Semester Lecture Plan

Name of the college: Parvatibai Chowgule College of Arts and Science (Autonomous), Margao - Goa

Name of Faculty: Shubhankar Shah	**Subject:** English	
Paper code: Eng-III.C-5	**Program/Course:** S.Y.B.A. – Contemporary Indian English Literature	**Division:** A
Academic year: 2023 - 2024	**Semester:** III	**Total Lectures: 30**

Expected Course Outcome:

1. To introduce the students to different genres of contemporary Indian writing in English.

2. To acquaint the students with the narrative of India's struggle for independence.

3. To familiarize the students with various themes and cultural contexts of Contemporary Indian English Writing.

Student Learning Outcome:

Upon completion of the course the student should be able to:

CO 1. Analyse the common tropes in prose literature of partition and children's literature.

CO 2. Define and recognize contemporary Indian English Literature.

CO 3. Identify various genres employed by the contemporary Indian English writers.

CO 4. Explain and analyse themes and narrative techniques employed by contemporary Indian English writers.

CO 5. Identify the special features of contemporary Indian Poetry and Drama.

Month	Lectures From: To:	No. of lectures	Topic, Subtopic to be covered	Exercise/Assignment	ICT Tools	Reference books

			allotted				
July	03/07/2023	04/07/2023	02	Competency Test COs, CAs and syllabus examined Unit I - Poetry: A. K. Ramanujan a) Love Poem for a Wife b) Looking for a Cousin on a Swing c) A River		Google Classroom	King, Bruce. *Modern Indian Poetry in English*. USA: Oxford University Press, 2005.
July	10/07/2023	11/07/2023	02	Unit I - Poetry: Kamala Das a) An Introduction b) My Grandmother's House c) Summer in Calcutta		Google Classroom	King, Bruce. *Modern Indian Poetry in English*. USA: Oxford University Press, 2005.
July	17/07/2023	18/07/2023	02	Jayanta Mahapatra a) Hunger b) Indian Summer		Google Classroom	King, Bruce. *Modern Indian Poetry in English*. USA: Oxford University Press, 2005.
July	24/07/2023	25/07/2023	02	Unit I - Poetry: Keki Daruwalla a) Boat-ride Along the Ganga		Google Classroom	King, Bruce. *Modern Indian Poetry in English*. USA: Oxford University

							Press, 2005.
July-August	31/07/2023	01/08/2023	02	Unit I - Poetry: Keki Daruwalla b) Draupadi c) Bars			King, Bruce. *Modern Indian Poetry in English*. USA: Oxford University Press, 2005.
August	07/08/2023	08/0/2023	02	Adil Jussawala a) On First Approaching Santacruz Airport, Bombay		Google Classroom	Monica. *Modern Indian Poetry in English.* New Delhi: Oxford University Press, 2010
August	07/08/2023	08/0/2023	02	Unit I - Poetry: Nissim Ezekiel a) Goodbye Party for Miss Pushpa T.S. b) Background Casually		Google Classroom	Iyengar, K. R. S. *Indian Writing in English*. New Delhi: Sterling Publishers Pvt. Ltd., fourth edition, 1984.
August	14/08/2023	15/0/2023 Independence Day holiday	01	Unit I - Poetry: Nissim Ezekiel c) Poet, Lover, Birdwatcher		Google Classroom	Iyengar, K. R. S. *Indian Writing in English*. New Delhi: Sterling Publishers Pvt. Ltd., fourth edition, 1984.
			02	Unit I - Poetry:		Google	Naik, M. K, S.

