PROBABILITY AND STATISTICS		Semester	III
Course Code	**BMAT301**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Descriptive statistics: Statistics Introduction, Measures of Variability (dispersion) Skewness Kurtosis, correlation, correlation coefficient, rank correlation, principle of least squares, method of least squares, regression lines, regression coefficients and their properties.

Module-2

Probability: Probability, Axioms of Probability, addition law and multiplicative law of probability, conditional probability, Bayes' theorem, random variables (discrete and continuous), probability density functions, and properties. Mean, variance and Standard deviation.

Module-3

Probability distributions: Discrete distribution – Binomial, Poisson approximation to the binomial distribution and their properties. **Continuous distribution**: Exponential and Normal distribution and their properties.

Module-4

Estimation and Testing of Hypothesis: Estimation–parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test.

Large Sample Tests: Test for a single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems.

Module-5

Small sample tests: Student t–distribution (test for single mean, two means and paired t–test), testing of equality of variances (F–test), $\chi 2$ – test for goodness of fit, $\chi 2$ – test for independence of attributes.

Course outcome (Course Skill Set)

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

1. Make use of the concepts of probability and their applications
2. Apply discrete and continuous probability distributions
3. Classify the concepts of data science and its importance
4. Interpret the association of characteristics and through correlation and regression tools
5. Design the components of a classical hypothesis test
6. Infer the statistical inferential methods based on small and large sampling tests

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. S. Ross, a First Course in Probability, Pearson Education India, 2002.

3. Peyton Z. Peebles, Probability, Random Variables & Random Signal Principles –, McGraw Hill Education, 4th Edition, 2001.
4. V. K. Rohatgi & A.K. Md. Ehsanes Saleh, *An Introduction to Probability and Statistics*, John Wiley and Sons, 2001.
5. S.C Gupta, V K Kapoor, *Fundamentals of Mathematical Statistics,* S Chand Publications, 12th Edition, 2020.

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc21_ma74/preview
- https://onlinecourses.nptel.ac.in/noc22_mg31/preview

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

- Group Discussion
- Quizzes

DRILLING AND BLASTING		Semester	III
Course Code	**BMN302**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- To understand the rock breakage concepts and methods such as drill and blast; mechanical cutting.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

MODULE-1

Explosives and Initiating Systems: Types of explosives, their composition and properties, classification; Selection of explosives; Manufacture, transport, storage and handling of explosives; Testing of explosives; Types of initiating systems – Electrical Detonators, Detonating cord, Detonating Relays, NONEL, Electronic Detonators, Blasting accessories, exploders.

MODULE-2

Drilling in Surface Mines: Blasthole drills – types, classification, applicability and limitations; Mechanics of drilling, performance parameters, drilling cost, drilling errors, Selection of drilling systems, organization of drilling.

MODULE-3

Blasting in Surface Mines: Mechanics of rock fragmentation; Livingston theory of crater formation; factors affecting blast design, Blast design - estimation of burden and spacing, estimation of charge requirement; initiation patterns; secondary blasting techniques; problems associated with blasting and remedies, ground vibration and air over pressure, blast instrumentation; cast blasting.

MODULE-4

Drilling & Blasting in Underground Mines Coal mines: Drilling systems and their applicability, blasting-off-solid, different blasting cuts, calculation of specific charge, specific drilling and detonator factor, initiation patterns. **Metal mines:** Drilling systems and their applicability, blast design for horizontal drivages, different blasting cuts, long hole blasting, vertical crater retreat blasting.
MODULE-5
Mechanised Cutting: Ripping, Cutting using– surface and underground machinery, rock breakers. **Blast design and analysis software.**

PRACTICAL COMPONENT OF IPCC *(May cover all / major modules)*

Sl.NO	Experiments
1	Drilling rate index.
2	Preparation and procedure for shot firing
3	Control blasting
4	Blast vibration measurement.
5	Blast design in surface mine
6	Blast design in underground coal mine
7	Blast design in underground metal mine
8	Fragmentation analysis. **(Can be Demo experiments for CIE)**

Course outcomes (Course Skill Set):

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

- Understanding about the explosives and initiating systems used in rock breakage.
- Blast hole drilling mechanism and selection of a drill for surface excavation.
- Ability to design the surface blast round and predict the outcomes of the blast design.
- Ability to design underground blast round and predict the outcomes of the blast design.
- Understanding the basics of mechanized excavation techniques.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other

assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. Drilling and blasting of rocks – Jimeno, Carcedo, Jimeno, T&F, 1995
2. Rock Blasting and Overbreak Control- C.J. Konya, 1991
3. Surface and underground excavations – R. R. Tatiya, 2010

Web links and Video Lectures (e-Resources):

https://onlinecourses.nptel.ac.in/noc22_mm02/preview

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstrations of Videos
- Group Discussion
- Quizzes

MINING GEOLOGY		Semester	III
Course Code	**BMN303**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- The primary objective of the course is to introduce fundamental concepts, ideas and materials in geology to students of science and engineering.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

MODULE-1

Introduction to science of Geology; its various branches and its application in mining engineering. **Mineralogy:** General properties; Bowen's Reaction Series, Classification of minerals and properties of common rock-forming minerals; Megascopic identification of some rock-forming minerals.

MODULE-2

Petrology: Rock cycle, Rock types, Classification and description of some common rocks; Megascopic identification of igneous, sedimentary and metamorphic rocks.

MODULE-3

Physical Geology: Evolution of the earth; Exogenous and endogenous processes shaping the earth; Important geomorphological features.

Stratigraphy: Principles of stratigraphy; Geologic Time Scale; Broad stratigraphic subdivisions and associated rock types of important coal belts and oil fields of India.

MODULE-4

Mineral and Energy Resources: Introduction and scope of economic geology (including coal and hydrocarbon resources); Ore and gangue minerals; Resource, reserve and grade; Distribution and mode of occurrence of some mineral deposits, coal and petroleum deposits; Megascopic identification of some ore-forming minerals.
MODULE-5
Structural Geology: Interpretation of topographic and geological maps; Attitude of planar and linear structures; Effects of topography on outcrops; Unconformities, folds, faults and joints - their nomenclature, classification and recognition; Some structural geological problems and their solutions.

