of Murugan: On Tamil Literature of South India, Brill Academic Pub, 1997.
4. George L. Hart, Poets of the Tamil Anthologies: Ancient Poems of Love and War, Princeton University Press, 2015.
5. Xavier S. Thani Nayagam, Landscape and poetry: a study of nature in classical Tamil poetry, Asia Pub. House, 1967.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1									0.9						0.6
2									0.9						0.6
3									0.9						0.6
4									0.9						0.6
5									0.9						0.6

HSMC– ELECTIVES – HUMANITIES I (ODD SEMESTER)

HU5171 **LANGUAGE AND COMMUNICATION** **L T P C**
3 0 0 3

COURSE DESCRIPTION

This course offers an introduction to language and communication. The primary goal of this course is to familiarize students with key ideas related to communication using language as well as non verbal means. Ideas related to the use of language and the underlying power structures are also examined. The course also examines the role of media in communication and in the dissemination of ideas as well as opinions.

Objectives

- ✓ To familiarize students with the concept of communication using linguistic and non linguistic resources.
- ✓ To help students ask critical questions regarding facts and opinions.
- ✓ To provide students with the material to discuss issues such as language and power structures.
- ✓ To help students think critically about false propaganda and fake news.

Learning Outcomes

- ➢ Students will be able to use linguistic and non linguistic resources of language in an integrated manner for communication.
- ➢ Students will be able to analyse communication in terms of facts and opinions.
- ➢ Students will be able to discuss, analyse and argue about issues related to language and power.

Attested

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UNIT I LINGUISTIC AND NON-LINGUISTIC RESOURCE OF COMMUNICATION: 9

a) Writing and Speech
b) Distinction between language structure and language use, form and function, acceptability and grammaticality
c) Gestures and Body language, pictures and symbols, cultural appropriacy
d) Communicative Competency, context and situation, combination of linguistic and non-linguistic elements of communication

UNIT II STRUCTURE OF WRITING/CONVERSATION: 9

a) Language skills and the communication cycle; speaking and listening, writing and reading
b) Initiating and closing conversations, intervention, turn taking
c) Writing for target reader, rhetorical devices and strategies
d) Coherence and Cohesion in speech and writing

UNIT III POWER STRUCTURE AND LANGUAGE USE: 9

a) Gender and language use
b) Politeness expressions and their use
c) Ethical dimensions of language use
d) Language rights as part of human rights

UNIT IV MEDIA COMMUNICATION: 9

a) Print media, electronic media, social media
b) Power of media
c) Manufacturing of opinion, fake news and hidden agendas

UNIT V PERSUASIVE COMMUNICATION AND MISCOMMUNICATION: 9

a) Fundamentals of persuasive communication
b) Persuasive strategies
c) Communication barriers

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Austin, 1962, J.L. How to do things with words. Oxford: Clarendon Press. Grice, P.1989. Studies in the way of words. Cambridge, M.A: Harvard University Press.
2. Chomsky, N.1966. Aspects of the theory of syntax, The MIT press, Cambridge. Chomsky, N.2006. Language and Mind, Cambridge University Press.
3. Hymes. D.N. 1972, On communication competence in J.B. Pride and J.Holmes (ed), Sociolinguistics, pp 269-293, London Penguin.
4. Gilbert, H.Harman, 1976. Psychological aspect of the theory of syntax in Journal of Philosophy, page 75-87.
5. Stephen. C. Levenson, 1983, Pragmatics, Cambridge University press.
6. Stangley, J. 2007. Language in Context. Clarendon press, Oxford. 7. Shannon, 1942. A Mathematical Theory of Communication. 8. Searle, J.R. 1969. Speech acts: An essay in the philosophy of language. Cambridge: Cambridge University Press.

HU5172 VALUES AND ETHICS L T P C
3 0 0 3

OBJECTIVES:

- Teach definition and classification of values.
- Explain Purusartha.
- Describe Sarvodaya idea.
- Summarize sustenance of life.
- Conclude views of hierarchy of values.