August	21/08/2023	22/0/2023		Arun Kolatkar a) The Bus b) An Old Woman c) Ajamil and the Tigers		Classroom	K. Desai and G. S. Amur. *Critical Essays on Indian Writing in English.* New Delhi: MacMillan, 1968.
August	28/08/2023	29/0/2023	02	Unit II – Drama Mahesh Dattani - Final Solutions		Google Classroom	Iyengar, K. R. S. *Indian Writing in English*. New Delhi: Sterling Publishers Pvt. Ltd., fourth edition, 1984.
September	04/09/2023	05/09/2023	02	Unit II – Drama Mahesh Dattani - Final Solutions		Google Classroom	Iyengar, K. R. S. *Indian Writing in English*. New Delhi: Sterling Publishers Pvt. Ltd., fourth edition, 1984.
September	11/09/2023	12/09/2023	02	Unit II – Drama Mahesh Dattani - Final Solutions		Google Classroom	Iyengar, K. R. S. *Indian Writing in English*. New Delhi: Sterling Publishers Pvt. Ltd., fourth edition, 1984.
September	18/09/2023	23/09/2023					

September	25/09/2023	26/09/2023	02	Unit II – Drama Girish Karnad - Yayati		Google Classroom	Joshi, Dr. Rakesh. *Girish Karnad's Plays.* Jaipur: Mark Publishers, 2011.
October	02/10/2023 Gandhi Jayanti	03/10/2023	01	Unit II – Drama Girish Karnad - Yayati		Google Classroom	Joshi, Dr. Rakesh. *Girish Karnad's Plays.* Jaipur: Mark Publishers, 2011.
October	09/10/2023	10/10/2023	02	Unit II – Drama Girish Karnad - Yayati		Google Classroom	Joshi, Dr. Rakesh. *Girish Karnad's Plays.* Jaipur: Mark Publishers, 2011.
October	16/10/2023	17/10/2023	02	Revision			
October - November	23/10/2023	11/11/2023		Diwali Holidays			
November - December	14/11/2023	02/12/2023		Exams			

Assessment Rubrics

Component	Max Marks
CA 1 - Educational Resource - Podcast (Unit 1: Poetry)	20
CA 2 - Role Play (Unit 2: Drama)	20
CA 3 - Open Presentation (Unit 3 & 4: Short Stories & Novel) - Loretta	20
CA 4 – Term Paper - (Unit 1 to 4)	40

Semester Lecture Plan

Name of the college: Parvatibai Chowgule College of Arts and Science (Autonomous), Margao - Goa

Name of Faculty: Shubhankar Shah	**Subject:** English	
Paper code: ENG-IV.C-6	**Program/Course:** S.Y.B.A. – Literary Criticism	**Division:** A
Academic year: 2023 - 2024	**Semester:** IV	**Total Lectures: 60**

Expected Course Outcome:

1. To enable the students to understand the nature of literary criticism.
2. To acquaint them with the terminology of literary criticism.
3. To provide them the knowledge of the important schools of literary criticism with the help of representative texts.
4. To help the students grasp methods and techniques of interpreting literature.
5. To be able to apply literary theory to text.

Student Learning Outcome:

Upon completion of the course the student should be able to:

CO 1: Demonstrate an understanding of key concepts in literary Criticism.

CO 2: Explain the meaning, significance, and value of specific works literary criticism.

CO 3: Use literary theoretical concepts to develop one's own interpretations of literary texts.

CO 4: Analyze specific literary theories in order to distinguish them from other theories and to identify the structure and logic of their arguments.

CO 5: Think critically about a range of literary theories.

Month	Lectures From:	To:	No. of lectures allotted	Topic, Subtopic to be covered	Exercise/ Assignment	ICT Tools	Reference books
December 2023	11/12/2023	15/12/2023	04	Competency Test Unit I: Introduction to literary Criticism 1. What is literature? 2. Difference between Literary Theory and Literary Criticism. 3. Functions of literary Criticism		Google Classroom	Habib M. A. R. *A History of Literary Criticism and Theory*. Blackwell Publishing, U.S.A., 2008.
	18/12/2023	22/12/2023	03	Unit I: Introduction to literary Criticism 4. Types of literary Criticism. 5. A brief survey of major critical schools Unit II: Classical Criticism 1. Features of Classical Criticism 2. Plato on Imitation and Art		Google Classroom	Daiches, David. *Critical Approaches to Literature*. Orient Longman, Mumbai,1967. Plato. *The Republic*. Rupa Publications, India, 2013.
	24/12/2023	1/01/2024		Christmas Vacation			
January 2024	02/01/2024	05/01/2024	03	Unit II: Classical Criticism 3. Aristotle's Poetics 4. Longinus' On the Sublime		Google Classroom	Aristotle. *The Poetics of Aristotle*. Emereo Publishing, Australia, 2012. Giles, Herbert Allen. *Longinus on the Sublime*. Kessinger Publishing,

