

# **BACHELOR OF ENGINEERING**

## **(SEMESTER SCHEME)**

### **FOUR YEAR INTEGRATED COURSE**

#### **Academic Regulations**

##### **1. Admission :**

A candidate for admission to the four year degree programme for B.E. (Civil, Chemical, Computer Science & Engineering, Electrical, Electronics & Communication, Information Technology, Mechanical, Mining, Production and Industrial Engineering) must have passed (10+2) Senior Secondary (with English, Physics, Chemistry & Mathematics) of a board situated in the State of Rajasthan or other examinations recognized as equivalent or higher thereto and selected through PET or otherwise as per the procedure laid down by the University from time to time.

2. The course of study shall extend over a period of four years (eight semesters as an integrated course). A student shall follow the prescribed courses as given in the teaching and examination scheme of the courses to which he is admitted.

3. There shall be a theory examination (Main Examination) at the end of each Semester in Civil, Chemical, Computer Science & Engineering, Electrical, Electronics & Communication, Information Technology, Mechanical, Mining, Production and Industrial Engineering, viz.,

At the end of First Semester

First B.E., First Semester Examination

At the end of Second Semester

First B.E., Second Semester Examination

At the end of Third Semester

Second B.E., Third Semester Examination

At the end of Fourth Semester

Second B.E., Fourth Semester Examination

At the end of Fifth Semester

Third B.E., Fifth Semester Examination

At the end of Sixth Semester

Third B.E., Sixth Semester Examination

At the end of Seventh Semester

Final B.E. Seventh Semester Examination

At the end of Eight Semester

Final B.E., Eight Semester Examination

(a) Practical and sessional examinations of I and II semester of First B.E. will be held at the end of II semester of the year.

(b) Practical and sessional examination of odd and even semester of Second B.E. Third B.E. & Fourth B.E. will be held at the end of each semester of the year.

(c) A candidate will be given mark sheet at the end of semester/year to indicate performance of the candidate as per the scheme of teaching and examination after the declaration of result.

4. The attendance requirement in the Faculty of Engineering shall be same as per ordinance as follows :

**O. 78-A : (1) For all regular Candidates in the Faculties of Arts, Education and Social Science, Science, Law, Commerce and engineering the minimum attendance requirement shall be that a candidate should have attended at last 70% of the lectures delivered and the tutorials held taken together as well as 70% for the practical and sessionals for the date of her/his admission.**

**(2) Condonation of shortage of attendance:**

The shortage of attendance up to the limits specified below may be condoned on valid reasons:

(i) Upto 60% in each subject plus 5 attendances in all at aggregate of subject/ papers may be condoned by the Vice Chancellor on the recommendation of the Dean / Director / Principal for undergraduate students and on the recommendation of the Head of the Department for the Post graduate classes.

(ii) The N.C.C./ N.S.S. cadets sent out to parades and camps and such students who are deputed by the University to take part in games, athletics or cultural activities may for purposes of attendance be treated as present for the days of these absence in connection with the aforesaid activities and that period shall be added to their subject wise attendance.

5. (a) A candidate who has attended a regular courses of study in the Faculty of Engineering for the first B.E. shall be eligible for appearing at the first semester examination of first B.E. for the B.E. degree which shall be common to all branches.

(b) Every candidate appearing for the first semester of first B.E. examination shall be required to show a competent knowledge of the subjects as per examination and teaching scheme.

(c) A candidate who has attended a regular course of study for the second semester of first B.E. and has appeared in the first semester examination of first B.E. for the B.E. degree, which shall be common to all branches.

(d) Every candidate appearing for the second semester for the first B.E. examination shall be required to show a competent knowledge of the subjects as per examination and teaching scheme.

6. (a) The course of study for the second B.E. Examination shall be separate for all branches of study.

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A candidate who after passing I & II semester (combined) of 1<sup>st</sup> B.E. examination with regular courses of study in a particular branch of Engineering shall be eligible for appearing at the third semester examination of second B.E. in that branch of study.

(b) Every candidate appearing for the third semester of second B.E. examination shall be required to show a competent knowledge of the subjects as per examination and teaching scheme.

(c) A candidate who has attended a regular course of study for the Fourth semester examination of second B.E. and has also appeared in the third semester examination of second B.E. shall be eligible for appearing at the fourth semester examination of second B.E. in he branch of study.

(d) Every candidate appearing for the sixth semester of third B.E. examination shall be required to show a competent knowledge of the subjects as per examination and teaching scheme.

7. (a) A candidate who after passing III & IV Semester of second B.E. examination and has attended a regular courses of study in a particular branch of Engineering for the fifth semester of Third B.E. shall be eligible for appearing at the fifth semester examination of third B.E. in that branch of study.

(b) Every candidate appearing for the fifth semester of third B.E. examination shall be required to show a competent knowledge of the subjects as per examination and teaching scheme.

(c) A candidate who has attended a regular course of study for the sixth semester of third. B.E. and also has appeared in the fifth semester examination of third B.E. shall be eligible for appearing at the sixth semester examination of third B.E. in that branch of study.

(d) Every candidate appearing for the sixth semester of third B.E. examination shall be required to show a competent knowledge of the subject as per examination and teaching scheme.

8. (a) A candidate who after passing V and VI semester of third B.E. examination and has attended a regular courses of study in particular branch of Engineering for the seventh semester of final B.E. shall be eligible of appearing at the seventh semester examination of final B.E. in that branch of study.

(b) Every candidate appearing for the seventh semester of final B.E. examination shall be required to show a competent knowledge of the subjects as per examination and teaching scheme.

(c) A candidate who has attended a regular course of study for the eighth semester of final B.E. and also appeared in the seventh semester examination of final B.E. shall

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be eligible for appearing at the eighth semester examination of final B.E. in that branch of study.

(d) Every candidate appearing for the eighth semester of final B.E. examination shall be required to show a competent knowledge of the subjects as per examination and teaching scheme.

9. Every candidate is required to undergo practical training in a workshop, factory, mine or engineering works/ design office approved by the Dean of the faculty for a period as mentioned below :

(a) Civil Engineering after II and III year	40 + 60 = 100 days
(b) Chemical Engineering after II and III year	40 + 60 = 100 days
(c) Computer Science & Engineering after II and III year	40 + 60 = 100 days
(d) Electrical Engineering after II and III year	40 + 60 = 100 days
(e) Electronics & Comm. Engineering after II and III year	40 + 60 = 100 days
(f) Mechanical Engineering after II and III year	40 + 60 = 100 days
(g) Mining Engineering after II and III year	40 + 60 = 100 days
(h) Production & Indl. Engineering after II and III year	40 + 60 = 100 days
(i) Information Technology after II and III year	40 + 60 = 100 days

10. (i) The candidate has to pass individually in all subjects of each semester from III to VIII semester. The result of I, III, V and VII semester shall be declared without awarding the division. The division will be awarded on the basis of combined performance of I & II semester, III & IV semester, V & IV semester and VII & VIII semester respectively.

(ii) For a candidate to pass in each semester he /she must obtain-

- (a) 35 percent mark in each written paper.
- (b) 50 percent mark in each of the practical & sessionals (Combined).
- (c) 45 percent in the grand total of the semester.

(iii) For written papers of first B.E. examination combined marks obtained in I & II semester shall be counted for applying clause 10 (ii) (a).

(iv) For first B.E. examination, if a candidate fails in not more than 3 units he/she shall be allowed to keep term (ATKT) in the next higher i.e., third semester, for the

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purpose of this clause each theory paper (Part I & Part II taken together) and each practical and sessionals shall be counted as one unit.

He/She shall be required to appear in those unit(s) in which he/she has failed, alongwith the corresponding semester examinations of next academic year. Candidates failed in English/Social Science shall be allowed on additional unit to keep term in higher semesters.

(v) For III to VII semester examinations, if a candidate fails in not more than three units in a semester examination he/she shall be allowed to keep term (ATKT) in the next higher semester, subject to the provision of clause 6(c) and 8(c). He/She shall appear in those unit(s) alongwith regular candidates whenever examination of that semester is held and pass in the unit(s) in which he/she has failed. For the purpose of this clause, each written paper and each practical and sessionals of a semester shall be counted as a separate unit.

NOTE : A candidate who is unable to appear at the semester examination is same papers, Practical and sessionals due to any reason what so ever, shall be considered as having filed in those paper(s), Practical(s) and Sessional(s).

(iv) All theory and practical examinations of first and second semester of each year will be held at the end of each respective semester except First year where practicals of first and second semester will be held at the end of second semester.

11. No candidate shall be permitted to pursuer a regular course of study of Fourth B.E. (VII and VIII semester) unless he/she has passed all the units of First B.E. examination. However, the unit of English/Social Science of First B.E. is exempted for the purpose.

### **12. Ex-student :**

(i) For II, and Final B.E. if a candidate fails in more than 3 units in a semester examination, he/she shall be declared as failed in that semester. For First BE, if a candidate fails in more than 3 units (excluding English/Social Science) he/she shall be declared failed.