UNIT I DEFINITION AND CLASSIFICATION OF VALUES 9

Extrinsic values- Universal and Situational values- Physical- Environmental-Sensuous- Economic-Social-Aesthetic-Moral and Religious values

UNIT II CONCEPTS RELATED TO VALUES 9

Purusartha-Virtue- Right- duty- justice- Equality- Love and Good

UNIT III IDEOLOGY OF SARVODAYA 9

Egoism- Altruism and universalism- The Ideal of Sarvodaya and Vasudhaiva Kutumbakam

UNIT IV SUSTENANCE OF LIFE 9

The Problem of Sustenance of value in the process of Social, Political and Technological Changes

UNIT V VIEWS ON HIERARCHY OF VALUES 9

The Problem of hierarchy of values and their choice, The views of Pt. Madan Mohan Malviya and Mahatma Gandhi

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Able to understand definition and classification of values.
CO2: Able to understand purusartha.
CO3: Able to understand sarvodaya idea.
CO4: Able to understand sustenance of life.
CO5: Able to understand views of hierarchy of values.

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

TEXTBOOKS:

1. AwadeshPradhan :MahamanakeVichara. (B.H.U., Vanarasi-2007)
2. Little, William, : An Introduction of Ethics (Allied Publisher, Indian Reprint 1955)
3. William, K Frankena : Ethics (Prentice Hall of India, 1988)

HU5173 HUMAN RELATIONS AT WORK L T P C
3 0 0 3

OBJECTIVES:

- Illustrate human relations at work its relationship with self.
- Explain the importance of interacting with people at work to develop teamwork.
- Infer the importance of physical health in maintaining human relations at work.
- Describe the importance of staying psychologically healthy.
- Identify the essential qualities for progressing in career.

UNIT I UNDERSTANDING AND MANAGING YOURSELF 9

Human Relations and You: Self-Esteem and Self-Confidence: Self-Motivation and Goal Setting; Emotional Intelligence, Attitudes, and Happiness; Values and Ethics and Problem Solving and Creativity.

UNIT II DEALING EFFECTIVELY WITH PEOPLE 9

Communication in the Workplace; Specialized Tactics for Getting Along with Others in the Workplace; Managing Conflict; Becoming an Effective Leader; Motivating Others and Developing Teamwork; Diversity and Cross-Cultural Competence.

UNIT III STAYING PHYSICALLY HEALTHY 9

Yoga, Pranayam and Exercise: Aerobic and anaerobic.

UNIT IV STAYING PSYCHOLOGICALLY HEALTHY 9

Managing Stress and Personal Problems, Meditation.

UNIT V DEVELOPING CAREER THRUST 9

Getting Ahead in Your Career, Learning Strategies, Perception, Life Span Changes, and Developing Good Work Habits.

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to

CO1: Understand the importance of self-management.
CO2: Know how to deal with people to develop teamwork.
CO3: Know the importance of staying healthy.
CO4: Know how to manage stress and personal problems.
CO5: Develop the personal qualities essential for career growth.

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

TEXT BOOK:

1. Dubrien, A. J. (2017). Human Relations for Career and Personal Success: Concepts, Applications, and Skills, 11th Ed. Upper Saddle River, NJ: Pearson.

REFERENCES:

1. Greenberg, J. S. (2017). Comprehensive stress management (14th edition), New York: McGraw Hill.
2. Udai, Y. (2015). Yogasanaurpranayam. New Delhi: N.S. Publications.

Attested

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HU5174 **PSYCHOLOGICAL PROCESSES** **L T P C**
3 0 0 3

COURSE DESCRIPTION

Psychological Processes course is designed for students to be aware of the basic principles of psychology for the better understanding of people's psyche and behaviour around them. This course enables learners to use the optimal use of different forms of thinking skills and thereby results in effective communication in diverse situations. Every unit of the syllabus highlights the psychological process of people, the most powerful and constructive use of perceptions.

OBJECTIVES

The major objectives of this course is

- To develop students' awareness – on psychology, learning behavior and usage of perception effectively.
- To learn to use the various kinds of thinking in a formal context.
- To critically evaluate content and comprehend the message on the bases of perception, personality and intelligence.

UNIT I INTRODUCTION

What is psychology? - Why study psychology? - Psychology as science – Behavior and its role in human communication – socio-cultural bases of behaviour – Biological bases of behavior - Brain and its functions – Principles of Heredity – Cognition and its functions Fields of psychology – Cognitve and Perceptual – Industrial and Organizational.