							U.S., 2010.
	08/01/2024	12/01/2024	04	Unit III: Neo-Classical Criticism 1. Features of Neo-Classical Criticism		Google Classroom	Habib M. A. R. *A History of Literary Criticism and Theory.* Blackwell Publishing, U.S.A., 2008.
	15/01/2024	19/01/2024	04	Unit III: Neo-Classical Criticism 2. John Dryden- Essay of Dramatick Poesie		Google Classroom	Arnold, Thomas. *Dryden: An Essay of Dramatic Poesy*. Atlantic Publisher, New Delhi, 2006.
	22/01/2024	26/01/2024	04	Unit III: Neo-Classical Criticism 3. Alexander Pope- Essay on Criticism		Google Classroom	Habib M. A. R. *A History of Literary Criticism and Theory.* Blackwell Publishing, U.S.A., 2008.
	29/01/2024	02/02/2024	04	Unit III: Neo-Classical Criticism 4. Dr. Samuel Johnson- Preface to Shakespeare		Google Classroom	Habib M. A. R. *A History of Literary Criticism and Theory.* Blackwell Publishing, U.S.A., 2008.
February 2024	5/02/2024	9/02/2024	04	Unit IV: Romantic Criticism 1. Features of Romantic Criticism		Google Classroom	Habib M. A. R. *A History of Literary Criticism and Theory.* Blackwell Publishing, U.S.A., 2008.
	12/02/2024	16/02/2024	04	Unit IV: Romantic Criticism 2. William Wordsworth- Preface to Lyrical Ballads.		Google Classroom	Habib M. A. R. *A History of Literary Criticism and Theory.* Blackwell Publishing, U.S.A., 2008.
	19/02/2024	23/02/2024	04	Unit IV: Romantic Criticism		Google Classroom	Nandwani Aditya. *S.T. Coleridge-Biographia*

				2. William Wordsworth- Preface to Lyrical Ballads.			*Literaria.* Anmol Publications Pvt. Ltd., New Delhi, 2009
	26/02/2024	1/03/2024	04	Unit IV: Romantic Criticism 3. Samuel Taylor Coleridge- Biographia Literaria –His concept of fancy and imagination, language of poetry.		Google Classroom	Nandwani Aditya. *S.T. Coleridge-Biographia Literaria.* Anmol Publications Pvt. Ltd., New Delhi, 2009
March 2024	4/03/2024	8/03/2024	04	Unit V: New Criticism 1. Features of New Criticism		Google Classroom	Wellek Rene. *A History of Modern Criticism*. Yale University Press, U.S., 1986
	11/03/2024	15/03/2024	04	Unit V: New Criticism 2. Thomas Stearns Eliot - Tradition and the Individual Talent		Google Classroom	Habib M. A. R. *A History of Literary Criticism and Theory.* Blackwell Publishing, U.S.A., 2008.
	18/03/2024	22/03/2024	04	Unit V: New Criticism 2. Thomas Stearns Eliot - Tradition and the Individual Talent		Google Classroom	Habib M. A. R. *A History of Literary Criticism and Theory.* Blackwell Publishing, U.S.A., 2008.
	25/03/2024	29/03/2024	04	Unit V: New Criticism 3. Ivor Armstrong Richards - Four Kinds of Meaning		Google Classroom	Habib M. A. R. *A History of Literary Criticism and Theory.* Blackwell Publishing, U.S.A., 2008.
	01/04/2024	05/04/2024	04			Google	Habib M. A. R. *A History*

				Unit V: New Criticism 3. Ivor Armstrong Richards - Four Kinds of Meaning		Classroom	*of Literary Criticism and Theory*. Blackwell Publishing, U.S.A., 2008.