(ii) If a candidate fails in either of the semester or both semesters of a particular year (III and IV semester of II BE, or V and VI semester of III BE, or VII and VIII semester of Final BE)) he/she shall be declared failed in that year. Such candidate shall have to pursue his /her study as a regular student as per following clauses(s):-

(a) A candidate failed in both semester of a year shall have to pursue his/her study as a regular student in both semester, shall have to take admission as regular student in that semester.

(b) A candidate failed in either semester of a year shall have to take admission as regular student in that semester. The other semester, in which he/she has been

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declared passed, shall be exempted from repeating and the marks obtained in that semester shall be carried over however, for VIII semester clause 17 shall apply.

(c) A candidate who has passed in all practicals and sessionals but has failed in more than 3 units of written papers in semester (III – VIII) shall appear in that semester examination as Ex-student in all written papers His practical and sessionals marks of that semester shall carried over.

However, such an examination-student can apply for regular course of study in the semester(s) in which he/she has failed. Being a regular student he/she shall appear in all the examinations of theory, practical and sessionals.

(d) Where a candidate fails in Practical and Sessional and is given the benefit of ATKT as per clause 10(ii), he/she may choose to attend laboratory/ sessional classes and submit a revised laboratory record/sessional. Such a candidate shall have a pay Rs. 1000/- for doing each practical and sessional during the semester.

13. A candidate may be permitted to change his/her branch of study. after passing BE I year, strictly on the basis of merit secured in BE I year examination (First and Second Semester examination taken together) depending upon the vacancies available in particular branch of study which shall be determined as follows:

The maximum strength of a branch should not increase by more than 10 percent of sanctioned strength and the minimum strength of a branch should not be decreased to less 80 percent of the sanctioned strength.

The sanctioned strength of a branch shall be reckoned to the number of candidates who have been promoted to the second year (Third Semester).

### **14. Award of Division :**

(a) First BE to Third B.E.

First Class : if a candidate secure a minimum of 60 percent.

Second Class : if a candidate secure a minimum of 50 percent.

Pass Class : if a candidate secure a minimum of 45 percent.

(b) Final B.E. for the declaration of Final B.E. result, marks shall be totaled up as follows :

First B.E. 50 % of the Marks secured.

Second B.E. 75 % of the Marks secured.

Third B.E. 100 % of the Marks secured.

Final B.E. 100 % of the Marks secured.

(c) For determining merit position of the candidates at the final year level the marks obtained by them in the second, third and final year as described shall only be considered.

(d) A candidate shall be awarded a degree with Honours if she/he secures a minimum of 70 percent of aggregate mark. A candidate shall be awarded a degree with first class if she/he secures a minimum of 60 percent of aggregate marks. A candidate shall be awarded a degree with second class if she/he secures a minimum of 50 percent of aggregate marks. The rest of the successful candidates will be awarded pass class.

**15. Requirement of additional degree:**

(a) An engineering graduate of the Jai Narain Vyas University, Jodhpur who wishes to qualify for an additional degree of Engineering of the University will be considered by a committee consisting of the Dean and the Head of Department concerned.

(b) He/she will be admitted in Third B.E. class of that branch. The Theory papers and Practicals and Sessional, which he/she has to appear at the various examinations in that branch, will be decided by the above committee.

(c) He/she will be awarded division as follows :

(i) 100 percent of marks of the paper and Practical and Sessionals and project if any, in which he/she appears for Third B.E.

(ii) And 100 per cent of the papers and Practical and Sessionals and Project if any, in which he/she appears for Final year.

(d) His/her marks for the training which he/she has undergone after Third B.E.

He/she will not be awarded division in Final year as per regulation.

He/she will not be awarded any position in the class.

(e) Mention will be made in the certificate that he/she has qualified for the additional degree.

(16) The medium of Instructions and Examination in all Engineering Examination of theory/Practical and Sessionals shall continue to be English as hitherto.

**17. Make up Examination for VII & VIII Semester:**

(a) There shall be a Make up Examination for the VII & VIII Semester held at suitable interval of time after declaration of the result of the VIII semester Examination. Candidates, who fail in this or are unable to appear in this Examination, may appear in the immediate subsequent Semester Examination.

(b) Candidates who have failed in the VIII Semester Examination but have passed in project, practical training and tour and shall be required to pass the examination in the rest of the subjects only.

(c) Candidates who passes in a limited number of Theory papers/Practical and Sessionals/Project in VIII semester Examination shall be awarded division with a mention of "Pass in more than one attempt" on the mark sheet with asterisks on the respective Theory papers/ Practical and Sessionals/Projects.

**18. For diploma passed candidates admitted to B.E.:**

(a) The diploma passed candidates admitted in the second B.E. (all branches) shall be required to undergo a regular courses of study in special Mathematics during the academic session and shall have to appear and pass in this Paper along with other Theory units of the Main Examination. For this subject, combined marks obtained in III & IV semester shall be counted for pass.

(b) No candidate for this category shall be permitted for regular course of study in Final B.E. unless he/she passed the special Mathematics paper.

**19. \* For B.Sc. Passed Candidate admitted to B.E.**

(a) The students admitted under mentioned category will have to clear definition of engineering subjects (theory and practical) of B.E. Ist year as mentioned below:

Theory:

- (i) Mechanical Engineering
- (ii) Civil Engineering
- (iii) Computer Science & Engineering
- (iv) Electrical Engg.
- (v) Electrical & Communication Engg.

Practical:

- |                                |                            |
|--------------------------------|----------------------------|
| (i) Machine Drawing            | (ii) Workshop              |
| (iii) Practical Geometry       | (iv) Civil Engineering     |
| (v) Computer Laboratory        | (vi) Electrical Laboratory |
| (vii) Electronics & Comm. Lab. |                            |

(b) No candidate of this category shall be permitted for regular course of study if final B.E. unless he/she passed all above mentioned papers in 19 (a).

\* Subject to the approval of higher bodies.

**TEACHING FACULTY**

S. No.	Name	Qualification
<b>Professor</b>		
1.	Dr. V. S. Palria, Head	B.E., M.E. Ph.D.
2.	Dr. A. S. Sheoran	B.E., M.E. Ph.D.
<b>Associate Professor</b>		
1.	Dr. S.K. Parihar	B.E., M.E. Ph.D.

**DEPARTMENT OF MINING ENGINEERING**  
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**JAI NARAIN VYAS UNIVERSITY, JODHPUR**

**BE II (Mi) 2013-14**

**Semester III Examination Scheme**

Subject Code	Subject	Lecture	Tutorial	Practical	Contact Hours	Credit	Unit	Exam Hours	Marks			
									Theory	Practical & Sessional*	Total	
SE 201 A	<b>A. Written Papers</b> Engg. Mechanics (Mi) Mechanical Engineering (Mi) Introduction to Mining (Mi) Mine Development (Mi) Geology I (Mi) Hydraulics for Mining (Mi)	3	1	-	4	3 ½	½	3	50	-	50	
ME 202 A		3	-	-	3	3	½	3	50	-	50	
MI 203 A		3	1	-	4	3 ½	½	3	50	-	50	
MI 204 A		3	1	-	4	3 ½	½	3	50	-	50	
G 205 A		3	-	-	3	3	½	3	50	-	50	
CE 206 A		2	-	-	2	2	½	3	50	-	50	
	<b>TOTAL (A)</b>	17	3	-	20	18 ½	3	18	300	-	300	
SE 221 B	<b>B. Practicals and Sessionals</b> Engg. Mechanics (Mi) Mech. Engineering (Mi) Mine Development Laboratory (Mi) Engg. Geology-I (Mi) Hydraulics for Mining (Mi) Computer Application (Mi)	-	-	2	2	1	½	2	-	50	50	
ME 222 B		-	-	2	2	1	½	2	-	50	50	
Mi 223 B		-	-	2	2	2	1	½	2	-	50	50
G 224 B		-	-	2	2	2	1	½	2	-	50	50
CE 225 B		-	-	2	2	2	1	½	2	-	50	50
Mi 226 B		-	-	2	2	2	1	½	2	-	50	50
	<b>TOTAL (B)</b>	-	-	12	12	6	3	12	-	300	300	
	<b>GRAND TOTAL (A+B)</b>	17	3	12	32	24 ½	6	12	-	600	600	

\* Tutorial, Practicals and Sessionals include quizzes, assignments and experiments.