UNIT II SENSORY & PERCEPTUAL PROCESSES

Some general properties of Senses: Visual system – the eye, colour vision – Auditory system – Hearing, listening, Sounds - Other senses - Selective attention; physiological correlates of attention; Internal influences on perception learning – set - motivation & emotion - cognitive styles; External influences on perception figure and ground separation – movement – organization – illusion; Internal-external interactions: Constancy - Depth Perception- Binocular & Monocular Perception; Perceptual defense & Perceptual vigilance; Sensory deprivation -Sensory bombardment; ESP - Social Perception.

UNIT III COGNITION & AFFECT

Learning and memory – philosophy of mind – concepts - words – images – semantic features – Association of words – Repetition – Retrieval – Chunking - Schemata - Emotion and motivation – nature and types of motivation – Biological & Psychosocial motivation – nature and types of emotions – physiological & cognitive bases of emotions – expressions of emotions – managing negative emotions - enhancing positive emotions.

UNIT IV THINKING, PROBLEM-SOLVING & DECISION MAKING

Thinking skills – Types of thinking skills – Concrete & Abstract thinking – Convergent & Divergent - Analytical & Creative thinking – Problem & Possibility thinking – Vertical & Lateral thinking – Problem solving skills – stages of problem solving skills – Decision making - intuition and reasoning skills - Thinking and language - The thinking process- concepts, problem solving, decision-making, creative thinking; language communication.

UNIT V PERSONALITY & INTELLIGENCE

Psychological phenomena & Attributes of humans - cognition, motivation, and behavior - thoughts, feelings, perceptions, and actions – personality dimensions, traits, patterns - Specialized knowledge, performance accomplishments, automaticity or ease of functioning, skilled performance under challenge - generative flexibility, and speed of learning or behavior change.

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REFERENCES
1. Morgan, C.T.and King, R.A (1994) Introduction to Psychology, Tata McGraw Hill Co Ltd, New Delhi.
2. Robert A. Baron (2002), Psychology, 5th Edition, Prentice Hall, India.
3. Michael W.Passer, Ronald E.smith (2007), Psychology: The science of mind and Behavior,3rd Edition Tata McGraw-Hill Edition.
4. Robert S.Feldman (2004) Understanding Psychology 6th Edition Tata McGraw – Hill.
5. Endler, N. S., & Summerfeldt, L. J. (1995). Intelligence. personality. psychopathology. and adjustment. In D. H. Saklofske & M. Zeidner (Eds.). International handbook of personality and intelligence (pp. 249-284). New York: Plenum Press.
6. Ford, M. E. (1994). A living systems approach to the integration of personality and intelligence. In R. J. Sternberg. & P. Ruzgis (Eds.). Personality and intelligence (pp. 188-21 7). New York: Cambridge University Press.
7. De Bono, E (1990) Lateral Thinking, Harper Perennial, New York.

HU5175 EDUCATION, TECHNOLOGY AND SOCIETY L T P C
3 0 0 3

COURSE DESCRIPTION

This course introduces students to multidisciplinary studies in Education, Technology and Society. Students will get an understanding of the relationship between education, technology and society. They will also learn about the long lasting impact of good education in a technologically advanced society.

COURSE OBJECTIVES:

The course aims
- To help learners understand the basics of different types of technology utilised in the field of education
- To make them realize the impact of education in society
- To make them evolve as responsible citizen in a technologically advanced society

LEARNING OUTCOMES

By the end of the course, learners will be able to
- Understand the various apps of technology apps and use them to access, generate and present information effectively.
- Apply technology based resources and other media formats equitably, ethically and legally.
- Integrate their technical education for betterment of society as well as their personal life.

UNIT I INDIAN EDUCATION SYSTEM

Gurukul to ICT education – Teacher as facilitator – Macaulay's Minutes – English medium vs Regional medium – Importance of Education in Modern India - Challenges in Education

UNIT II LEARNING THEORIES

Learning Theories – Behaviorism – Cognitivism – Social Constuctivism – Humanism Learning Styles – Multiple Intelligences – Emotional Intelligence – Blooms Taxonomy

UNIT III TECHNOLOGICAL ADVANCEMENTS

Web tools – Social media in education – elearning – MOOCs – Mobile assisted learning – Learning Apps – Blended learning - Self-directed learning

UNIT IV EDUCATIONAL TECHNOLOGY

Technological implications on Education – Teaching, Learning & Testing with Technology - Advantages and drawbacks – Critical analysis on the use of technology

UNIT V ETHICAL IMPLICATIONS

Plagiarism – Online Copyright issues – Ethical and value implications of education and technology on individual and society.