PRACTICAL COMPONENT OF IPCC *(May cover all / major modules)*

Sl.NO	Experiments
1	Megascopic identification of rock-forming minerals.
2	Megascopic identification of ore-forming minerals.
3	Megascopic identification of igneous, sedimentary and metamorphic rock types.
4	Megascopic identification of various types of coal.
5	Interpretation & description of topographic maps and Geological maps
6	Interpretation & description of structural geological maps – Dipping strata, Folded & Faulted strata and unconformities.
7	Tracing of out crop maps
8	To determine true dip when two apparent dips are known.
9	To determine the amount of apparent dip when true dip and direction of apparent dips are given.
10	To determine the direction of apparent dip when true dip and amount of amount of apparent are known.
11	Calculation of attitude, thickness and depth of ore bodies
12	Bore Hole problems (Three point problems): on ground level

Course outcomes (Course Skill Set):

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

- Understand the basics of mineralogy and petrology and learn identification of some minerals and rocks.
- Learn about the fundamentals of stratigraphy.
- Understand physical and structural geology and solve some structural geological problems.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the

SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. Hefferan, K. and O'Brien, J., 2010. Earth Materials, Wiley-Blackwell, Sussex; 670 p.
2. Jain, S., 2014. Fundamentals of Physical Geology, Springer, New Delhi; 494 p.
3. Van der Pluijm, B.A., Marshak, S., 2004. Earth Structure – An Introduction to Structural Geology and Tectonics, W.W. Norton & Company, New York; 656 p.

Web links and Video Lectures (e-Resources):

https://nptel.ac.in/courses/105105170

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstrations of Videos
- Group Discussion
- Quizzes
- Field visit

ELEMNTS OF MINING ENGINEERING		Semester	III
Course Code	**BMN304**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course objectives:

- To understand the basic concept of mining industry in relation to national economy and infrastructure building.
- To be familiar with the various methods for opening up of deposits.
- To understand the technical details of various unit operations involved in shaft sinking.
- To learn various methods of shaft sinking and Tunneling methods
- To be familiar with the various types of Mine supports.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Introduction to Mining Engineering: Significance to mining industry in national economy and infrastructure building, basic mining terminologies, stages in mine life cycle, geo-technical investigations, classification of mining methods and their selection criteria.

Opening up of Deposits: Types, size and location of entries into underground coal and other minerals.

Module-2

Shaft Sinking Operation: Preliminary geo-technical investigations for a shaft sinking, surface arrangements for sinking shafts and equipment. Unit-operations of drilling, blasting, mucking; temporary and permanent lining. Construction of insets and shaft stations.

Special and Mechanized Methods of Shaft Sinking: Methods of sinking shaft in water-logged, pressurized strata in loose and running soils. Mechanized shaft sinking, shaft borers and drop raise method. Need for widening and deepening of operating shafts. Different methods for widening and deepening shafts- cycles of operation, equipment and manpower needed. Numerical related to shaft sinking.

Module-3

Development of Workings: Drivage of cross cuts, drifts, inclines and raises by conventional and mechanized methods. Calculation of OMS. Arrangements for ventilations, supports, lightings, transportations and drainages. Drilling patterns for underground coal mines and hard rock mines.

Module-4
Mine Support Systems: Types of support: timber, prop, chock/cog, cross bar, concrete, steel and hydraulic supports. Yielding and rigid supports. Fore poling, roof stitching, roof bolting, applicability, advantages and limitations of various supports. Systematic support rules.
Module-5
Tunnelling Methods: Conventional Method: drilling and blasting method, types of drill patterns, blasting and transportation of muck. Mechanized Method: construction and working principle of tunnel boring machine, applicability, advantages and limitations of tunnel boring machine. Shield Tunnelling Method: construction and working principle, applicability, advantages and limitations.

Course outcome (Course Skill Set)

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

1. The students will gain technical knowledge on stages of mining and methods of development.
2. They will be able to design various drilling patterns used in drivage of adit, shaft, incline, drives, cross-cut and tunnel.
3. They will be able to identify, formulate and solve engineering problems in shaft sinking.
4. They will possess ability to use the techniques, skills, and modern engineering tools necessary for mine

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Elements of Mining Technology, vol. I, D. J. Deshmukh, Vidyasewa Prakashan, Nagpur, 7th Ed, 1996.

2. Introductory Mining Engineering, Hartman H.L, John Wiley Sons, 1st Ed. 2004.
Web links and Video Lectures (e-Resources):
• https://www.youtube.com/watch?v=HCDsFIqIfA0 • https://www.youtube.com/watch?v=S9ytDMJLHkc
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • Demonstrations of Videos • Group Discussion • Quizzes • Field visit

COMPUTER AIDED MINING DRAWING LAB		Semester	III
Course Code	**BMN305**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	03
Examination type (SEE)	Practical		

Course objectives:

- To understand the draw, modify and dimensioning tools in the CAD package
- To draw the orthographic projections
- To draw mining Machineries using CAD tools.

Sl.NO	Experiments
1	Learning of the following commands using a CAD package: Drawing Commands: Line, arc, circle, polygon, Donut, Solid, Spline Pline, Text, M Line, ellipse, dimensioning, object snaps point, Hatch, layers, Units. Exercise using Draw commands.
2	Learning of the following commands using a CAD package: Editing Commands: Limits, Erase, Array, Copy, Move, Offset, Stretch, Pedit, change properties, Trim, Extend, Fillet, Chamfer, Break, Mirror, Scale, Rotate, Zoom, Pan. Exercise using Edit commands.
3	Learning of the following commands using a CAD package: Id, list, Dist, Area, DB list, Status Selection sets i.e., window, crossing, fence, W polygon. Plotting.
4	Simple exercises using any of the above commands.
5	08 (Eight) Exercises (Mining Drawing) using any of the above commands.

Course outcomes (Course Skill Set):

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

- To use the draw, modify and dimensioning tools in the CAD package.
- Ability to draw orthographic projections using CAD package.
- Ability to draw mining Machineries using CAD tools.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- **"Machine Drawing with Auto CAD"** Goutam Pohit& Goutham Ghosh, 1st Indian print Pearson Education, 2005.
- **"Auto CAD 2006, for engineers and designers"** Sham Tickoo. Dream tech 2005.

INTRODUCTION TO DATA SCIENCE		Semester	III
Course Code	**BMN306A**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	
Examination type (SEE)	Theory		

Course objectives:

- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- Understand the basic types of data and basic statistics
- Identify the importance of data reduction and data visualization techniques

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Introduction: Definition of Data Science- Big Data and Data Science hype – and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting. Basics of R: Introduction, R- Environment Setup, Programming with R, Basic Data Types.

Module-2

Data Types & Statistical Description: Types of Data: Attributes and Measurement, What is an Attribute? The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Inter- quartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

Module-3

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting, Matrices: Creating and Naming Matrices, Matrix Sub setting, Arrays, Class. Factors and Data Frames: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames. Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors.

Module-4

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements. Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List. Functions in R: Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

Module-5

Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation. Data Visualization: Pixel-Oriented, Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

Course outcome (Course Skill Set)

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

1. Understand basic terms what Statistical Inference means.
2. Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data
3. describe the data using various statistical measures
4. utilize R elements for data handling
5. perform data reduction and apply visualization techniques

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014
2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.
4. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
5. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
6. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
7. Paul Teetor, "R Cookbook", O'Reilly, 2011.