For a pass, a candidate must obtain:

- 35 per cent in each written paper,
- 50 per cent in each of the Practicals and sessionals
- 45 per cent in the grand total

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**BE II (Mi) 2013-14****Semester IV Examination Scheme**

Subject Code	Subject	Lecture	Tutorial	Practical	Contact Hours	Credit	Unit	Exam Hours	Marks		
									Theory	Practical & Sessional*	Total
MA 251 A	<b>A. Written Papers</b> Maths (Mi) Shaft Sinking, Supports & Subsidence (Mi) Electrical Engineering (Mi) Mining Machinery I (Mi) Basic Mine Surveying (Mi) Geology II (Mi)	2	-	-	2	2	½	3	50		50
Mi 252 A		2	-	-	2	2	½	3	50		50
EE 253 A		3	1	-	4	3 ½	3	½	3	50	50
Mi 254 A		3	1	-	4	3 ½	3	½	3	50	50
Mi 255 A		2	1	-	3	2 ½	1	1	3	50	50
G 256 A		3	1	-	4	3 ½	3	½	3	50	50
	<b>TOTAL (A)</b>	15	4		19	17	3 ½	18			300
Mi 271 B	<b>B. Practicals and Sessionals</b> Comp. Application in Mining (Mi) Electrical Engineering (Mi) Mining Machinery I (Mi) Basic Mine Surveying (Mi) Engineering Geology (Mi) Mining lab, field work including Camp	-	-	2	2	½	½	2		50	50
Mi 272 B		-	-	2	2	½	½	2		50	50
Mi 273 B		-	-	2	2	½	½	2		50	50
Mi 274 B		-	-	3	3	½	½	2		50	50
G 275 B		-	-	2	2	½	½	2		50	50
Mi 276 B		-	-	2	2	½	½	-	10	50	50
	<b>TOTAL (B)</b>	-	-	13	13	3	2 ½			300	300
	<b>GRAND TOTAL (A+B)</b>	15	4	13	32	20	6			600	600

Joint award for I and II Semester (Marks not counted for award of division)

NSS/NCC etc - 2 2 2 100 100

1 ½

\* Tutorial, Practicals and Sessionals include quizzes, assignments and experiments.

For a pass, a candidate must obtain:

(a) 35 per cent in each written paper, (b) 50 per cent in each of the Practicals and sessionals (c) 45 per cent in the grand total

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**BE III (Mi) 2014-15****Semester V Examination Scheme**

Subject Code	Subject	Lecture	Tutorial	Practical	Contact Hours	Credit	Unit	Exam Hours	Marks			
									Theory	Practical & Sessional*	Total	
Mi 301 A	<b>A. Written Papers</b> Mining Machinery II (Mi) Underground Coal Mine Production (Mi) Surface Mining Production (Mi) Rock Mechanics (Mi) Advanced Mine Surveying (Mi) Economic Geology I (Mi)	3	-	-	3	3	1/2	3	50	-	50	
Mi 302 A		3	-	-	3	3	1/2	3	50	-	50	
Mi 303 A		3	-	-	3	3	1/2	3	50	-	50	
Mi 304 A		3	1	-	-	4	3 1/2	1/2	3	50	-	50
Mi 305 A		2	1	-	-	3	2 1/2	1/2	3	50	-	50
G 306 A		3	-	-	-	3	3	1/2	3	50	-	50
	<b>TOTAL (A)</b>	17	2	-	19	18	3	18	300	-	300	
Mi 321 B	<b>B. Practicals and Sessionals</b> Mining Machinery II (Mi) Mine Production Laboratory (Mi) Computers in Mining (Mi) Rock Mechanics (Mi) Advanced Mine Surveying (Mi) Economic Geology I (Mi)	-	-	2	2	1/2	1/2	2	-	50	50	
Mi 322 B		-	-	2	2	1/2	1/2	2	-	50	50	
Mi 323 B		-	-	2	2	1/2	1/2	-	-	50	50	
Mi 324 B		-	-	2	2	1/2	1/2	2	-	50	50	
Mi 325 B		-	-	3	3	1 1/2	1 1/2	2	-	50	50	
G 326 B		-	-	2	2	1	1	1/2	2	-	50	50
	<b>TOTAL (B)</b>	17	2	13	13	4 1/2	3	8	300	300	600	
	<b>GRAND TOTAL (A+B)</b>	17	2	13	32	22 1/2	6	8	300	300	600	

\* Tutorial, Practicals and Sessionals include quizzes, assignments and experiments.

For a pass, a candidate must obtain:

- 35 per cent in each written paper,
- 50 per cent in each of the Practicals and sessionals
- 45 per cent in the grand total

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**BE III (Mi) 2014-15****Semester VI Examination Scheme**

Subject Code	Subject	Lecture	Tutorial	Practical	Contact Hours	Credit	Unit	Exam Hours	Marks			
									Theory	Practical & Sessional*	Total	
Mi 351 A	<b>A. Written Papers</b> Underground Metal Mining (Mi) Sub-Surface Environment (Mi) Mine Hazards (Mi) Mine Surface Environment (Mi) Computer Application in Mines (Mi) Economic Geology II (Mi)	3	1	-	4	3 ½	½	3	50	-	50	
Mi 352 A		3	1	-	4	3	½	3	50	-	50	
Mi 353 A		3	-	-	3	3 ½	½	3	50	-	50	
Mi 354 A		3	1	-	4	3 ½	½	3	50	-	50	
Mi 355 A		2	-	-	2	½	½	3	50	-	50	
Mi 356 A		3	-	-	3	3	½	3	50	-	50	
	<b>TOTAL (A)</b>	17	3	-	20	17	3	18	300	-	300	
Mi 371 B	<b>B. Practicals and Sessionals</b> Underground Metal Mining (Mi) Sub-Surface Environment (Mi) Mine Hazards (Mi) Mine Surface Environment (Mi) Economic Geology II (Mi) Survey Camp + Training	-	-	2	2	1	½	2	-	50	50	
Mi 372 B		-	-	2	2	1	½	2	-	50	50	
Mi 373 B		-	-	2	2	2	1	½	2	-	50	50
Mi 374 B		-	-	2	2	2	1	½	2	-	50	50
Mi 375 B		-	-	2	2	2	1	½	2	-	50	50
Mi 376 B		-	-	2	2	2	1	½	2	-	50	50
	<b>TOTAL (B)</b>	-	-	12	12	6	3	12	-	300	300	
	<b>GRAND TOTAL (A+B)</b>	17	3	12	32	23	6	12	-	600	600	

Join award for I and II Semester (Make not counted for award of division)  
 NSS/NCC etc - 2 2 1 ½

\* Tutorial, Practicals and Sessionals include quizzes, assignments and experiments.

For a pass, a candidate must obtain:

(a) 35 per cent in each written paper, (b) 50 per cent in each of the Practicals and sessionals (c) 45 per cent in the grand total

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**Semester VII Examination Scheme**

**BE IV (Mi) 2015-16**

Subject Code	Subject	Lecture	Tutorial	Practical	Contact Hours	Credit	Unit	Exam Hours	Marks		
									Theory	Practical & Sessional*	Total
Mi 401 A	<b>A Written Papers</b>	3	1	-	4	3 ½	½	3	50	-	50
Mi 402 A	Mine Planning (Mi)	3	-	-	3	3	½	3	50	-	50
Mi 403 A	Mine Legislation (Mi)	2	-	-	2	2	½	3	50	-	50
Mi 404 A	Mine Management (Mi)	3	1	-	4	3 ½	½	3	50	-	50
Mi 405 A	Environment Management in Mine (Mi)	3	1	-	4	3 ½	½	3	50	-	50
G 406 A	Mineral Processing (Mi)	2	1	-	3	2 ½	½	3	50	-	50
	Elective I (Mi)	16	4		20	18	3	18	300		300
	<b>TOTAL (A)</b>										
Mi 421 B	<b>B. Practicals and Sessionals</b>	-	-	2	2	1	½	2	-	50	50
Mi 422 B	Mine Planning (Mi)	-	-	2	2	1	½	2	-	50	50
Mi 423 B	Environment Management in Mining (Mi)	-	-	2	2	1	½	2	-	50	50
Mi 424 B	Mineral Processing (Mi)	-	-	2	2	1	½	2	-	50	50
Mi 425 B	Elective I (Mi)	-	-	2	2	1	½	2	-	50	50
	Project and Seminar (Mi)	-	-	2	2	1	½	2	-	50	50
	<b>TOTAL (B)</b>			10	10	5	2 ½	10		250	250
	<b>GRAND TOTAL (A+B)</b>	16	4	10	30	23	5 ½	28		250	550

\* Tutorial, Practicals and Sessionals include quizzes, assignments and experiments.

For a pass, a candidate must obtain:

- (a) 35 per cent in each written paper,
- (d) 50 per cent in each of the Practicals and sessionals
- (e) 45 per cent in the grand total

**DEPARTMENT OF MINING ENGINEERING**  
**FACULTY OF ENGINEERING, M.B.M. ENGINEERING COLLEGE**  
**JAI NARAIN VAYS UNIVERSITY, JODHPUR**

**BE IV (Mi) 2015-16**

**Semester VIII Examination Scheme**

Subject Code	Subject	Lecture	Tutorial	Practical	Contact Hours	Credit	Unit	Exam Hours	Marks		
									Theory	Practical & Sessional*	Total
Mi 451 A	<b>A Written Papers</b>	3	-	-	3	3	½	3	50		50
Mi 452 A	Mine & Mineral Economics (Mi)	2	-	-	2	2	½	3	50		50
Mi 453 A	Advanced Mining Methods (Mi)	3	1	-	4	3 ½	½	3	50		50
Mi 454 A	Mining and Processing of Dimensional stone (Mi)	3	1	-	4	3 ½	½	3	50		50
Mi 455 A	Mines Safety Engineering (Mi)	3	1	-	4	3 ½	½	3	50		50
	<b>Elective II (Mi)</b>	14	3	-	17	15 ½	2	15	250		250
	<b>TOTAL (A)</b>										
Mi 471 B	<b>B. Practicals and Sessionals</b>	-	-	2	2	1	½	2	-	50	50
Mi 472 B	Mine & Mineral Economics (Mi)	-	-	2	2	1	½	2	-	50	50
Mi 473 B	Mining and Processing of Dimensional stones (Mi)	-	-	2	2	1	½	2	-	50	50
	<b>Elective II (Mi)</b>	-	-	6	6	3	1 ½	6	-	150	150
Mi 474 B	<b>C Practical Training &amp; Tour</b>	-	-	-	-	1	½	-	-	50	50
	Practical Training & Tour	-	-	-	-	1	½	-	-	50	50
Mi 475 D	<b>D Project</b>	-	-	8	8	3	2	-	-	150	150
	Project (Mi)	-	-	8	8	3	2	-	-	150	150
	<b>TOTAL (D)</b>	14	3	14	31	22 ½	6 ½	21	-	350	600
	<b>GRAND TOTAL (A+B+C+D)</b>										

Join award for I and II Semester (Make not counted for award of division)

NSS/NCC etc

2

2

2

1

1

100

100

100

100

100

\* Tutorial, Practicals and Sessionals include quizzes, assignments and experiments.