TOTAL:45 PERIODS

TEACHING METHODS

Teaching modes include guest lectures, discussion groups, presentations, visual media, and a practicum style of learning.

EVALUATION

As this is course is not a content based course, it focuses more on the ethical use of technology in education and society, and so, evaluation can be based on assignments and discussions. So there is no need for an end semester examination. Internals marks can be taken for the total marks.

INTERNAL (100 % WEIGHTAGE)

(a) Written Test (40 marks)
(b) Assignment: Write a real time report of the technology use in any school / college (15 marks)
(c) Presentation: Students choose any one of the technological tools and present its relevance to education and society (15 marks)
(d) Group discussion: Students discuss in groups on case studies relating to various challenges in education and technology use in society (20 marks)
(e) Blog entry: Making weekly blog posts in Class Blog on the topics related to the course posted by the instructor and commenting on others' posts. (10 marks)

REFERENCES

1) Education and Social order by Bertrand Russel
2) Theories of learning by Bower and Hilgard
3) Technology and Society by Jan L Harrington

HU5176 PHILOSOPHY L T P C
3 0 0 3

OBJECTIVES

- To create a new understanding by teaching philosophy through a comparison of Indian and Western traditions.
- To Fosters critical thinking and imagination by dealing with inter-related concepts in literature and science.
- To bridge the gap between the sciences and humanities through introspective analyses.
- To nurture an understanding of the self and elucidates ways to progress towards a higher understanding of one's self and others.

UNIT I KNOWLEDGE 9

Knowledge (Vidya) Versus Ignorance (Avidya)- Brihadaranyaka Upanishad. Unity and Multiplicity – Isha Upanishad. What is True Knowledge? Ways to True Knowledge. Introduction to Philosophy of Yoga, Socratic Debate, Plato's Views. Asking and Answering Questions to Stimulate Critical Thinking and to Draw Ideas. Argumentative Dialogues. Dialectical Methods to Arrive at Conclusions.

UNIT II ORIGIN 9

Origin of Universe And Creation – 'Nasidiya Sukta' in Relation With Big Bang Theory. Greek Concept of Chaos. The Concept of Space – Space as the Final Goal – Udgitha. Relationship Between Teacher

And Student – The Knowledge Of Combinations, Body And Speech – Siksha Valli – Taittriya Upanishad.

UNIT III WORD **9**

Aum- Speech and Breath as Pair – Chandogya Upanishad and Brihadaryanaka Upanishad. Significance of Chants, Structure of Language and Cosmic Correspondences. The Non-Dual Word – Bhartrihari's Vakyapadiyam. Sphota-Ultimate Reality Expressed Through Language. Intention. Thought 'Sabdanaor' and Speaking.

UNIT IV KNOWLEDGE AS POWER/OPPRESSION **9**

Power- as Self-Realization in Gita. Krishna's Advice to Arjuna on How to Conquer Mind. Francis Bacon – Four Idols – What Prevents One From Gaining Knowledge? Michel Foucault- Knowledge as Oppression. Panopticon. Rtam (Truth) and Satyam (Eternal Truth).

UNIT V SELF KNOWLEDGE/BRAHMAN **9**

Knowledge about Self, Transcendental Self. The Different Chakras and the Stages of Sublimation. Philosophy of Yoga and Siva for Union of Mind and Body. Concept of Yin/Yang. Aspects of the Feminine / Masculine.

TOTAL : 45 PERIODS

OUTCOMES:

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

1. Think sceptically, ask questions and to arrive at deductions.
2. Connect and relate different branches of thought.
3. Comprehends the relation between language, thought and action.
4. Arrive at a better understanding of self and others and forms a new outlook.