Web links and Video Lectures (e-Resources):

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Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstrations of Videos
- Group Discussion
- Quizzes

STRENGTH OF MATERIALS		Semester	III
Course Code	**BMN306B**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3+0+0+0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3 Hrs.
Examination type (SEE)	Theory		

Course Learning objectives: This course will enable students to

- Understand the simple stresses, strains, and compound stresses in various structural components.
- Understand the bending moments and shear forces in different types of beams under various loading conditions
- Know the bending stress, shear stress, and torsional stress in beams and shafts with different cross sections
- Understand the deflection in beams and the stability of columns under different loading conditions.
- Understand the behaviour and strength of structural elements subjected to compound stresses and stresses in thin and thick cylinders.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teacher can use to accelerate the attainment of the various course outcomes.

1. Apart from conventional lecture methods various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills.
2. Arrange field visits to give brief information about the water and wastewater treatment plant.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinkingand enhance the knowledge of treatment processes.
5. Adopt Problem Based Learning (PBL), which fosters students, Analytical skills, develop thinking skills suchas the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Seminars, surprise tests and Quizzes may be arranged for students in respective subjects to develop skills

Module-1

Simple Stresses and Strains: Introduction, Properties of Materials, Stress, Strain, Hooke's law, Poisson's Ratio, Stress – Strain Diagram for structural steel, Principles of superposition, Total elongation of tapering bars of circular and rectangular cross sections. Composite section, Volumetric strain, expression for volumetric strain, Elastic constants, relationship among elastic constants. Thermal stresses and strains, Compound bars subjected to thermal stresses, state of simple shear. **(L1, L2, L3)**

Module-2

Bending moment and shear force diagrams in beams: Introduction to types of beams, supports and loadings. Definition of shear force and bending moment, sign convention, Relationship between loading, shear force and bending moment, Shear force and bending moment equations, development of Shear Force Diagram(SFD) and Bending Moment Diagram (BMD) with salient values for cantilever, simply supported and overhanging beams for point loads, UDL (Uniformly Distributed Load), UVL (Uniformly Varying Load), Couple and their combinations

(L1,L2,L3)

Module-3

Bending and Shear Stresses in Beams: Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, 'I', and 'T' sections.

Torsion in Circular Shaft: Introduction, pure torsion, Assumptions, derivation of torsion equation for circular shafts, torsional rigidity and polar modulus Power transmitted by a shaft.

(L1, L2, L3)

Module-4

Deflection of Beams: Definition of slope, Deflection and curvature, Sign conventions, Derivation of moment- curvature equation. Double integration method and Macaulay's method: Slope and deflection for standard loading cases and for determinate prismatic beams subjected to point loads, UDL, UVL and couple.

Columns and Struts: Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns. **(L1,L2,L3)**

Module-5

Compound Stresses:

Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses

Thin and Thick Cylinders:

Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, Longitudinal stress and change in volume. Thick cylinders subjected to both internal and external pressure; Lame's equation, radial and hoop stress distribution. **(L1,L2,L3)**

Course outcome (Course Skill Set)

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

1. Evaluate the simple stresses, strains and compound stresses
2. Calculate the Bending moments, shear force and draw BMD, SFD for various types of beams and loadings
3. Analyse the bending stress, shear stress and torsional stress in beams and shafts with different cross sections
4. Evaluate the deflection in beams and determine the stability of the columns.
5. Evaluate the behaviour and strength of structural elements under the action of compound stresses and stresses in thin and thick cylinders.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text Books

- B.C Punmia Ashok Jain, Arun Jain, "Strength of Materials", Laxmi - 2018-22 Publications, 10th Edition-2018
- R K Bansal, "A Textbook of Strength of Materials", 4th Edition, Laxmi Publications, 2010
- S.S. Rattan "Strength of Materials" McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint 2013).
- Vazirani, V N, Ratwani M M. and S K Duggal "Analysis of Structures Vol. I", 17th Edition, Khanna Publishers, New Delhi.
- R.K. Rajput, "Strength of materials" S. Chand Publishing (6th Edition)
- S S Bhavikatti, "Strength of Materials" Vikas Publishing (5th Edition)
- B.S. Basavarajaiah, P. Mahadevappa "Strength of Materials" in SI Units, University Press (India) Pvt. Ltd., 3rd Edition,2010

Web links and Video Lectures (e-Resources):

1.Strength of Materials web course by IIT Roorkee https://nptel.ac.in/courses/112107146/

2.Strength of Materials video course by IIT Kharagpur https://nptel.ac.in/courses/105105108/

3.Strength of Materials video course by IIT Roorkee https://nptel.ac.in/courses/112107147/18

4.All contents organized http://www.nptelvideos.in/2012/11/strengthof-materials-prof.html

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quiz (To assist in GATE Preparations)
- Demonstrations in Lab
- Virtual Lab Experiments

MASTERING OFFICE		Semester	III
Course Code	BMN358A	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	03
Examination type (SEE)	Practical		

Course objectives:

- Understand the basics of computers and prepare documents and small presentations.
- Attain the knowledge about spreadsheet/worksheet with various options.
- Create simple presentations using templates various options available.
- Demonstrate the ability to apply application software in an office environment.
- Use MS Office to create projects, applications.

Sl.NO	Experiments
1	**MS-Word**: Working with Files, Text – Formatting, Moving, copying and pasting text, Styles – Lists – Bulleted and numbered lists, Nested lists, Formatting lists. Table Manipulations.
2	**MS-Word**: Graphics–Adding clip Art, add an image from a file, editing graphics.
3	**MS-Word**: Page formatting - Header and footers, page numbers, Protect the Document, Mail Merge, Macros – Creating & Saving web pages, Hyperlinks.
4	**MS-Excel:** Modifying a Worksheet – Moving through cells, adding worksheets, rows and columns, Resizing rows and columns, selecting cells, Moving and copying cells,
5	**MS-Excel:** freezing panes - Macros – recording and running. Linking worksheets - Sorting and Filling, Alternating text and numbers with Auto fill, Auto filling functions.
6	**MS-Excel:** Graphics – Adding clip art, add an image from a file, Charts – Using chart Wizard, Copy a chart to Microsoft Word.
7	**MS-Power Point**: Create a Presentation from a template- Working with Slides – Insert a new slide, applying a design template, changing slide layouts – Resizing a text box, Text box properties.
8	**MS-Power Point**: delete a text box - Video and Audio effects, Color Schemes & Backgrounds Adding clip art, adding an image from a file, Save as a web page.
	Demonstration Experiments (For CIE)
9	**MS-Access**: Using Access database wizard, pages and projects. Creating Tables – Create a Table in design view.
10	**MS-Access**: Datasheet Records – Adding, Editing, deleting records, Adding and deleting columns Resizing rows and columns, finding data in a table & replacing, Print a datasheet. Queries - MS-Access.
11	**Microsoft Outlook:** Introduction, Starting Microsoft Outlook, Outlook Today.
12	**Microsoft Outlook:** Different Views in Outlook, Outlook Data Files.