For a pass, a candidate must obtain:

(a) 35 per cent in each written paper, (b) 50 per cent in each of the Practicals and sessionals (c) 45 per cent in the grand total

**Electives: Mi 406/455 A**

I. Geological Exploration of Mining Deposits (Mi)

II. Underground Space Technology (Mi)

III. Numerical Methods and their Application in Mining (Mi)

IV. Rock Slop Engineer (Mi)

V. Rock Engineering (Mi)

VI. Rock Fragmentation (Mi)

VII. Mine Design and System Engg.

**SE 201 A ENGINEERING MECHANICS (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	2	1		50	50	100

Analysis of statically determinate pin-jointed frames method of joints, method of section and Graphical method.

Stress and strain Hooke's law, Tension, Compression and Shear, Complementary Shear stress, Poisson's Ratio, Elastic Constants and their relation for an isotropic material. Temperature stresses and composite bars, elastic and plastic behaviour of structural steel in tensile and compression tests. Principal planes, stresses and strains, Mohr's Circle diagram.

Strain energy and resilience: Resistance deformation diagram: Strain energy, proof Resilience, gradual, sudden and impact loading shear resilience Strain energy in terms of principal stresses.

Theories of failure: Introduction, maximum Principal stress theory, maximum Principal strain theory, Maximum shear stress, Maximum Strain energy theory and maximum shear strain energy theory.

Columns and Struts:

Introduction: Elastic stability, Euler's theory; long columns, the equivalent length, limitations of euler's formula, Rankine formula, long columns under eccentric loading, Secant formula, Parry's formula for long columns with eccentric load. Indian standard formula.

Bending moment and shearing force diagrams under static loads, concentrated, uniformly distributed and uniformly varying loads on cantilever, simply supported and overhanging beams.

Theory of simple bending, distribution of normal stress due to bending, section modulus.

Shear stress distribution in rectangular, circular, I, Tee and L-sections.

Torsion : Shear stress in solid and hollow circular shafts, angle of twist, power transmitted by shaft under pure torsion. Combined bending and torsion.

**ME 202 A MECHANICAL ENGINEERING (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	-	2	1		50	50	100

Transmission of Power: Belts, ropes and chains, length of belts, tension in belts, centrifugal tension and maximum power transmitted by belts. Simple gear trains.

Brakes and Dynamometer : Band brake, block brake, band and block brake, single and multiple disc clutches. Transmission and absorption type dynamometers.

Balancing : Balancing of rotating masses in single and multiple planes; Partial primary and secondary balancing of reciprocating masses.

Vibrations : Free, longitudinal, transverse and torsional, Critical speeds.

Bearings and Couplings : Main types of bearings and couplings, Antifriction bearings.

Lubrication : Laws of friction for dry and lubricated surfaces, Methods of lubrication of bearings.

Steam Boilers : High pressure boilers of natural and forced circulation, La Mont, Benson Loeffler, Vortex Boilers.

Steam Turbines : Expansion of Steam through nozzles with and without friction. Throat pressure for maximum discharge. Working of impulse and reaction Turbines. Compounding, Velocity diagrams. Governing in Turbines, Emergency governing.

Condensers : Types, classification and details, vacuum efficiency, cooling Towers and spray ponds.

Gas Turbines : Basis principles, Simple gas turbine cycle, application of Gas Turbines.

Refrigeration and Air Conditioning : Bell-Coleman refrigerators. Vapour compression and absorption refrigerators. Psychrometry Chart, Introduction to comfort air conditioning.

**ME 203 A INTRODUCTION TO MINING (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	-	1/2		50	-	50

Significance of Mining Industry, History of Mining, Mining & Socio-Economic impact.

Mining and Surface Environment, Health and Safety.

Mineral Resource of Rajasthan & India, Mineral and energy resources of world, Terminology in Mining.

Basic Concepts of Underground Mining, Mining methods for coal and non-coal deposits, Elementary ideas about Surface Mining, Comparison of underground and surface mining.

Prospecting & Exploration- Reconnaissance, Principles and methods-Trenching & Pitting. Boring: Principles of boring; surface layout; method of percussive, rotary, (drilling), properties of drilling muds, Core recovery: Interpretation of borehole data, borehole logging, difficult boring, directional drilling, deflection of boreholes, Difficulties in boring.

General concepts of Mine Development.

Unit Operations-drills and drilling, explosives and blasting, loading and transportation.

Drills & Drilling : Types of drills, drilling accessories, drillability of rocks, diamond drilling.

Explosives & Blasting : Types of explosives, properties of explosives, modern explosives, initiation systems, principles of blasting, Blasting practice: surface blasting, underground blasting.

Loading : Basic Loading equipment and their application.

Transportation : Basis ideas about Transportation equipment and their application.

**Mi 204 A MINE DEVELOPMENT (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	2	1		50	50	100

Different methods of entering into a deposit to be worked out by underground mining Adit, Shaft, incline shaft, incline, decline. Their merits and demerits and applicability, optimum location of shaft.

Horizontal Development Small and medium size, drifting and tunneling : Shape, size and gradient of drives and tunnels. Conventional method of drifting Drilling blasting, loading and transport of muck support, ventilation drainage. Drivage work in varying ground conditions using conventional methods.

Fast drivage and tunneling using jumbos, bores, trackless mucking and transportation units, description and details of machines, Large size drives and tunnels : Different methods of driving.

Vertical Development Conventional method of raising by raise climbers, long hole raising of driving.

**G 205 A GEOLOGY I (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	-	2	1		50	50	100

Earth Science and its branches. Introduction to geological Engineering

Origin of Earth. Earth as a planet in the Solar System, Internal Structure of the Earth.

The theory of Plate tectonics, Continental drifts, Mid-oceanic ridges. Island archs. Applications of the Plate tectonic theory.

Degradational Geomorphic Processes: Weathering its type and agent. Erosion, Denudation and Soil profile. Importance of weathering and erosion in Civil Engineering. Geological work of river, glaciers, wind, sea and Ground water.

Mineralogy : Physical properties of minerals. Brief introduction of following mineral families Quartz, Feldspar, Mica, Olivine, Pyroxene, Amphibole. Garnet, Physical properties of following rock forming minerals Quartz crystal, Jasper, Chert, Biotite, Muscovite, Orthoclase, Plagioclase, Microcline, Augite, Hornblende, Tourmaline, Nepheline, and Corundum. Physical properties of following industrial minerals Talc, Gypsum, Fluorite, Apatite, Beryl, Barite, Kyanite, Graphite. Physical properties of following ore minerals : Magnetite, Hematite, Galena sphalerite, Chalcopyrite, Bauxite, Chromite, Wolframite, Pyrolusite, Psilomelene, Pyrite and Pyrrhotite.

Structural Geology : Bedding plane, Dip and Strike, Folds, Faults and unconformity: terminology classification and identification in the field and map. Geological maps and cross sections. Cross section preparation from individual maps of simple bedding, fold fault or unconformity.

Stratigraphy : Principles of Stratigraphy. Geological Time Scale Early Earth and Precambrians of India. (Dharwar, Cuddapah, Aravalli, Delhi, Malani and Vindhyan Supergroup).

Elements of remote sensing. Aerial photo-interpretation for geological exploration in major Engineering projects. Geological mapping and preparation of Cross Sections, Subsurface exploration with pitting, trenching, shaft sinking and aditing. Their advantages and limitations. Drilling: Classification of drilling methods in various geological conditions. Advantages problems and limitations of drilling methods.

**CE 206 A HYDRAULICS FOR MINING APPLICATIONS (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
2	-	2	1		50	50	100

Properties of fluids, fluid statics and its application to mining. Hydrodynamic studies including the energy balance and Bernoulli's equation, energy losses in incompressible flow, the momentum equation and its application, and flow and pressure measuring devices. Flow in closed conduits, including series and parallel pipeline systems and pipe networks. Introduction to open channel flow.