REFERENCES:

1. Swami Nikhilananda: The Upanishads, Swami Nikhilananda, Advaita Ashrama, Kolkata.
2. Swamy Tapasyananda: Srimad Bhagavad Gita, The Scripture of Mankind, Sri Ramakrishna Math, Chennai.
3. Subrahmanyam, Korada: Vakyapadiyam of Bhartrhari Brahmakanda, Sri Garib Dass series.
4. Swami Lokeswarananda: Chandogya Upanishad, Swami Lokeswarananda, Ramakrishna Mission Institute of Culture, Kolkata.
5. Brahma, Apuruseya: The Four Vedas: Translated in English.
6. Haich, Elizabeth: Sexual Energy and Yoga.
7. Bacon, Francis: Power as Knowledge
8. Vlastos, Gregory: Socrates Ironist and Moral Philosopher.
9. Plato: The Republic, Penguin.
10. Gutting, Garry: Foucault A Very Short Introduction, Oxford.

HU5177 APPLICATIONS OF PSYCHOLOGY IN EVERYDAY LIFE **L T P C**
3 0 0 3

UNIT I INTRODUCTION **7**

Nature and fields.

UNIT II PSYCHOLOGY IN INDUSTRIES AND ORGANIZATIONS **9**

Job analysis; fatigue and accidents; consumer behavior.

UNIT III PSYCHOLOGY AND MENTAL HEALTH **11**

Abnormality, symptoms and causes psychological disorders

UNIT IV PSYCHOLOGY AND COUNSELING 7

Need of Counseling, Counselor and the Counselee, Counseling Process, Areas of Counseling.

UNIT V PSYCHOLOGY AND SOCIAL BEHAVIOUR 11

Group, group dynamics, teambuilding, Prejudice and stereotypes; Effective Communication, conflict and negotiation.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Schultz, D. & Schultz, S.E. (2009). Psychology and Work Today (10th ed.). New Jersey:Pearson/Prentice Hall
2. Butcher, J. N., Mineka, S., & Hooley, J. M. (2010). Abnormal psychology (14th ed.). New York: Pearson
3. Gladding, S. T. (2014). Counselling: A comprehensive profession. New Delhi: Pearson Education
4. Aronson, E., Wilson, T. D., & Akert, R. M. (2010). Social Psychology (7th Ed.). Upper Saddle River, NJ: Prentice Hall

HSMC– ELECTIVES – HUMANITIES II (EVEN SEMESTER)

HU5271 GENDER, CULTURE AND DEVELOPMENT L T P C

3 0 0 3

COURSE DESCRIPTION

This course offers an introduction to Gender Studies that asks critical questions about the meanings of sex and gender in Indian society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary drawing from Indian literature and media studies, to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with class, caste and other social identities. This course also seeks to build an understanding of the concepts of gender, gender-based violence, sexuality, and rights and their impact on development through a number of discussions, exercises and reflective activities.

Objectives

- ✓ To familiarize students with the concepts of sex and gender through literary and media texts.
- ✓ To help students ask critical questions regarding gender roles in society.
- ✓ To provide students with the material to discuss gender issues such as gender based discrimination, violence and development.
- ✓ To help students think critically about gender based problems and solutions.

Learning Outcomes

- ➢ Students will be able to critically read literary and media texts and understand the underlying gender perspectives in them.
- ➢ Students will be able to analyse current social events in the light of gender perspectives.
- ➢ Students will be able to discuss, analyse and argue about issues related to gender and their impact on society, culture and development.

UNIT I: Introduction to Gender

- Definition of Gender
- Basic Gender Concepts and Terminology
- Exploring Attitudes towards Gender
- Social Construction of Gender

Texts:

1. Sukhu and Dukhu (Amar Chitra Katha)
2. The Cat who Became a Queen (Folk tale, J. Hinton Knowles, Folk-Tales of Kashmir. London: Kegan Paul, Trench, Trübner, and Company, 1893, pp. 8-10.)

UNIT II: Gender Roles and Relations

- Types of Gender Roles
- Gender Roles and Relationships Matrix
- Gender-based Division and Valuation of Labour

Texts:

1. Muniyakka (Short Story, Lakshmi Kannan, Nandanvan and Other Stories, Hyderabad: Orient Blackswan, 2011)
2. Video: Witness: Freeing Women From Cleaning Human Waste (2014, HRW, Manual Scavenging, India)

UNIT III: Gender Development Issues

- Identifying Gender Issues
- Gender Sensitive Language
- Gender, Governance and Sustainable Development
- Gender and Human Rights
- Gender and Mainstreaming

Texts:

1. The Many Faces of Gender Inequality (Essay, Amartya Sen, Frontline, Volume 18 - Issue 22, Oct. 27 - Nov. 09, 2001)
2. Tell Us Marx (Poem, Mallika Sengupta, Translated by Sanjukta Dasgupta)