Assessment Rubrics

Component	**Max Marks**
ISA 1 (CA1) – Class Presentation – Group (Unit 1 to 5)	30
ISA 2 (CA2) – MCQ (Unit 1 to 5)	30
SEE - Written Test (Unit 1 to 5)	40
Practical	NA
Project	NA

Practical Plan-2023- 2024

Name of the College: Parvatibai Chowgule College of Arts and Science (Autonomous), Gogol Margao-Goa

Name of Faculty: Dr. Meghana S Devli	**Subject:** Geology	**Course Code:** UG-GEL-102
Course Title: Earth's Dynamics and Tectonics	**Program: FY BSc**	**Division: A**
Academic year: 2023 – 2024	**Semester: II**	**Total Practical Sessions: 15**

Course Objectives: This is a core branch of earth science which deals with basic concepts of natural internal forces shaping the earth. Earth's Dynamics and Tectonics aims at acquainting the student with these forces as well as the geological structures resulting from the action of these forces on rocks.

Expected Course Outcome: The course also aims at providing an understanding of the processes in action on the earth's surface and their impact on man and his institutions.

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

CLO4 Read and interpret geological maps and draw geological cross – sections.

CLO5 Derive graphical solution to structural problems.

Practical Number	Practical Session	Tentative Date	Remark
1	Briefing about the practical sessions	18.12.23	
2	----	25.12.23	Christmas
3	----	01.01.24	New Year Eve
4	Horizontal single series	08.01.24	
5	Horizontal single series with vertical dyke	15.01.24	
6	Horizontal single series with vertical dyke	22.01.24	
7	Practical Assessment - 1	29.01.24	
8	Inclined single series	05.02.24	
9	Inclined single series with intrusion	12.02.24	
10	Inclined single series with intrusion	19.02.24	

11	Practical Assessment - 2	26.02.24	
12	Graphical solutions to structural problems	04.03.24	
13	Graphical solutions to structural problems	11.03.24	
14	Graphical solutions to structural problems	18.03.24	
15	----	25.03.24	Holi
16	Practical Assessment - 3	01.04.24	

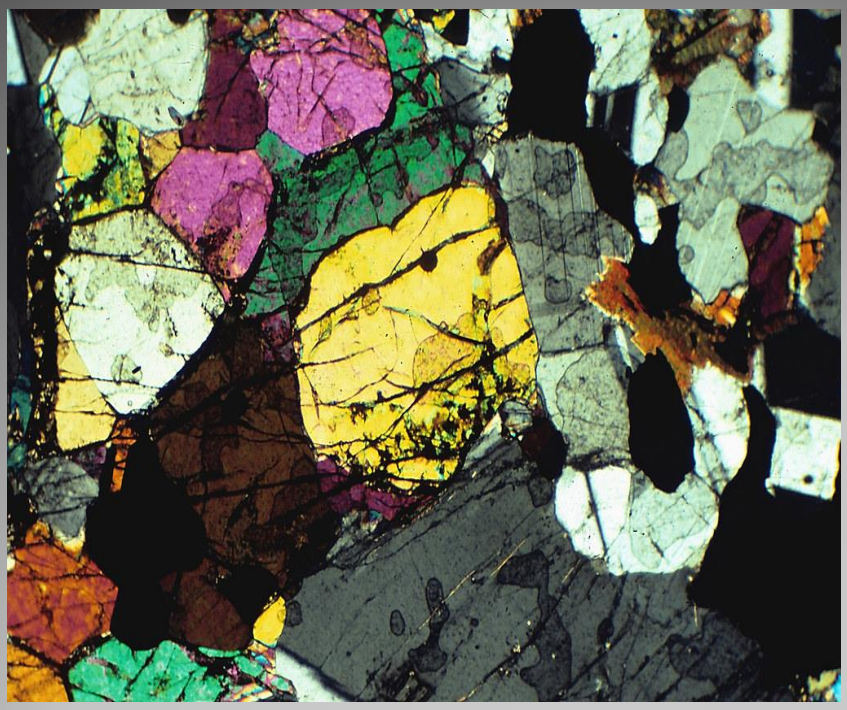
List of books recommended for reference

Mandatory reading

- Monroe and Wicander., (2001) The Changing Earth: Exploring Geology and Evolution (3rd edition).
- Jain, A K., Structural Geology, , Geological Society of India.
- Hils, E. S., Elements of Structural Geology, Methuen.