Pumps and Pumping : Principal types, construction, operation and characteristics, calculation of size and efficiency. Installation, care and maintenance. Strength frictional resistance, installation in shafts and roadways, maintenance, damage due to corrosion, abrasive material and precaution, cleaning and replacement of pipes. Applications of industrial pumps, sumps design, hydraulic structures, underground mine dewatering systems, open pit mine drainage systems

**MA 251 A MATHEMATICS (Mi)**

**(CALCULUS, VECTORS AND STATISTICS)**

L	T	P	UNIT	Marks :	Th.	P	T
2	1	-	1/2		50	-	50

Differential Equation : Simultaneous differential equation. Total differential equations. Cauchy's or Euler's equations, initial and boundary value problems, Fourier transform, Laplace transform. Partial differential equations of first order.

Vector Calculus : Gradient, Divergence, curl, gauss, Stoke's and Green's theorems (Statement and verification only).

Complex Analysis : Analytic functions, Complex integration, Cauchy's formula, Taylor's and Laurent's expansions, Conformal mapping. Contour integration.

Statistics and Probability : Correlation and regression, Binomial, Poisson and normal distribution, theorems of probability and their applications.

**Mi 252 A SHAFT SINKING, SUPPORTS & SUBSIDENCE (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
2	-	-	1/2		50	-	50

Shaft Sinking : Size Selection, size and shape of shafts sinking, shaft-preparatory arrangements, drilling and blasting, mucking, hoisting, ventilation, pumping, lightening and supporting shafts sides, complete cycle of operation. Special methods of sinking to be used in difficult ground conditions, Enlarging and depending of shafts, Modern techniques of shaft sinking, Driving staple shafts.

Supports : Examination of roof, Material for support, Storage, preservation and fire proofing of timber, Objectives and limitations of supports under different conditions, rigid and yielding types of supports, Strata bolting, Recovery of falls, Timber, masonry, concrete and steel supports, Rules for supports in mines, withdrawl of supports.

Subsidence: Causes and impacts of subsidence; mechanics of surface subsidence, Vertical and lateral movements and their estimation; angle of fracture, angle of draw; factors affecting subsidence, discontinuous and continuous subsidence; monitoring, prediction.

**EE 253 A ELECTRICAL ENGINEERING (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	2	1		50	50	100

D.C. Machines : Constructional features, E.M.E. and torque equation, characteristics of motors, starter, speed control of motors, electric braking methods, application of d.c. motors in mines.

Three Phase Induction Motors : Constructional features, types, principle of operation, torques curves, losses, efficiency starter. Single phase induction motor, construction and starting methods.

Synchronous Generators : Construction and principle, Starting of motors, Application of a.c. machines in mines.

Three Phase Transformer : Principle of working, O.C. and S.C. test regulations and efficiency.

Power Supply System for Mines : Generation, Transmission and Distribution of electrical power for Mines, Comparison between Surface and Underground supply system. Line Conductors, insulators and underground cables for Mines and their installation. Cable types and cable jointing.

Application of Electrical Machinery to Mining : Types of transformers for use in underground haulages, pumps and working face machinery, flame proof construction; switch gear and circuit breakers; remote control devices; leakage protection, earthing and other safety device, heat control, feed back, Rating of electric motors.

**Mi 254 A MINING MACHINERY I (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	2	1		50	50	100

Compressed Air : Pipe lines and distribution of compressed air, calculations of main parameters. Comparison of compressed air with other forms of power.

Conveyor haulage different types, their construction, installation maintenance and design calculations, low profile dumpers and shuttle cars, their construction, operation and maintenance.

Aerial ropeways different types, their construction, installation operation and maintenance, their layout including ropetensioning arrangement.

Wire Ropes : Wire ropes used in mines Different types and their construction, installation and tests, Rope splicing and change of ropes. Rope caps and process of capping.

Transport : Track and mine car. Haulage track its laying and maintains, gage-selection. Mine tubs and cars their constructional details and attachments.

Rope haulage : Different types. Their constructions, installation, maintenance and design calculations.

Mine Locomotives : Different types, their construction, operation, maintenance and design calculations

**Mi-255 A - BASIC MINE SURVEYING (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
2	1	3	1 1/2		50	50	100

Miners Dial : Construction, use, tests and adjustment.

Theodolite : Various types of theodolites, temporary and permanent adjustments, measurement of horizontal and vertical angles. Tubular and through compass.

Traversing : Theodolite traversing, traverse plotting, Closing error and its adjustment. Omitted measurements and their calculations.

Levelling : Levelling instruments, Fly levelling , measurement of depth of shaft; underground levelling, subsidence survey.

Tacheometric Surveying : Principle, additive and multiplying constants, determination of constants, Reduction of data by use of techeometric table. Type of tacheometry. General procedure for field work.

Contouring: Definitions, characteristics of contours, methods of contouring by level, tacheometer, Interpolation of contours.

Triangulation Surveying : Basic concept of triangulation surveying.

**G 256 A GEOLOGY II (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	2	1		50	50	100

Agradational Geomorphic Processes : Earthquakes definition, Geological causes, measurement (Magnitude and intensity), Seismic-zones of India, Aseismic designs, Volcanoes their types products and distribution. Mountains-their types, genesis and distribution.

Igneous Rocks : Forms of Igneous rocks. Tabular classification of Igneous rocks. Texture, structures and cooling history of Igneous rocks, Crystallization of unicomponent and biocomponent magma. Petrological characters of Granite, Syenite, Gabbro, Anorthosite, Dunite, Peridotite, Pegmatite, Rhyolite, Basalt.

Sedimentary Rocks : Formation of Sedimentary rocks. Classification of Sedimentary rocks. Texture and Structures. Characteristics of conglomerate, Breccia, Sandstone, Siltstone, Shale, Limestone, dolomites and Phosphorite.

Metamorphic Rocks : Kind and agents of metamorphism. Textures and Structures of Metamorphic rocks. Metamorphic facies and grade. Characteristics of Gneiss, Phyllite Schist, Slate, Quartzite, Eclogite, Granulite.

Structural Geology : multigeneration folding. Lineation, Schistosity and Joints. Geological maps showing various combinations of fold fault, unconformity and intrusives.

Phenozoic Stratigraphy : Marwar Supergroup and Cambrians of salt range. Gondwana Supergroup. Deccan Traps. Mesozoics of Gujarat and Rajasthan. Siwalik Supergroup. Origin of Indogangetic alluvium, Thar desert and Himalaya.

Tunnels : Terminology and Classification, Hazards and influence of geological factors at tunnel sites (including, structural, Lithological and Ground water). Indian Tunnels. Geological investigations at Dem preventive measures of land slides.

**Mi 301 A MINING MACHINERY II (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	-	2	1		50	50	100

Winding : Shaft fittings and head gear design.

Winding System : Different types, mechanical and electrical braking. Ward Leonard control, automatic winding. Winding drums : types their construction and duty cycles, detaching hooks, cages, skips and suspension gear, rigid and rope guides. Methods of counter balancing loads, Multi rope winding, winding from different horizons. Design calculation for different types of winding system. Safety devices.

Signalling Safety regulations different signalling system in mines.

Mineral Handling : Layouts of pit-top and pit-bottom, details of banking, mineral handling and screening equipments, creepers, trippers, Layouts of railways siding of mines.

Mechanics of Coal Cutting : Workability of Coal, efficiency of coal cutting equipments; design of equipments; Selection and application of machinery.

Face Loaders for Coal Mines. Construction features, principal types, choice of loaders, operation and maintenance, layout of faces for working with Power loaders under varied condition.

Cutter Loaders. Coal Ploughs and continuous Miners : Principles of operation, construction features, their suitability, their choice, operation and maintenance.

**Mi 302 A UNDERGROUND COAL MINING (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	-	-	1/2		50	-	50

Stratified deposits, their origin and distribution; Characteristics of roofs, floors and associated rocks.

Factors influencing choice of Methods : Classification of mining, systems their relative and application, layout and development of mines, mechanized development layout, type of machinery, personnel; cycle of operation.

Details of Board and Pillar method size of pillars and headings, panel system application, size of panels, barrier and preparatory stoppings, working of panels; Pillar extraction and safety, room and Pillar, Method of working.

Longwall system of workings, advancing and retreating methods, development and maintenance of longwall faces, mechanization, Layout of workings for the required outputs; Length and direction of faces. Size of gates and their maintenance, organization on a longwall face.

Stowing : Principle, method of stowing hand packing (Packwalls) Mechanical, Pneumatic and hydraulic stowing their merits, demerits and applicability, collection and preparation of materials, transport, handling and storage of material on surface and underground face arrangements.

**Mi 303- A SURFACE MINING PRODUCTION (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3		2	1		50	50	100

Surface Mining : general information, basic definition, surface mining, quarrying strip mining, open pit mining, open cast mining, Terms: advantages and disadvantages. Determination of main parameters, major dimensions, heights and widths and benches. Slop angles.

Opening up of mines by surface methods, driving of ingoing trenches, laying of communication routes, system of disposal of overburden, removal of cover rocks, factors influencing selection and characteristics of opencast work.

General surface mining method, basis layouts, choice of mining method.

Major operations in surface mining.

Ground Preparation : Bull dozing, scrapping, grading, ripping.

Drilling: Criteria for selection and performance of different types of drilling equipments, drilling patterns: inclined drilling.