Course outcomes (Course Skill Set):

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

- Know the basics of computers and prepare documents, spreadsheets, make small presentations with audio, video and graphs and would be acquainted with internet.
- Create, edit, save and print documents with list tables, header, footer, graphic, spellchecker, mail merge and grammar checker.
- Attain the knowledge about spreadsheet with formula, macros spell checker etc.
- Demonstrate the ability to apply application software in an office environment.
- Use Google Suite for office data management tasks.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are

appointed by the Head of the Institute.

- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- Sanjay Saxena, A First Course in Computers (Based on Windows 8 And MS Office 2013) Vikas Publishing 2015.
- Jennifer fulton, Sherri Kinkoph, and Joe Kraynak, The Big Basics Book of Microsoft Office 1997, PHI, 1998.
- Laura Acklen et al, Microsoft Office 97 Professional Essentials,EEE Que E&T, PHI (1998).
- Andy Channelle, Beginning OpenOffice 3, APress 2009.
- R. Gabriel Gurley, A Conceptual Guide to OpenOffice.Org 2 for Windows and Linux

PERSONALITY DEVELOPMENT AND SOFT SKILLS		Semester	3
Course Code	BMN358B	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	1
Examination type (SEE)	Theory		

Course objectives:

- To offer placement focused guidance across interview best practices, formal communication, and business etiquette
- To give learners a comprehensive understanding of job skills and knowledge that are essential for adapting to changes in workplace

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Chalk and talk
2. Power point Presentation, video
3. Practice sessions.

Module-1

LSRW and Personality Development: Importance of LSRW Skills: Art of listening- Listening comprehension – Art of Speaking – Art of Reading – Reading comprehension – Art of Writing – email writing Personality Development: Emotional Intelligence – Self Awareness – Self Management – Personal SWOT – Manners & Etiquette – Positive Attitude – Confidence building Interpersonal Skills: Active Listening – Motivation – Flexibility – Patience – Dependability – Adaptability – Interpersonal & Intrapersonal skills – Body Language

Module-2

NVC, Presentation and Teamwork: Non – Verbal Communication: Body language – Gestures – Postures – Eye contact – Hand Shake – First impression – Proxemics – Facial Expressions Presentation Skills: 4P's of Presentation – Communicating with Credibility – Audience analysis and Building Rapport – Usage of Figures, diagrams & Charts – Presenting with Confidence – Body Language in Presentation Teamwork: What is a Team - Stages of a Team – Benefits of Team work & Collaboration – Group vs Team – Types of Teams – Roles of the Team

Module-3

Etiquette and Management: Critical Thinking & Problem Solving: Core Skills – Uses & Importance of Critical Thinking – Principles of Critical Thinking – Facts about Problem Solving – Skills to use in Problem Solving - Problem Solving Process – Barriers to Problem Solving Time Management: Managing your time – Time wasters – Analyzing your Strengths and weakness – Goal Setting – Why Goal Setting is important - SMART Goals – Types of Goals Business Etiquette: Types of Etiquette – Importance of Etiquette – Meeting Etiquette – Office Etiquette – Phone and email Etiquette – Work Place Etiquette

Module-4

Leadership: Leadership Skills: What makes an effective Leader – Relationship Building – Leader vs Boss – Decision Making Skills – Innovation & Motivation – Dependability Business Writing – How to improve your Business writing skills – Importance of Business writing – how to write effectively – 5C's of Business writing – 4 types of Business writing Conflict Management: Strategies of Conflict Management – Best practices for Conflict Resolution –

Stress Management – Learn to say No – Importance of Conflict Management at Work Place

Module-5

V GD, Creativity and Psychometry: Group Discussion: Types of GD – Attitude & being Proactive – Time management & how to stick to it – Importance of Listening - Do's & Don'ts Creativity & Innovation: What is Creativity – What is Innovation – Difference between Creativity & Innovation – Categories and misconception of Creativity Psychometric Analysis: What is Psychometric Analysis – Cognitive Skills – Importance of Personality Tests – Personality Profiling

Course outcome (Course Skill Set)

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

1. Use English as a medium of communication in interviews and in any professional working environment proficiently
2. Develop necessary skills to Answer common interview questions, express confidence in body language and present with clarity

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

1. Personality Development And Soft Skills, Barun K Mitra, 2nd edition, Oxford University Press, 2016
2. Power of Positive thinking, Norman Vincent Peale, ISBN-13 978-0091906382, RHUK, 2016
3. Magic of thinking Big, David J Schwartz, ISBN-13 978-1785040474, Vermilion, 2016

Web links and Video Lectures (e-Resources):

- NPTEL videos.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Select a topic and write an essay
- Conduct group discussion

PROGRAMMING IN C++		Semester	3
Course Code	BMN358B	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	1
Examination type (SEE)	Theory		

Course objectives:

- Understanding about object oriented programming and Gain knowledge about the capability to store information together in an object.
- Understand the capability of a class to rely upon another class and functions.
- Understand about constructors which are special type of functions.
- Create and process data in files using file I/O functions
- Use the generic programming features of C++ including Exception handling.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information ratherthan simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Introduction to Object Oriented Programming: Computer programming background- C++ overview- First C++ Program -Basic C++ syntax, Object Oriented Programming: What is an object, Classes, methods and messages, abstraction and encapsulation, inheritance, abstract classes, polymorphism.

Textbook 1: Chapter 1(1.1 to 1.8)

Module-2

Functions in C++: Tokens – Keywords – Identifiers and constants – Operators in C++ – Scope resolution operator – Expressions and their types – Special assignment expressions – Function prototyping – Call by reference – Return by reference – Inline functions -Default arguments – Function overloading.

Textbook 2: Chapter 3(3.2,3.3,3.4,3.13,3.14,3.19, 3.20) , chapter 4(4.3,4.4,4.5,4.6,4.7,4.9)

Module-3
Inheritance & Polymorphism: Derived class Constructors, destructors-Types of Inheritance-Defining Derived classes, Single Inheritance, Multiple, Hierarchical Inheritance, Hybrid Inheritance. Textbook 2: Chapter 6 (6.2,6.11) chapter 8 (8.1 to,8.8).
Module-4
I/O Streams: C++ Class Hierarchy- File Stream-Text File Handling- Binary File Handling during file operations. Textbook 1: Chapter 12(12.5) , Chapter 13 (13.6,13.7)
Module-5
Exception Handling: Introduction to Exception - Benefits of Exception handling- Try and catch block- Throw statement- Pre-defined exceptions in C++ . Textbook 2: Chapter 13 (13.2 to13.6)
Course outcome (Course Skill Set) At the end of the course the student will be able to: 1. Able to understand and design the solution to a problem using object-oriented programming concepts. 2. Able to reuse the code with extensible Class types, User-defined operators and function Overloading. 3. Achieve code reusability and extensibility by means of Inheritance and Polymorphism 4. Identify and explore the Performance analysis of I/O Streams. 5. Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

1. Bhushan Trivedi, "Programming with ANSI C++", Oxford Press, Second Edition, 2012.
2. Balagurusamy E, Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd , Fourth Edition 2010.
3. Bhave , " Object Oriented Programming With C++", Pearson Education , 2004.
4. Ray Lischner, "Exploring C++ : The programmer's introduction to C++" , apress, 2010
5. Bhave , " Object Oriented Programming With C++", Pearson Education , 2004

Web links and Video Lectures (e-Resources):

- Basics of C++ - https://www.youtube.com/watch?v=BClS40yzssA
- Functions of C++ - https://www.youtube.com/watch?v=p8ehAjZWjPw
  Tutorial Link:
- https://www.w3schools.com/cpp/cpp_intro.asp
- https://www.edx.org/course/introduction-to-c-3

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstration of simple projects.