Supplementary Reading

- Zumberge J.H. & Nelson C.A., Elements of Geology (3rd edition), John Wiley & Sons, New York.



Advanced Mineralogy and Geochemistry (Core)

Faculty Details

Dr Meghana S Devli, Associate Professor, Department of Geology, Parvatibai Chowgule College (Autonomous) , Margao-Goa

COURSE DETAILS

Course Title : **ADVANCED MINERALOGY AND GEOCHEMISTRY**
Course Code : **GEL-III.C-5A**
Credits : **3 (45 Contact hours)**
Marks : **75**

Course Objectives

- The course provides geoscientific study of mineralogy in understanding the structure, chemistry, optical & physical properties, stability relations and genesis of minerals. With respect to geochemistry the student will understand the distribution of various elements and their abundances in the earth's crust.

Course Learning Outcomes

Upon completion of the course, the student will be able to,

CO1 Explain the concept of Gibbs Phase Rule, Collate structure, chemical composition with physical and optical properties of minerals of major silicate group of minerals, interpret stability relations of minerals using Phase diagrams of Olivine, Pyroxene and Feldspar Group of minerals. Explain how minerals originate and associate with each other in a rock.

CO2 Collate structure, chemical composition with physical and optical properties of minerals of major silicate group of minerals and interpret stability relations of minerals of Feldspathoid, Silica, Amphibole and Mica Group of minerals. Explain how minerals originate and associate with each other in a rock.

CO3 Describe the geochemical composition of the earth and describe how compatible and incompatible elements are involved in the various geochemical processes.

CO4 Calculate end-members for olivine, pyroxene and feldspar group of minerals and determine the structural Formula for the various silicate group of minerals.

CO5 Plot major oxides and trace elements on tectonic discriminant diagrams

SYLLABUS

MODULE I **(15 hours)**

Introduction to mineral chemistry, Gibbs Phase Rule, Phase diagram.

Structure, mineral chemistry, paragenesis, and Phase diagrams of the following silicate group of minerals:

Olivine group (Forsterite-Fayalite System)
Pyroxene group (Diopside-Anorthite System)
Feldspar group (Albite-Anorthite System; Orthoclase-Albite System)

MODULE II **(15 hours)**

Structure, mineral chemistry, paragenesis, and stability relations of the following silicate group of minerals:

- Feldspathoid group (Leucite-Silica System)
- Silica
- Amphibole
- Mica

MODULE III **(15 hours)**

- Whole rock analysis (major, trace REE)
- Concept of compatible and incompatible elements,
- Use of geochemistry in deducing tectonics.
- Primitive mantle normalized diagram and their significance in petrogenesis.

Practical: 1 credit
Maximum Marks: 25

1. Calculation of end-members for olivine, pyroxene and feldspar group of minerals.
2. Plotting of major oxides in tectonic discriminant diagrams

COURSE SCHEDULE

Lecture No	Topic	Reference book No
	MODULE I	
1	Introduction to Mineral chemistry	1, 2, 3, 4, 5, 6, 7, 8
2	Gibbs Phase Rule	1, 2, 3, 4, 5, 6, 7, 8
3	Phase diagram	1, 2, 3, 4, 5, 6, 7, 8
4 to 6	Structure, mineral chemistry, paragenesis, Phase diagrams of the following silicate group of minerals Olivine Group Forsterite-Fayalite System	1, 2, 3, 4
7 to 9	Structure, mineral chemistry, paragenesis, and Phase diagrams of the following silicate group of minerals Pyroxene Group Diopside-Anorthite System	1, 2, 3, 4
10 to 13	Structure, mineral chemistry, paragenesis, and Phase diagrams of the following silicate group of minerals Feldspar Group Albite -Anorthite System Orthoclase-Albite System	1, 2, 3, 4
14 -15	CA-1: Presentation Feedback	
	MODULE II	
16 - 18	Structure, mineral chemistry, paragenesis, and Phase diagrams of the following silicate group of minerals Feldspathoid Group Leucite-Silica System	1, 2, 3, 4