Blasting: Explosives and blasting equipment, primary blasting calculation of charges, multirow blasting; Twin bench blasting : Coyote blasting, secondary blasting, overcasting by explosives.

Excavation and Loading: Factors influencing choice of excavating and loading machines, their performance in different condition of ground, Power shovel, Dragline, BWE, BCE, Front end loaders, backhoes, Surface miner.

Transport: Comparative study of different transport system in opencast mines, factors influencing choice of a system, optimization of load haul system, Dumpers, Coal haulers, belt conveyer, pipe line transportation.

Storage: Stock piling and rehandling, spreaders, reclaimers.

Reclamation: Planning methods of reclamation for different types of opencast mines.

Drainage: Sources of water assessment of drainage requirements drainage patterns.

Slope Stability: Factors influencing stability of slopes, mechanics of slope failures, stability analysis, methods of improving stability of slopes, protection and monitoring, Influence of pit slope on mine economics.

### **Mi 304 A ROCK MECHANICS (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	2	1		50	50	100

Application of Rock Mechanics.

Stress and Strain in Rock: Analysis of stress, strain and constitutive relations in isotropic and anisotropic rock under static and dynamic loading.

Physico-mechanical Properties of Rock: Determination of physical properties, strengths, strength indices and static elastic constants; parameters influencing strength, abrasivity and of its determination. Specific gravity, hardness, porosity moisture content, permeability, swell index, slake durability, thermal conductivity.

Dynamic Properties of Rock and Rockmass

Time Dependent Properties of Rock: Creep deformation and strength behaviour; creep test and archeological models.

Behaviour of Rockmass: Rockmass structure, classification in- situ elastic properties and strength determination.

Failure Criteria for Rock and Rockmass: Mechanics of rock failure; Coulomb, Mohr and Griffith criteria; empirical criteria.

Pre-mining State of Stress: Sources, methods of determination including overcoring and hydro-fracturing methods.

Physico-mechanical Properties of Soil: Physical properties including consistency and gradation: classification of engineering soils; engineering properties of soils compressibility, consolidation, compaction and strength.

Ground Water: Influence of water on rock and soil behaviour; permeability of rocks; measurement of permeability; ground water flow in rockmass; measurement of water pressure.

**Mi 305 A ADVANCED MINE SURVEYING (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	2	1		50	50	100

Curve Ranging: Definition, different methods of setting out curves (apex accessible and apex inaccessible). Elements of compound curves. Methods of setting out.

Correlation: Methods of correlation of surface and underground surveys through inclines, one or two vertical shafts, steeply inclined shafts; correlation by magnetic needle; precautions and accuracy, use of Gyroscope.

Stope and Face Surveying: Use of Miner's dial, hanging compass with clinometer and theodolite in stop surveying; tape triangulation, traversing, radiation and other methods, Planimeter and its use.

Mine Plans and Sections: Legal requirements as to mine plans in India, preparation and preservation of plans and section; representation of geological and other features in mine plans and sections; tridimensional drawing; enlargement of plans, use of ediograph and pentagraph preparation of mine modes.

Photogrammetry: Introduction to photogrammetry, scale of a vertical photograph, photograph versus maps, application of photogrammetry in mining.

Dip & Fault problems:

Application of GIS, GPS and other information Technology tools in surveying and computations.

**G 306 A - ECONOMIC GEOLOGY I (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	-	2	1		50	50	100

Brief history and uses of minerals and development of Economic Geology. Minerals and their economic classification. Rock forming and economic minerals. Metallic, non metallic and Metallic minerals, non metallic (Industrial) minerals and mineral fuels (Petroleum, Coal and Nuclear minerals). Ore and gangue minerals. Importance of minerals in national economy.

Classification of economic minerals deposit forming processes. Economic minerals deposit forming processes of Igneous association and Magmatic concentration : early and late magmatic concentration processes. Economic deposits associated with acidic, basic and ultrabasic rocks.

Pegmatites : as a rock and economic deposit forming process, Simple and complex pegmatites, Indian Pegmatite belts.

Contract Metasomatism : Skarns as a process of formation of economic deposit. Role of intrusive and invaded rocks. Characteristics of the deposits. Metamorphism as ore forming process.

Hydrothermal : Process and deposits. Origin and nature of hydrothermal solutions. Wall rock alteration. Crustification and comb structures, cavity filling and metasomatic replacement type deposits. Hypo-meso-, epi-, tele-, and Xenothermal deposits.

Volcanogenic Process and deposits, Characteristics, mode of occurrence and genesis of important Indian deposits of the following metallic deposits golds, copper, lead and zinc, chromium and tungsten.

Mode of occurrence, genesis, Indian deposits and economic uses of Industrial minerals with special reference to following industries, Refractory, Abrasive, Glass and ceramic, fertilizer, cement, paint and pigment, and Gem stones.

**Mi 351 A UNDERGROUND METAL MINING (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	2	1		50	50	100

Present status of Indian metal mining industry

Mine Structures : Construction of mine portals, shaft insets and plats; ore and waste bins; skip-pockets, engine chambers, ore passes, chutes, garages, grizzlies. Underground chambers and sumps and other subsidiary excavations.

Secondary Breaking : Conventional, electrical and mechanical methods.

Stoping Methods : Selection of stoping methods, classification of different mining methods.

Stope layouts and stope preparation work with different stopping methods. Haulage and dumping, ventilation loading, underground crushing.

Open stopping method-Room and Pillar, sub-level, Shrinkage, Blast Hole and Vertical Crater Retreat, Stopping and their variations.

Supported stopping methods Timber, Post and Pillar, square set, cut and fill and their variations.

Fill Support : Material of backfill and their procurement; sand gathering plant, theoretical aspects of slurry transportation; preparation, transport and placement of hydraulic backfill with and without cement; rock and concrete fills, surface arrangement for storage and mixing; pneumatic and mechanical methods of backfill. Caving Stopping methods Top slicing, sub-level caving, block caving and their variations. Design and construction of draw points, mechanics of draw and draw control procedures, recovery and dilution.

Stopping of superimposed veins and parallel ore bodies. Combined methods.

**Mi 352 A SUB-SURFACE ENVIRONMENT (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	2	1		50	50	100

Mine Gases: Mine atmosphere its composition, Pollution of mine, air-mine gases, toxicity of gases. Origin, occurrence, physical, chemical and physiological properties of various gases and their detection.

Heat and Humidity in Mines : Rock temperature geothermic gradient auto-compression, Humidity, its determination and effects. Metabolism and respiration. Climate conditions, Kata thermometer assessment of comfort conditions. Control of temperature and humidity in deep mines. Airconditioning in mines.

Ventilation : Necessity and standard for ventilation, Flow of air in ducts and mine roadways, resistance of airways.

Law of ventilation : Chezy's and Atkinson's equation. Equivalent resistance of mines, equivalent orifice, mine characteristics.

Natural ventilation and its measurement, Thermodynamics of ventilation and determination of pressure volume diagram, Mine fans, principal types, their

construction and working, characteristics and suitability; booster and auxiliary fans, venturi and air jets.

Installation of fans, air locking arrangement, design of evasee, parallel and series operations of mines fans.

Coursing, distribution and regulation of air current and splitting in underground working; Ventilation of dead ends. System of Ventilation; Forcing and exhausting, ascensional and descensional, homotrope and antirope ventilation.

Measurement of air flow and pressure ventilation survey, ventilation.

Calculation concerning to fans and ventilation of mines, Network problems.

**Mi 353 A MINE HAZARDS (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	-	2	1		50	50	100

Mine fires and spontaneous combustion: Surface fires, its effects; causes and prevention; underground fires: (a) spontaneous combustion; its causes, detection and preventive measures; (b) accidental fires causes and prevention. Physical and chemical characteristics of coal liable to spontaneous heating, Detection by practical and scientific method, preventive measures and dealing with underground fires.

Study of atmosphere behind sealed off area, factors of conditions for reopening; different method of reopening, difficulties, dangers and safety measures various mean for fires fighting. Fire fighting organization.

Dust in mines: dangers, formation, prevention and suppression. Dust sampling apparatus, their construction and applications.

Explosion: methane layering. Types, causes of explosions and preventive measures. Fire damp explosion limits of explosibility of fire damp, factor affecting the limit of explosibility, sources of initiation of fire damp explosion. Coal dust explosion, relative inflammability of coal dust, its measurements. Factors affecting relative inflammability; safeguards against coal dust explosion, watertreatment, stone dust and dusting; stone dust and water barriers, water gas explosion causes and safety measures.

Problems of radiation in atomic mineral mines.

Mine rescue and recovery work: different type of rescue equipments; test on rescue apparatus. Rescue station, recovery and first aid appliances. Training of personnel and organization of rescue station; rescue and recovery work in connection with mine fire, explosion and other conditions.

Mine inundations: causes; precautionary measures; precautions to be taken while approaching old workings. Burnside boring apparatus. Design and construction of water dams; recovery of flooded mines. Dewatering of old working. Water blast dangers and precautions.

### **Mi 354 A MINE SURFACE ENVIRONMENT (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	2	1		50	50	100

Introduction : Environmental issues in mineral industry.

Socio-Economic Environment: Parameters, economic impacts direct and Indirect, social impact demography, housing, local services, socio cultural.