UNDERGROUND COAL MINING		Semester	IV
Course Code	**BMN401**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course objectives:

- Understand the mode of access to reach coal seams and choice of mine seam
- Gain knowledge of bord and pillar method of mining
- Gain knowledge of longwall method of mining.
- Knowledge of extracting of thick coal seams by special methods

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Choice of methods of mining coal seams; factors affecting choice of mining methods; In-seam and horizon mining; Underground coal mining methods, Comparison of underground mining methods.

Opening of coal seams: Types of mine entries (shaft, incline, adit), Relative advantages and disadvantages, Location of entries.

Module-2

Development: Bord and Pillar, and Room and Pillar Mining; design of bord & pillar workings, the panel system, panels and inter-panel barriers, size of pillars and galleries; methods of driving galleries; layouts for different combinations of loading and transport systems including continuous systems. **Depillaring:** preparatory arrangements for depillaring; sequence and manner of extraction of pillars; mechanized pillar extraction, setting and withdrawal of supports; air-blasts; partial extraction.

Module-3

Longwall Mining: Factors affecting longwall mining, longwall face layouts, advancing and retreating faces, single versus double unit longwall faces, orientation of longwall faces; single versus multiple heading gate roads, factors affecting length and width of longwall panel.

Module-4

Extraction of Longwall panel: working with shearer and plough, support system of longwall face and gate roads, monolithic packing in longwall advancing gate roads; case studies of longwall faces in India. Strata mechanics around Longwall panel.

Module-5

Thick seam mining: multi-section mining, slicing methods, sublevel caving, integrated sublevel caving, blasting gallery method, thick seam extraction by cable bolting, hydraulic mining.

Contiguous seam working: working under surface structures and water bodies, harmonic mining; shaft pillar extraction; Horizon mining; Gasification of coal.

Course outcome (Course Skill Set)

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

1. Ability to identify mode of access to reach coal seam and choice of mining method.
2. Ability to design bord and pillar method of mining.
3. Ability to design longwall method of mining.
4. Ability to design the extraction of thick coal seams by special methods.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Principles and Practices of coal mining by R.D.Singh
2. Underground Winning of Coal by T N Singh
3. SME Mining Engineering Handbook
4. S. S. Peng and H S Chiang, *Longwall mining,*, Wiley, New York , 708p

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=bXORrVmxwbM
- https://www.youtube.com/watch?v=-lF9sl00_WM
- https://www.youtube.com/watch?v=HG7H05u5GQc&t=6s
- https://www.youtube.com/watch?v=HHaUypSqdzM&t=21s
- https://www.youtube.com/watch?v=xDyfW8yjymM&t=34s
- https://www.youtube.com/watch?v=WUwdqSlxXuw

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstrations of Videos
- Group Discussion
- Quizzes

ROCK MECHANICS		Semester	IV
Course Code	**BMN402**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory +08 labs	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- To describe the importance of Rock Mechanics in the field of mining and identify of the physical and mechanical properties of rocks.
- To understand stress and strain in rocks and the physical and mechanical properties of rocks, and failure criteria for rock and rockmass.
- To understand the methods of in-situ strengths of rock mass

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

MODULE-1

Introduction to Rock Mechanics: Definition, Scope and importance, development and application of rock mechanics in mining. Discontinuities; Description of discontinuities, Introduction to mapping and hemispherical projection of discontinuities. Barton's shear strength of joints.

MODULE-2

Analysis of Stress: Introduction, definition and basic concepts, stress in a plane, (two dimensional stress), Mohr's Circle of stress, equations of equilibrium, plane stress equations. Simple numerical problems.

MODULE-3

Analysis of Strain: Introduction, definition and basic concepts, strain in a plane, (two dimensional strain), Mohr's Circle of strain, equations of compatibility, stress-strain relationship, plain strain equations, elasto plastic behaviour of rocks.

MODULE-4

Physico-mechanical properties of rock: Determination of physical properties, strengths, strength indices and static elastic constants; Parameters influencing strength; Abrasivity of rock and its determination.

Pre-mining state of Stress: Stresses in rock mass, Factors influencing the in-situ state of stress, Estimating in-situ stresses; Methods of Stress determination - Hydro fracturing, stress relief methods.

MODULE-5

Rock mass properties: Strength and Deformability of Rock Mass In situ shear tests; Evaluation of shear strength; In situ bearing strength test; In situ deformability tests- Plate Loading Test, Plate Jacking Test and Borehole Jack Tests.

Failure criteria for rock and rockmass: Theories of rock failure: Coulomb, Mohr and Griffith criteria; Empirical criteria.

PRACTICAL COMPONENT OF IPCC*(May cover all / major modules)*

Sl.NO	Experiments
1	Stereographic Hemispherical projections Problem 1– Bedding planes and cleavage planes
2	Stereographic Hemispherical projections Problem 2 – slope/bench failure
3	Analysis of stress using Mohr's circle.
4	Analysis of strain using Mohr's circle.
5	Use the Mohr's Circle construction to predict stresses on surfaces, construct the Coulomb failure envelope.
6	Determination of Porosity in rocks.
7	Determination of moisture content in rocks.
8	Determination of permeability of rocks.

Course outcomes (Course Skill Set):

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

- describe the importance of Rock Mechanics in the field of mining and identify of the physical and mechanical properties of rocks.
- calculate the stress and strain in rocks and rockmass.
- understand the time dependent behaviour of rock.
- Understand failure criteria for rock and rock mass.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. Fundamental of Rock Mechanics by Jaeger, J.C. and Cook, NGW
2. Underground Excavation in Rock, Hoek, E and Brown, ET
3. Rock Mechanics for Underground Mining, Brady, BHG and Brown, ET
4. Introduction to Rock Mechanics, Goodman, RE.
5. Coal Mine Ground Control: Syed Peng

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/105106055

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstrations of Videos
- Group Discussion
- Quizzes

MINE SURVEYING		Semester	IV
Course Code	**BMN403**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- Students will be given the basic idea of principles of surveying and mine surveying.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

MODULE-1

Surveying: Definition, objective, classification and principles of surveying.