UNIT IV: Gender-based Violence

- The concept of violence
- Types of Gender-based violence
- The relationship between gender, development and violence
- Gender-based violence from a human rights perspective

Texts:

1. Lights Out (Play, Manjula Padmanabhan)
2. Lights Out (Video of play enacted)

UNIT V: Gender and Culture

- Gender and Film
- Gender, Media and Advertisement

Texts:

1. Mahanagar (Movie: Satyajit Ray)
2. Beti Bachao Beti Padhao Advertisements

READINGS: Relevant additional texts for readings will be announced in the class. Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments.

ASSESSMENT AND GRADING:
Discussion & Classroom Participation: 20%
Project/Assignment: 30%
End Term Exam: 50%

HU5272 ETHICS AND HOLISTIC LIFE L T P C
3 0 0 3

OBJECTIVES:

- To emphasize the meaning and nature of ethics, human values and holistic life for leading a good, successful and happy life through continuous examination of thoughts and conduct in day to day life.
- To understand the status and responsible role of individual in abatement of value crisis in contemporary world in order to develop a civilized and human society. Understanding the process of ethical decision making through critical assessment of incidents/cases of ethical dilemmas in personal, professional and social life.
- To view the place of Ethics and Human Values in the development of individual and society through identification and cross examination of life values and world view of his/her role models in society.

UNIT I HUMAN LIFE, ITS AIM AND SIGNIFICANCE
The concept of a successful life, happy life and a meaningful life, Ethical and decision making capability and its development: Meaning of Ethical dilemma, sharing real life experiences.

UNIT II CREATIVE AND LEADERSHIP ABILITY AND THEIR DEVELOPMENT
Intellectual, Emotional, Creative, Ethico - spiritual development, Aesthetic sense, Self-dependency, Activeness, Development of positive attitude.

UNIT III HARMONY IN PERSONAL AND SOCIAL LIFE:
Concept of personal and group Ethics; Balance between - rights and duties-welfare of self and welfare of all, Creating a value based work culture in hostel, classroom and other places in the campus and society.

UNIT IV CHARACTER, RIGHTEOUSNESS AND VIRTUES FOR A MEANINGFUL LIFE
Egolessness, Humility, Righteousness, Purity, Truthfulness, Integrity, Self-restraint, Self-control, Sense of responsibility, Empathy, Love, Compassion, Maitri / Comradeship, Cooperation, Tolerance.

UNIT V DILEMMA BETWEEN MATERIALISTIC DEVELOPMENT AND HUMAN WELFARE
Science, Technology, Consumerism, Relation with Nature and Environment, New dimension of Global Harmony: Democracy, Equality, Social Justice

TOTAL:45 PERIODS

Attested

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OUTCOMES:

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

1. Enable students to understand the concept of contemporary ethics at different levels: Individual, local and Global and enable them to cross examine the ethical and social consequences of the decisions of their life-view and world view.
2. Develop the ability of students to create a balance between their individual freedom and social responsibilities and enable them to identify the personal, professional and social values and integrate them in their personality after cross examination.
3. Enable students to cross examine their earlier decisions taken in life and understand the meaning of ethical dilemma to overcome the ethical dilemmas and engage in critical reflection.
4. Develop positive habits of thought and conduct and work cohesively with fellow beings who have variety of strengths, experiences, shortcomings and challenges, hence to enable them to handle diverse type of personalities.
5. Enable students to develop a method for making ethically sound decisions for themselves, within hostels, classrooms, university campus and society.

HU5273 LAW AND ENGINEERING L T P C
3 0 0 3

UNIT I THE LEGAL SYSTEM: SOURCES OF LAW AND THE COURT STRUCTURE 9

Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law- Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers. (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court) Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration.

UNIT II LAWS 9

Basic principles of contract law, sale of goods law, laws relating to industrial pollution, accident, environmental protection, health and safety at work, patent law, constitutional law: the supreme law of the land, Information technology law and cyber crimes.

UNIT III BUSINESS ORGANISATIONS 9

Sole traders (Business has no separate identity from you, all business property belongs to you).

Partnerships: Types of Partnerships - Limited Liability Partnership, General Partnership, Limited Partnerships. Companies: The nature of companies, Classification of companies, Formation of companies, Features of a public company, Carrying on business, Directors– Their Powers and Responsibilities/Liabilities.