Land Environment: Visual impacts; landscape analysis; land use pattern; landscape planning; degradation of soil quality.

Water Environment: Natural drainage pattern, water table, Impact on surface water and on sub-surface waters, Acid Mine Drainage; AMD Generating Minerals, AMD Formation, its impact on the environment, problems in India.

Air Environment: Gaseous and particulate air pollution sources, monitoring and control, Airborne Repairable Dust: Generation, dispersion, measurement and control.

Ecological environment: Impacts on flora and fauna.

Noise: Impact on human health, noise level, noise abatement strategies, standards.

Blasting: Environment aspects of ground and air Vibrations, fly rock, Dust.

### **Mi 355 A COMPUTER APPLICATION IN MINING (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
2	-	-	1/2		50	-	50

Introduction to Computer Graphics: Input and Output devices, displays; graphics printers, plotters, digitizers, scanners and pointing devices.

Points, line, plane and co-ordinates. Vectors pixels and frame buffers. Line and circle generation algorithms. Introduction to 2D Transformation, Translation, rotation, scaling, shearing and reflection.

Introduction to database system. Use of any DBMS package for programming related to mining activities.

Introduction to CAD and its application of Mining.

**Mi 356 A - ECONOMIC GEOLOGY II (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	-	2	1		50	50	100

Theory of Plate tectonics and formation of economic deposits. Geothermometers and Geobarometers. Metallogenic provinces and epochs.

Economic mineral deposit forming processes of sedimentary associations.

Sedimentation: Chemical precipitation of iron and manganese deposits. Factors controlling economic concentration and their mutual dependence.

Residual Concentration: Characteristic of the process and controlling factors. Bauxite, classification and Indian deposits of bauxite. Blue dust ore. Residual Cr and Ni profiles.

Mechanical concentration : Eluvial, Alluvial, wind and beach placers, Placer gold, diamonds and thorium

Oxidation and Supergene Sulphide enrichment : formation of solvent, dissolution migration and deposition of metals. Gossans : Type and importance.

Biogenic deposits and Process.

Mode of occurrence, genesis and Important Indian deposits of iron, manganese, aluminium.

Mineral fuels : Petroleum : Origin migration, formation of Reservoir. Bombay offshore, North eastern and Cambay basin petroleum regions.

Coal : Characteristics, proximate and ultimate analysis, rank, classification and uses. Origin of coal. Indian coal and lignite fields.

Nuclear mineral deposits : their potential and genesis.

Ore microscopy : Principal, outline of important optical properties of ore minerals. Ore microscopic properties of ore minerals of gold, silver, copper, lead, zinc, iron, manganese and chromium.

**Mi 401 A – MINE PLANNING (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	2	1		50	50	100

Introduction : Mine planning and its components, role of planning in mining ventures; technical information for mine planning ; reserve estimation.

Mineral inventory and ore reserves. The basis difference cut off grade, its determination. Grade Tonnage curves and their computation.

Surface Mine Planning : Bench geometry and mine layouts, planning steps; determination of mine size and Taylor's mine life rule; ultimate pit configuration; mining programme; haul road design.

Underground Mine Planning : Mining system and sub-systems; optimal geometrical size of a mine; planning and scheduling of production.

Determination of optimum. Size of mine, life of mine, rate of production and mining losses, Optimisation of mine design on economic considerations.

Feasibility study : its functions and preparation of feasibility report for metallic and non-metallic minerals.

Details Project Report

**Mi 402 A MINE LEGISLATION (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	-	-	1/2		50		50

National Mineral Policy, Statutory laws concerned with development and conservation of minerals. Mines and Minerals (Regulation and Development) Act; Mineral Concession Rule, Minerals Conservation and Development Rules.

Statutory Laws in respect of employment, safety, health and sanitation, Mines Act, The Mines Rule; The Coal Mines and Metalliferous, Mines Regulations; Mine Rescue Rules.

Mine Vocational Training Rules : Explosives Rules, Indian Electricity Act and Rules; Pit Head Bath Rules.

**Mi 403 A MINE MANAGEMENT (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
2	-	-	1/2		50		50

Elements of management functions planning, organization and control; structure and design of organization for mining enterprises. Principles of Scientific Management, Standardisation and Rationalisation.

Personnel Management : Selection, training and development of human resource; job evaluation and incentive.

Production Management : Determination of norms and standards of operations by work study; analysis of mine capacities; production planning, scheduling and control short and long term; productivity its concept and measurement, Productivity.

PERT and CPM, Net work diagrams. Industrial psychology; human relationship; Operational research; Management by objective.

Materials Management : Introduction; purchase and stores management; inventory analysis and control; value analysis.

Financial Management : Capital and capital management in public and private enterprises; methods of cost analysis and cost control; break-even charts; standard costing and budgetary control.

**Mi 404 A – ENVIRONMENT MANAGEMENT IN MINES (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	2	1		50	50	100

Environmental impact of Mining Projects on its various stages

Waste Rock Mill Tailing disposal: Characterization, Site selection, Rock and Mill Tailing disposal: Potential environment impact, Decommissioning reclamation.

Treatment of Acid Mine Drainage: active and passive treatment technologies including constructed wetlands.

Ecological Restoration of Mining Sites: Ecological restoration, Natural restoration, Restoration planning, goal and objectives, Restoration techniques, Resilience and restoration success.

Post Mining Land Use: Management principles, Inventory of pre-mining land use, Post mining land uses, Selection of post mining land use.

Mine Closure: Causes, mine closure objective, Planning, Closure design, Risk and Socio economic response of mine closure, Closure of mine entries.

Preparation of Environment management plan: Public hearing, collecting baseline data, Environment impact assessment and prediction, Environment management plan, environment monitoring and management.

Environment Protection Act 1986 and other relevant provisions for the environment applicable to mining projects.

**Mi 405 A MINERAL PROCESSING (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	2	1		50	50	100

Communication and Liberation : Theory and practice of crushing and grinding.

Sizing and Classification : Laws of setting of solids in fluid; laboratory methods of sizing and interpretation of sizing data, Industrial sizing by screens. Types of classifiers. Classification as means of sizing/concentration.

Gravity concentration Methods : Jigging, flowing, Film concentration like spirals and shaking table, Heavy Media Separation Theory, application and limitations of each method. Introductory Froth Flotation : Physico-Chemical principles underlying flotation-reagents, flotation of sulphides, oxides and non-metallics.

Electrical Methods of Concentration : Electrostatic and Magnetic methods.

Dewatering and drying: Thickening, filtration and drying coal washing, coal washability, crushing, sizing and cleaning of coal.

Sampling : Importance and methods used in Ore-Dressing.

Simplified Flow Sheets: Beneficiation of coal and simple ores of copper, lead, zinc, Iron and manganese with reference to Indian deposits.

**Mi 406 A ELECTIVE I**

L	T	P	UNIT	Marks :	Th.	P	T
2	1	2	1		50	50	100

**Paper to be opted from 406/455**

**Mi 451 A MINE & MINERAL ECONOMICS**

L	T	P	UNIT	Marks :	Th.	P	T
3	-	2	1		50	50	100

Introduction : Economic importance of the mineral industry; mining economy, risky nature of the mining industry, State and the mining industry; national mineral policy. Royalty, taxes and duties; imports and exports.

Mineral resource concept, classification and estimation. Conservation of mineral resource scope and limitations. Small mines and their socio-economic significance. Mineral Information System.

Evaluation of Mineral Deposits: Standard controlling factors, calculation of tonnage factors and mineable ore limits, Ore classification.

Loss of mineral in mining : Classification and incorporation of losses; coefficient of completeness of mineral extraction; dilution and recovery.

Cost of mining : Capital and operating costs; factors affecting operating cost; methods of estimating future costs; standard cost and forecast; budget and budgetary control.

Mine Sampling : Theory of sampling, method of sampling employed in different cases, precaution to be taken; Reduction, Calculation of overage reef values and widths; average stopping values and width and average milling values and widths; estimation of average-tonnages and value in mine-percentage sorted, percentage recovered, sampling procedure and precaution of sampling alluvial deposits and dumps, estimation of reserves.

Mine Valuation: Different methods and their application; depreciation and amortisation and redemption of capital; Life of mine; its present value, Reports on valuation.

**Mi 452 A ADVANCED MINING METHODS (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
2	-	-	1/2		50	-	50

Supports: Powered supports, their principles of operation and design. Constructional features and application; support of wide excavations longwall faces and depillaring. Horizon mining, cross-cuts, laterals, their intervals, methods of drivage, application of the system of mining.

Modified methods of working, Thin, thick contiguous, including steeply inclined seam, working of seams liable to spontaneous heating. Working of seams under river

and water lodgements, Classification of coal underground underlying principles, applicability and practices.

Hydraulic Mining : Principles and applications, plants and layouts operations and control, advantage.

Underground Coal Gasification: Basic principal; methods of gasification; scope of application.

Mining of Thin Seams : Problems in mining thin seams; equipment and methods for thin seam extraction.

Deep Mining: Problems of deep mining and the remedical measures; design and layout of stopes in rockburst prone mines.