Linear Measurement: Instruments for measuring distances, ranging survey lines. EDM: Principle of measurement.

Angular measurement 1: Surveyor's and Prismatic compass - principle and construction; bearing of lines; local attraction; magnetic declination.

MODULE-2

Angular Measurement 2: Essentials of the micro-optic theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments; Theodolite traversing; Computation of co-ordinates; Adjustment of traverse.

Triangulation: classification, reconnaissance, measurement, procedures for angles and base-line; GPS and its application in mine surveying.

MODULE-3

Levelling & Contouring: Types of levels, setting of level instruments and levelling staff, types of levelling methods- reciprocal levelling, profile levelling, differential levelling, reduction of levels by height of instrument method and rise and fall method.

Concept of contour, Methods of contouring and uses of contours.

Tacheometry: Principle and classification of tachometry; stadia tachometry; distance and

elevation formulae.

MODULE-4

Mine Surveying – Statutory Requirements: General requirements about mine plans and sections, Types of plans and sections, Specification of Limits of Error.

Correlation and Alignment: Correlation of surface and underground surveys: Verticality of shafts, shaft depth measurement, Direct traversing in inclined shaft, correlation in vertical shaft – single and two shafts. Underground Levelling. Determination of Gyro-north, Modern Gyro-Laser combination Correlation.

MODULE-5

Development and Stope Surveying: Control of direction and gradient in drifts, tunnels, raises, winzes, Methods of survey in moderately and steeply inclined ore bodies, flat and vertical ore bodies/seams.

Subsidence Monitoring: Subsidence Monitoring of subsidence due to underground mining activities.

Setting out curves – surface and underground.

PRACTICAL COMPONENT OF IPCC *(May cover all / major modules)*

Sl.NO	Experiments
1	Linear measurements using chains, tapes and Distometer.
2	Angular measurements using surveyor's / prismatic compass.
3	Horizontal angle by Repetition Method and by Reiteration Method.
4	A height of an object by measuring vertical angle.
5	Find the difference in elevation and calculate the reduced levels of various points by H.I method, and Rise & Fall method
6	The configuration of ground survey by conducting profile levelling using auto level.
7	Measurement of angles, distance and determination of coordinates and RL using Total Station.
8	Study of GPS and data collection.

Course outcomes (Course Skill Set):

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

- Understanding of basic principles and need of surveying.
- Knowledge on measurement tools and techniques for mining applications.
- Plans and sections to be maintained as per statutory requirements, Accuracy assessment of surveying work including required accuracy of plans and sections.
- Orientation and alignment surveys for mine development, depillaring, stoping and tunnelling operations.
- Underground stope surveying techniques.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. Punmia, B. C. (2005), Surveying Vol. 1 and II
2. Schofield, W. and Breach M. (2006), Engineering Surveying
3. S. K. Roy, *Fundamentals of Surveying*, Printice Hall of India Pvt., New Delhi , Third Printing, 2004.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/105107122
- https://nptel.ac.in/courses/105104101

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstrations of Videos
- Group Discussion
- Quizzes

MINE SURVEYING LAB		Semester	IV
Course Code	**BMNL404**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	3
Examination type (SEE)	Practical		

Course objectives:

- To gain insights to measure distance and elevation using optical instruments.
- To set out a curve in underground and surface.
- To connect the baseline from surface to underground.

Sl.NO	Experiments
1	To determine the constant K and C of the tachometer by field method.
2	To determine the distance and elevation by Stadia Method.
3	To determine the distance and elevation by Tangential Method.
4	To set out a simple curve by Deflection distance Method.
5	To set out a simple curve by Rankin's Method.
6	Correlation survey by Direct Traversing through Incline and Shaft.
7	Correlation survey by Weisback Co-planning Method.
8	Correlation survey by Weisback Triangle Method.
	Demonstration Experiments (For CIE)
9	To control the directions of underground workings.
10	To transfer levels from surface to underground.
11	Underground traversing
12	Preparation of digital mine plans using Total station data

Course outcomes (Course Skill Set):

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

- An ability to measure distance and elevation using optical instruments.
- An ability to set out an curve in underground and surface.
- An ability to connect the baseline from surface to underground.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- Punmia, B. C. (2005), Surveying Vol. 1 and II
- Schofield, W. and Breach M. (2006), Engineering Surveying

Introduction to Applied Artificial Intelligence		Semester	IV
Course Code	**BMN405A**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course objectives:

- The course examines the concepts and algorithms that lay the foundation for technologies like self-driving cars, recommendation systems, and medical diagnostics. Using simple use cases, students will gain exposure to AI algorithms through case study-based exercises

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Introduction to Artificial Intelligence (AI): What is AI and main paradigms within AI. Machine Learning (ML) techniques and its significance.

Basic Concepts of Python Programming: Python's Operators, functions, statements modules and ML libraries. Google Colab and Jupyter notebook IDE.

Module-2

Feature Engineering Variable Types, Scales of Measurement, Visual representation of data in plots, handling outliers etc.

Introduction to ML Algorithms Supervised and Unsupervised learning techniques;

Module-3

Introduction to ML Algorithms classification and regression problems; loss function; gradient descent optimizer; regularization.

Measures of Algorithm performance: Cross validation, hyperparameter tuning, overfitting, trade-off between bias and variance, confusion matrix, evaluation metrics.

Module-4

AI and ML Cloud platforms: Dataiku, Orange, Microsoft Azure, Google AI, etc. Python packages: scikit learn, keras; ML frameworks: TensorFlow.

Neural Networks: Multi-Layer Perceptron (MLP), Activation-functions, BP algorithm, convolutional neural network (CNN), recurrent neural network (RNN) and long short-term memory (LSTM).

Module-5

Natural Language Processing Tokenization, Stemming, Lemmatization, POS Tagging.

Capstone project: Solve a couple of simple machine learning case studies using the AI platforms or Python.

Course outcome (Course Skill Set)

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

1. Understand the Foundations of artificial intelligence and the recent applications. Brief overview of ML and its significance.
2. build models on data sets using different ML techniques.
3. Understand about platforms that enables non specialists with no or less coding expertise to use AI/ ML and build models.
4. Use the information learnt in the class to solve real-life problems.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Deep Learning with Python by Francois Chollet– 22 December 2017

2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, by Aurélien Géron; Third Edition– 10 October 2022

Reference Books:

3. The Hundred-Page Machine Learning Book, Andriy Burkov; 1 January 2019
4. Machine Learning Using Python, Manaranjan Pradhan, U Dinesh Kumar; Wiley (1 January 2019)

Web links and Video Lectures (e-Resources):

- .