UNIT IV LAW AND SOCIETY 9

Interdisciplinary nature of law, legal ideologies/philosophy/ schools of jurisprudence**.**

UNIT V CASE STUDIES 9

Important legal disputes and judicial litigations

TOTAL: 45 PERIODS

Attested

DIRECTOR
Centre for Academic Courses
Anna University, Chennai-600 025

HU5274 **FILM APPRECIATION** **L T P C**
3 0 0 3

COURSE DESCRIPTION

This is an intensive course designed to promote comprehensive understanding and insights into the nature of cinema and other related forms and practices. Movies, though at times are used more as escapism, they are also a true art form and expressive tool used by writers, directors and actors. This course will explore the aesthetics of cinema, the concepts behind storytelling and various other elements of a film. It will also explore the impact of movies in our society and in our lives. It also encourages students to use films as a medium to analyse visual texts and read underlying messages.

OBJECTIVES:

- To help learners understand the various movie genres and its types.
- To understand various elements that contributes to film making.
- To make them realize the impact of film in society.
- To analyse the visual media and interpret the underlying messages.

UNIT I THE COMPONENTS OF FILMS 9

Story, Screenplay & Script – Actors – Director – Crew Members – Mis En Scene – Structure of A Film – Narrative Elements – Linear & Non-Linear – Types of Movie Genres: Mysteries, Romantic Comedies, Horror Etc.

UNIT II EVOLUTION OF FILM 9

History of Films – Early Cinema – Silent Movies – Talkies – Film Language, Form, Movement – Film Theories – Realist, Auteurists, Feminist, Psychonalyic, Idealogical Theories.

UNIT III FILMS ACROSS THE WORLD 9

European Films – Russian Films – Japanese Films – Korean Films – Hollywood Film – Studio Culture – All Time Great Movies.

UNIT IV INDIAN FILMS 9

The Early Era – History Of Indian Cinema – Movies for Social Change – Hindi Movies that Created Impact – Regional Movies – Documentaries – Cultural Identity.

UNIT V INTERPRETING FILMS 9

Film Criticism & Appreciation – Censorship in Movies – Cultural Representation in Movies – Television – New Media & Online Media – Films Beyond Entertainment.

TOTAL: 45 PERIODS

OUTCOMES

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

- Recognize types of films, their impact on society and their roles in our lives.
- Have an understanding of the concepts of storytelling, Mise en Scene, and other elements of film making.
- Interpret the underlying messages in the movies.

Teaching Methods

- Each unit consists of reading materials, learning activities videos, websites. Students are expected to watch movies sometimes in class and at times at home and discuss in class.

Evaluation

- As this is course is critical appreciation course on films, there is no written end semester examination. The course is more on learning how to critically analyse a movie and appreciate its finer elements. Therefore evaluation can be based on assignments and discussions. Internals marks can be taken for the total marks.

Internal (100 % weightage)

- Assignment 1: Write a movie review with critical analysis (20 marks).
- Assignment 2: Write a script for a scene taken from a short story / novella (20 marks).
- Presentation: Students choose any one topic related to films and present it to the audience. (25 marks)
- Group discussion: Students discuss in groups on the various aspects of movies and its impact on society. (25 marks)
- Blog entry: Making weekly blog posts in Class Blog on the topics related to the course posted by the instructor and commenting on others' posts. (10 marks)

REFERENCES

1. A Biographical Dictionary of Film by David Thomson, Secker & Warburg, 1975
2. Signs and Meaning in the Cinema by Peter Wollen, Secker & Warburg, 1969
3. The World Viewed by Stanley Cavell 1971
4. Film Style and Technology: History and Analysis by Barry Salt, Starword, 1983
5. The Encyclopedia of Indian Cinema Edited by Ashish Rajadhyaksha and Paul Willemen, BFI, 1994.

HU5275 FUNDAMENTALS OF LANGUAGE AND LINGUISTICS L T P C
3 0 0 3

OBJECTIVES

- To broadly introduce students to the formal and theoretical aspects of linguistics.
- To enable learners to understand the various practical applications of language and recent findings in the field of applied linguistics.