Special Methods : Hydraulic, thermal, hydrochemical and biochemical method; nuclear device mining system scope of application for mining of deep seated low grade mineral deposits; underwater/sea-bed mining current status; different methods of winning manganese nodules from the ocean-floor.

Recent developments in underground metal mining.

Ore mining by leaching.

### **Mi 453 A MINING AND PROCESSING OF DIMENSIONAL STONES**

L	T	P	UNIT	Marks :	Th.	P
3	1	2	1		50	100

Resources of Marble, Granite, Slate, Sandstone and Limestone as Dimensional stones in India vis-à-vis world, uses, marketing export. Allotment of lease and other legal aspects. Geological, Mineralogical and physico mechanical properties of dimensional stones, criteria for selection of dimensional stone deposit.

Mining : Convention mining of sandstone, Limestone, Marble and Granite. Wire saw, chain saw, hydraulic splitting flam jet cutting, water channeling etc. Blasting in dimensional stone mines. Development of mine, mine layout, Block yield.

Processing : Dressing, Sawing, Gangs saw, circular saws, preparation and mounting of blade/discs and segments. Polishing Manual Mechanical, various types of polishing machine.

Abrasive : Type, use and selection, shaping.

Tile preparation, automatic tiling plant.

Environmental impact of mining and processing of dimensional stones, secondary use of quarried land and waste of the industry.

### **Mi 454 A MINE SAFETY ENGINEERING (Mi)**

L	T	P	UNIT	Marks :	Th.	P	T
3	1	-	1/2		50	-	50

Development of industrial safety movement with special reference to mining; Accident costs, safety and productivity, safety standards, accident compensation and insurance.

Accident cause concept of causes; unsafe conditions; unsafe acts, purpose and procedure of investigation. Accidents reports. Corrective action; personal protective equipment, emergency organization.

Accident proneness; age experience; physical fitness; effect of environment. Accidents classifications Different bases.

Accidents rates; frequency and severity rates; inter-industry and international comparisons, accidents record and statistics. Accident and incident analysis.

Safety organization, role of Management, supervisors and workers; pit safety committee; workmen's inspection, Role of safety officers.

Arousing and maintaining safety, interest, publicity and propaganda for safety, development of safe behaviour, safety instruction, audiovisual aids, safety drives and campaigns; appraisal of safety programmes.

Safety engineering : layout and safety; maintenance and safety; job safety analysis. Safety education and training.

Vocational training as an aid of safety and productivity; techniques of training; lesson plan; training aids; training games, discussion method, motivation of workers.

Mine vocational training scheme, staff and institution facilities; training records and reports; appraisal of trainees; assessment and evaluation of training schemes.

### **Mi 455 A ELECTIVE II**

L	T	P	UNIT	Marks :	Th.	P	T
2	1	2	1		50	50	100

**Paper to be opted from 406/455**

**Mi 406/455 A - GEOLOGICAL EXPLORATION OF  
MINERAL DEPOSITS (i)**

Exploration : Basic aim of exploration.

Classification of methods of exploration.

Surface Exploration and sub surface exploration.

Aerial photography and remote sensing. Geometrical characteristics. Vertical and oblique photographs. Elements and principles of stereoscopic pairs. Satellite imagery and their interpretation. Gray, coloured and infrared photographs. Interpretative characteristics of Aerial photographs and their application in identification of Geomorphology, Structures and Lithology.

Principles of Geological exploratory mapping. Significance of various scales of mapping. Underground mapping.

Geophysical exploration : Principles of geophysical exploration, Gravity methods : Application of gravity methods to mineral exploration, surface and airborne surveys, Specific application of gravity methods : to mineral and oil exploration, Magnetic methods : Magnetic methods of geophysical exploration, organization of magnetic surveys, Regional and local surveys. Precautions in magnetic surveys, Electrical methods, Potential methods, Interpretation of potential survey data. Resistivity surveying, instruments and organization, Two layer cases and interpretation of resistivity data, Seismic methods : Instruments and organization of reflection and refraction surveys, Interpretation of seismic data; application to oil exploration.

Geochemical exploration : Principles and methods of geochemical prospecting, methods of geochemical exploration, applicability and precautions in geochemical explorations. Pedo-, Litho-, Litho-, Geo- and hydro-geochemical explorations.

Boring : Principles of boring; Selection of sites for boreholes; surface layout; method of percussive (solid hollow and ropes), rotary,(diamond, chilled shot, clays and other system), details of equipments, properties of drilling muds, core recovery wire line, core barrel: Interpretation of borehole data, borehole logging, maintenance of records, difficult boring, controlled directional drilling, deflection of boreholes, Difficulties in boring, Fishing tools and their uses.

Ore-guides and controls ; Ore show's target rings and intersecting loci, Regional and local guides to ore, Physiographic guides, Lithological and stratigraphic guides, Structural guides and fracture pattern. Mineralogical, guides, bottoming and zoning of mineral deposits.

**Mi 406/455 A - UNDERGROUND SPACE TECHNOLOGY (ii)**

Need for underground space Storage of materials, defence facilities including civil defence shelters. Nuclear waste Disposal.

Geo- engineering Investigations.

Preparing sub-surface geological x-section, geo-radar use and data analysis for shallow tunnels. Phsico-mechanical properties and collection of rock mechanical data.

Planning & Design

Determination of appropriate size and shape. Design of opening in rocks with the help of filed data, instrumentation and monitoring, Numerical modeling to assess the stability.

Underground Storage:

Storage for petroleum, storage technique, ground water requirements, water curtain system, types of storage, advantages and disadvantages, global information about oil storage, selected case histories.

Large Caverns:

Dimensioning of the cavern, study of in situ state of stress and stability of side walls, Effect of situ stress in deciding the axis of cavern.

Excavation for shallow and deep tunnels and caverns.

Shield tunneling, earth pressure balancing shields, types of shields and selection. Excavation sequence for large cavern, machines for excavation and muck transport, blast design and blasting technique.

Support design and stabilization techniques : Design of steel supports.

Environmental Aspects : Analysis of exhaust fumes, standards for ventilation in traffic tunnels and other underground facilities, Design of ventilation system.

**Mi 406 / 455 A NUMERICAL METHODS AND  
THEIR APPICATION IN MINING (Mi) (iii)**

Introduction to Elastic Rock Models : Fundamentals, Elatic, homogenous, isotropic, non-linear elastic and elasto-plastic models. Finite difference patterns solution.

Finite Element Method : The concept ; Discretization and element configuration ; Element stiffness ; Assemblage and solution.

Boundary Element Method : The concept : Discretization; Different methods of solution for isotropic and infinite media.

Practical application of above methods.

**Mi 406 / 455 A ROCK SLOPE ENGINEERING (Mi) (iv)**

Introduction, Basic Mechanics rock and spoil slope failures, Geological data collection. Geophysics for open pit sites, Shear Strength, Groundwater flow.

Design of slopes, Principles and scope. Slope design of plane wedge and circular failures. Stability analysis.

Support and reinforcement of rock slopes.

Monitoring of slopes. Blasting practice for rock slopes.

Economics and Planning consideration.

**Mi 406 / 455 A ROCK ENGINEERING (Mi) (v)**

Design and Stability of Structures in Rock: Initial rock pressure due to narrow and wide excavations. Theories of ground movement, criteria for design and support of underground excavations; design of single and multiple openings in massive, stratified and jointed rock mass; mine pillars and their classification, pillar stresses, pillar design, stability analysis of pillars.

Subsidence: Causes and impacts of subsidence; mechanics of surface subsidence, Vertical and lateral movements and their estimation; angle of fracture, angle of draw; factors affecting subsidence, discontinuous and continuous subsidence; monitoring, prediction.

Caving of Rock mass: Caving characteristics of rocks; capability index, subsidence control protection of surface structures, design of protection pillars including shafts pillars.

Rock burst: Phenomenology of rock bursts; prediction and control of rockroses; bumps and gas outbursts.

Introduction to Methods of Stress Analysis: Predictive methods for mine design; principles of classical stress analysis closed form solutions for simple excavation shapes; introduction to computational methods of stress analysis finite element, boundary element, distinct element methods and hybrid computational schemes.

Monitoring Rock mass Performance: Purpose and nature, monitoring systems including seismic and miroseismic methods.

Mechanics of Fragmentation: Mechanism of rock cutting by picks, disc and roller-cutters; water-jet cutting; mechanics of blasting; methods of assessing cutability.

**Mi 406 / 455 A - MINE DESIGN AND SYSTEM ENGINEERING (Mi) (vi)**

Technical and economical consideration in opening of deposits of open cast and Underground methods.

Different modes of entries to mine underground deposits and their selection optimum size shape and location of these mine entries.

Dividing mining properties into parts panels and level. Size of panel, level interval, size of long wall face.

Pit limit Design Determination of ultimate open pit configuration by various methods.

Introduction to Systems Engineering : Concepts of system, components and system environment; classification of system; system analysis; creative aspects of planning and design; factors influencing creativity; techniques for generating alternative ideas/ solutions.

Project Management with PERT & CPM: Assumptions of PERT and CPM; art of drawing network; redundancy and identification of redundant jobs; algorithm for calculation of critical path and identification of critical jobs; critically index; statistics to PERT; probability of completing a project by a due date; lowest cost schedule; case examples.