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstrations of Videos
- Group Discussion
- Quizzes

THERMODYNAMICS & FLUID MECHANICS		Semester	IV
Course Code	**BMN405B**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course objectives:

- To understand basic principles and basic concepts of Thermodynamics.
- To understand Principles of Fluid mechanics
- To understand working principles of compressor.
- To understand the working principles of pumps, flow through pipes

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Basic concepts of Thermodynamics: Thermodynamic system, classification of thermodynamic system. Thermodynamic property- extensive and intensive properties. Thermodynamic state, thermodynamic process. Reversible, irreversible process, Quasi-static process. Thermodynamic equilibrium, zeroth law of thermodynamics.

Energy: classification, stored energy and energy in motion. Work and heat-definition, work done at the moving boundary. Comparison between work and heat.

Module-2

I and II Laws of Thermodynamics: I and II Laws of thermodynamics: Statements, cyclic processes, numerical problems.

Air Compressors: Single stage and multistage reciprocating air compressors on surface and in underground mines. Expression for work done during single stage air compression with and without clearance volume. Volumetric efficiency.Simple numerical problems on single stage compressors only.

Module-3

Fluid Mechanics: Definition and properties of Fluids, ideal and real fluid units, systems of measurement. Fluid properties-density, specific weight, specific volume, specific gravity, viscosity, compressibility, surface tension and capillarity, vapour pressure and cavitation,

Fluid flow measurements: Venturimeter, Orifice meter. Flow through orifices and notches. Loss of head due to friction in pipes. Discharge measurements in pipes.

Module-4
Fluid Statistics: pressure, atmospheric pressure, gauge and absolute pressure, measurement of pressure, piezometer tube, double column u-tube manometer, differential and inverted U-tube measurements, Bourdon's pressure gauge, diaphragm pressure gauge and dead weight pressure gauge. Total pressure and center of pressure on submerged plane surfaces; horizontal, vertical and inclined planes, curved surface submerged in liquid. **Buoyancy:** definition, center of buoyancy, metacenter and metacentric height, conditions of equilibrium of floating and submerged bodies, determination of metacentric height experimentally and theoretically.
Module-5
Fluid Dynamics: Introduction to equation of motion, Euler's equation of motion, Bernoulli's equation from first principles and also from Euler's equation, limitations of Bernoulli's equation, assumptions, hydraulic gradient line and total energy line. Numerical Problems.

Course outcome (Course Skill Set)

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

1. Able to understand basic concepts of Thermodynamics.
2. Enables to solve problem related to work & heat.
3. Able to understand principle and operation of reciprocating compressor.
4. Able to understand pumps &flow through pipes.
5. Able to understand basic principles of Fluid mechanics.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. **Engineering thermodynamics,** Nag P.K., Tata McGraw Hill publications., 2nd Ed. 2002.
2. **A** Text Book of Fluid Mechanics **and** Hydraulic Machines, R.K.Bansal, Laxmi publications. 2006.
3. **Hydraulics and Fluid Mechanics,** Modi P.N. and Seth, S.M., Standard Publishers, New Delhi., 1999.

Web links and Video Lectures (e-Resources):

- .

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstrations of Videos
- Group Discussion
- Quizzes

GEOSPATIAL TECHNIQUES IN PRACTICE		Semester	3
Course Code	**BMN405C**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course objectives:

- Introduce the concept of various geospatial technologies used in the industry
- Help to acquire basic idea about the processing and mapping with modern surveying equipment.
- Elaborate proven concepts, business practices and applications of geospatial technology.
- Explain learners understand how geospatial concepts are leveraged in handling real world business challenges of engineering and construction industry.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. The online courses available should be shared with students
2. YouTube videos
3. Power point presentations
4. Visit to Survey of India office to collect more information

Module-1

Need of Geospatial technology in Industry: Geospatial in Day to Day Life, Spatial thinking, Evolution of location technology and importance of geography and maps. Need for spatial information, Terminologies, logic, language and formats of spatial technology. Location perspective of construction industry, Overview of Geospatial technology in tenders, Design and execution and Construction lifecycle management. Fundamentals and components of Geospatial Engineering, Surveying and Conventional survey equipment Vs Modern surveying equipment Components. Digital Land Surveying Needs.

Module-2

Total Station and Global Navigation Satellite System (GNSS): Basics of Surveying, Introduction to Survey and Mapping, Geospatial Surveying Equipment, Demo of Total Station Equipment, Setting out and mapping, Advanced geospatial solutions, GNSS Overview of components, working and signal structure of Global navigation System.

Module-3

Geospatial Engineering and technology: Remote Sensing Technologies, Types of remote sensing, Sensors and its types, Application of sensors & platforms, Image Acquisition, Applications of Remote Sensing. 3D scanning, Principles and the science behind photogrammetry, LiDAR, RADAR and SONAR. Introduction to Platforms and working.

Module-4

Geographical Information System: Basics of GIS, Vector & Raster data models, Types and components of a Map. Hardware for GIS, DEM and TIN Data products, Attribute Data Types. Basic GIS data conversions, conversions from non-spatial formats to spatial formats. Demo of Conversion of Excel to GIS, Demo of Conversion of CAD TO GIS, Demo of Downloading and Geo-referencing Topo sheets and Raster files.

Module-5

Applications and Future trends of Geospatial Technologies: Application of GIS - Spatial Analysis, Catchment Area delineation, Overlay Analysis, Cluster Analysis, Hotspot Analysis and View shed Analysis. Future Trends of Geospatial Technologies. Case Study 1 -Benefit Realization - Case Study 2 Advancements in Modern Survey & Mapping Technologies, Advancements in Spatial Analytics – Geo Intelligence, Future Trends, Geospatial Technology - Way Forward.

Course outcome (Course Skill Set)

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

1. Comprehend different geospatial techniques in the Construction Industry.
2. Understand the application of geospatial equipment like Total Station, GNSS, LIDAR, UAV (Drones), etc.,
3. Evaluate the various spatial analysis operations by using GIS Environment
4. Create a map layout with all essential cartographic elements in GIS Environment.
5. Illustrate the various geospatial emerging trends of GIS in Industry.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

- T. P. Kanetkar and S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2010, 24th edition.

- James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, McGraw Hill 2001
- Satheesh Gopi, R. Sathikumar, N. Madhu, — Advanced Surveying, Total Station GPS and Remote Sensing — Pearson education, 2nd Edition,2017.
- George Joseph and C. Jeganathan, Fundamentals of Remote Sensing, Third Edition Universities Press (India) Private limited, Hyderabad, 2018
- M. Anij Reddy. Textbook of Remote Sensing and Geographical Information systems. BS Publications, 2012.

Web links and Video Lectures (e-Resources):

E-learning content on L&T EduTech Platform.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- ArcGIS Online Open source
- QGIS Open source
- GPS co-ordinates app Open source
- Total Station Demo
- GNSS Demo

Finance for Professionals		Semester	4
Course Code	BMN456A	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	1
Examination type (SEE)	Theory		

Course objectives:

- To give learners an overview of finance and develop their finance sense

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Blackboard teaching
2. Power point Presentation
3. Videos, NPTEL materials
4. Quiz/Assignments/Open book test to develop skills.