CONTENTS : -

UNIT I LANGUAGE AND LINGUISTICS: AN OVERVIEW 9

Language and Linguistics-Linguistic Knowledge-Knowledge of Sound Systems & Words – Creativity of Language – Relationship of form and meaning. Grammar – descriptive, prescriptive, universal-Human Language – Animal Language – Sign Language- Computers and Language.

UNIT II MORPHOLOGY - WORDS OF LANGUAGE 9

Content and function words – morphemes -free & bound –prefixes – suffixes – roots and stems – inflectional and derivational morphology-compound words and their formation – malapropisms – slips of the tongue.

UNIT III SYNTAX- THE SENTENCE PATTERNS OF LANGUAGE AND SEMANTICS-THE MEANING OF LANGUAGE 9

Syntax : Rules of Syntax- Sentence Structure-Structural Ambiguity-Syntactic Categories. Semantics: Lexical Semantics – Anomaly-Metaphors- Idioms- Synonyms – Antonyms – Homonyms -Pragmatics– Speech Acts

UNIT IV PHONETICS – THE SOUNDS OF LANGUAGE 9

Speech sounds- Introduction to branches of Phonetics- The Phonetic Alphabet – IPA – Consonants - Vowels – Diphthongs- Tone and Intonation.

Attested

UNIT V APPLIED LINGUISTICS - THE PRACTICAL APPLICATIONS OF LANGUAGE 9

Language learning and teaching (ELT)- lexicography-translation studies-computational linguistics-neurolinguistics (speech pathology and language disorders)- forensic linguistics – sociolinguistics.

TOTAL : 45 PERIODS

Teaching Methods :

Lectures, discussion.

Evaluation Internal and External :

Internal: 2 written tests + assignments, seminars, project (50+15+15+20).
External: A 3 hour written exam (50 marks)

REFERENCES :

1.Victoria Fromkin, Robert Rodman, Nina Hyams.2019.An Introduction to Language.USA.CENGAGE.11th edition
2. Cook. G,2003. Applied linguistics.UK: Oxford University Press.

HU5276 UNDERSTANDING SOCIETY AND CULTURE THROUGH LITERATURE L T P C
3 0 0 3

OBJECTIVES

- To internalize the importance of language by understanding its role in the transformation of man.
- To look at language, literature and culture as locus of identity and change.
- To extract meaning from existing literatures and cultures.
- To identify meanings in modern life by reconnecting with lost cultures.

UNIT I INTRODUCTION

Why study literature? Tracing the origin – pictures. Tokens as precursors of writing. Movement from three dimensions to two dimensions- Pictography. From visual to oral -Logography. Reading out literature to young children- Edmund J Farrell.

UNIT II READING CULTURE

Reading culture through language, signs and consumables- Roland Barthes. Culture through poems- Nissim Ezekiel's 'The night of the Scorpion' . 'Nothing's Changed'- Tatamkhulu Afrika- Apartheid. Ruskin Bond- 'Night train at Deoli'- How real life is different from movies.

UNIT III IDENTIFYING MEANING

Searching and locating meaning through literature. Looking for order in a chaotic world. The Myth of Sisyphus (Albert Camus) and Adi Shankar's 'Jagat Mithya'- the world as an illusion. The Indian version as 'meaninglesss meaning'.

UNIT IV POST MODERNISM

'If on a winter's night a traveler'- Italo Calvino. The book about the reader- the experience of reading as reading. Metafiction. Selfie Culture. Visual Culture as purpose of modern life.

UNIT V RETURNING TO PICTURES

Literature of the present- Emphasis on the visual world. Twitterature. SMS. Whatsapp language. Consumer culture. Change in fixed gender notions. Interactive sessions. Introspection.

Reading list

1. Bond, Ruskin: 'Night train at Deoli'
2. Ezekiel, Nissim: ' The Night of the Scorpion'
3. Afrika,Tatamkhulu: 'Nothing's Changed'
4. Barthes, Roland: *Mythologies*
5. Shankaracharya: *Viveka Chudamani*
6. Camus, Albert- *The Myth of Sisyphus*
7. Calvino, Italo: *If on a winter's night a traveler*
8. Farrell, Edmund J: 'Listen, my children, and you shall read'

OUTCOMES

- Can identify the connections among language, literature and culture.
- Is able to relate between seemingly different aspects of life.
- Understands the fractions in modern life and can assimilate meanings.