Module-1

Economics: Introduction to economics, Economic policies, Role of monetary policy in managing the economy

Module-2

Finance Vocabulary and Financial Statements: Unique role of finance, Unique role of finance example, Accounting, finance & auditing, Capital vs. revenue, Capital vs. revenue example, Sources & uses of funds, Sources & uses of funds example, Revenue recognition principles, Double entry bookkeeping, Illustration of double entry book keeping, Understanding profit & loss, Understanding profit & loss example, Profit and profitability, Profit and profitability example 1, Profit and profitability example 2

Module-3

Financial Statement and Risk Analysis: Finance metrics & financial statement analysis, Finance metrics & financial statement analysis example, understanding liquidity, understanding liquidity example, Funds flow analysis, Example of funds flow analysis, Cash flow analysis, Example of cash flow analysis, Introduction to risk management, understanding risk management example, Management of risk, understanding risk management measurement example, Understanding risk management products example, Holistic look at risk management.

Module-4

Time Value of Money: Time value of money, understanding time value of money, understanding financial functions, Applications of time value of money, Capital structure, Capital structure example, Cost of capital, Cost of capital example, Capital budgeting, Understanding capital budgeting - example

Module-5

Personal Finance: Financial Instrument, Approaches to investing, Ratios for investment, Portfolio management principles, Example of portfolio, forming a portfolio, Forming a portfolio example

Course outcome (Course Skill Set)

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

1. Understand how their work and effort contribute to organizational financial performance
2. Comprehend financial acumen and tools to optimize outcomes

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

1. Financial Management: Theory & Practice | 11th Edition by Prasanna Chandra
2. International Financial Reporting Standards (Bangalore Univ)

Web links and Video Lectures (e-Resources):

- E-learning content on L&T EduTech Platform.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Case study to understand the project finance concept

Programming in Python		Semester	IV
Course Code	**BMN456B**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	02
Examination type (SEE)	Practical		

Course objectives:

- Demonstrate the use of Python IDLE to create Python Applications.
- Develop Python programming language for solving real-world problems.
- Utilize Object-Oriented Programming concepts in Python.

Sl.NO	Experiments
1	Develop a python program to check whether the given number is odd or even
2	Develop a python program to find the smallest and largest number in a list
3	Develop a python program to arrange the numbers in ascending and descending order
4	Develop a binary search program in python
5	Develop a python program to find the best of two test average marks out of three test's marks accepted from the user.
6	Develop a Python program to check whether a given number is palindrome or not and also count the number of occurrences of each digit in the input number.
7	Write a Python program that accepts a sentence and find the number of words, digits, uppercase letters and lowercase letters.
8	Write a Python program for pattern recognition with and without using regular expressions
	Demonstration Experiments (For CIE)
9	Develop a Python program to calculate the powder factor for a given mining conditions
10	Develop a Python program to calculate the stripping ratio for a given mining conditions and to select a suitable mining method
11	Develop a Python program to calculate the productivity for a given mining conditions
12	Develop a Python program to calculate the blending ratio for a given grade of deposits from different benches

Course outcomes (Course Skill Set):

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

- Demonstrate proficiency in handling of loops, lists and creation of functions.
- Identify the commonly used operations involving regular expressions.
- Solving of mining conditions by developing program in Python.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- https://nptel.ac.in/courses/106106145
- Core Python Programming, W.Chun, Pearson.
- Introduction to Python, Kenneth A. Lambert, Cengage
- Learning Python, Mark Lutz, Orielly

Quantum GIS		Semester	IV
Course Code	**BMN456C**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	02
Examination type (SEE)	Practical		

Course objectives:

- Learning the open source QGIS software for Civil Engineering applications.
- Understand raster and vector data.
- Creation of base map and thematic maps for specific application.

Sl.NO	Experiments
1	Introduction to QGIS
2	Creating a Basic Map using QGIS
3	Classifying Vector Data using QGIS
4	Creating Maps using QGIS
5	Creating Vector Data using QGIS
6	Vector Analysis using QGIS
7	Rasters using QGIS
8	Completing the Analysis using QGIS
	Demonstration Experiments (For CIE)
9	Plugins using QGIS
10	Online Resources using QGIS
11	GRASS using QGIS
12	Any one Application exercise

Course outcomes (Course Skill Set):

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

- Use open-source software for civil engineering applications
- Various tools in QGIS software
- Create thematic layers with attribute data
- Generate maps for decision making

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- https://docs.qgis.org/2.14/en/docs/training_manual/

Technical Writing Skills		Semester	4
Course Code	**BMN456D**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	1
Examination type (SEE)	Theory		

Course objectives:

- Achieve better Technical writing and Presentation skills for employment.
- Develop adequate knowledge of paragraph writing and precise writing techniques
- Write business proposals and reports.
- Write conference papers and prepare gist of published papers.
- Develop efficiency in drafting social media posts and blogs.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Chalk and talk
2. Power point Presentation, video
3. Practice sessions.

Module-1

Technical Report Writing: Introduction to Technical writing process, Understanding of writing process, Introduction to various Technical Report writing.

Module-2

Art of condensation and Paragraph Writing: Introduction and importance, Types and principles of condensation. Importance of paragraph writing, Features and its construction styles.

Module-3

Business Report Writing: Introduction, Definition and Salient features of Business reports. Significance and types of report writing. (Formal and Informal). Resume building and Types of resumes. (samples of resumes)

Module-4

Technical Articles and Proposals: Nature and significance, Types of technical Articles Journal articles and conference papers. Elements of technical articles .Introduction to technical proposal writing, Purpose, importance, structure and types of technical proposals.

Module-5

Social media posts and Blog Writing: Ethics and practices of social media posts, Principles and fundamentals, Guiding principles for composition of articles, some common pitfalls. Maintaining common etiquette. Blogs and Blog writings strategies.

Course outcome (Course Skill Set)

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

1. Effectively communicate in technical matters.
2. Practice preparation of gist, abstract and notes from a technical article.
3. Prepare a business proposals and reports.
4. Write and respond in social media and write blogs.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Books

1. Sanjay Kumar and Pushpalata, 'Communication Skills', Oxford University Press. 2018.
2. M. Ashraf Rizvi, 'Effective Technical Communication', McGraw Hill, 2018.
3. Gajendra Singh Chauhan and et.al. 'Technical Communication', Cengage Publication, 2018.
4. Meenakshi Raman and Sangeeta Sharma, Technical Communication Principles and Practice, Oxford University Press, 2018.

Web links and Video Lectures (e-Resources):

- https://developers.google.com/tech-writing/announcements
- https://www.classcentral.com/course/technical-writing-7117.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstrations of Videos
- Group Discussion
- Practice sessions
- Presentation on any social issues
- Quizzes