19 - 21	Structure, mineral chemistry, paragenesis, and Phase diagrams of the following silicate group of minerals Amphibole Group	1, 2, 3, 4
22 - 24	Structure, mineral chemistry, paragenesis, and Phase diagrams of the following silicate group of minerals Mica Group	1, 2, 3, 4
25 - 27	Structure, mineral chemistry, paragenesis, and Phase diagrams of the following silicate group of minerals Silica Group	1, 2, 3, 4
28 - 30	CA2 - MCQ Feedback	
MODULE III		
31 - 34	Whole rock analysis (major, trace REE)	5, 6, 7, 8
35 - 37	Concept of compatible and incompatible elements,	5, 6, 7, 8
38 - 40	Use of geochemistry in deducing tectonics.	5, 6, 7, 8
41 - 43	Primitive mantle normalized diagram and their significance in petrogenesis.	5, 6, 7, 8
44 -45	CA3: Written Test Feedback	

List of books recommended for reference

1. Deer, W. A, Howie, R. A and Zussman. J., (2013). An Introduction to Rock-Forming Minerals, Mineralogical Society.
2. Ford, W. E., (2006). Dana's Textbook of Mineralogy (with extended treatise Crystallography and Physical Mineralogy). CBS Publishers, New Delhi.
3. Griffen, D. T, Phillips, W. R and William, R. Phillips., (2004). Optical Mineralogy: The Nonopaque Minerals. CBS Publishers, New Delhi.
4. Mason and Berry, (2004). Mineralogy, CBS Publishers, New Delhi.
5. Faure, G (1998) Principles and Applications of Geochemistry. Prentice Hall
6. White, W M (1997) Geochemistry, Wiley-Blackwell
7. Krauskopf, K B and Bird, D K (1995) Introduction to Geochemistry. McGraw-Hill
8. Mason, B and Moore, C., (1982). Principles of Geochemistry, John Wiley & Sons.

COURSE EVALUATION METHODOLOGY

I. Continuous Assessments (CA) : 30 marks

Assessment	Mode	Maximum Marks
CA1	Reasoning Test	15
CA2	Assignment and Presentation	15
CA3	Multiple Choice Questions	15

The best two will be considered for the purpose of totaling to maximum 30marks.

II. Semester End Examination (SEE) : 45 marks

A written examination of 45marks involving the entire syllabus will be conducted at the end of the semester.

GEMMOLOGY (SEC: Skill Enhancement Course)

Faculty Details

Dr Meghana S Devli, Associate Professor, Department of Geology, Parvatibai Chowgule College (Autonomous) , Margao-Goa

COURSE DETAILS

Course Title : G**emmology**
Course Code : **GEL-SEC-1A**
Semester **: III**
Credits : **4 (60 Contact hours)**
Marks : **100**

Course Objectives

- To introduce students to the study of gemstones.

Course Learning Outcomes

Upon completion of the course, the student will be able to:

CO1 Decide on the factors deciding cost of a gemstone, explain the causes of colours in gemstones.

CO2 Explain how gemstones are synthesized, explain how gemstones are enhanced from low-grade to saleable quality, and explain the styles of cuts preferred for different gemstones.

CO2 Identify gemstones based on visual observations, by using a dichroscope, polariscope and determining Specific Gravity.

CO4 Identify gemstones using a refractometer, spectroscope, ultraviolet lamp and microscope.

Syllabus

Module I (15 hours)

Introduction to Gemmology
Association of Gemstones with rocks
Factors deciding the cost of a gemstone
Causes of colour in gemstones
International grading of diamonds
Composites

Module II (15 hours)

Enhancement and Treatments of gemstones
Synthesis of gemstones
Need for Faceting
Styles of cut

Module III **(15 hours)**

Visual observation of gemstones: Colour changing Sapphire, Colour changing Alexandrite, Opal, Sunstone, Star Garnet, Star Ruby, Diamond, Spectrolite, Lapis Lazuli, Chrysoberyl cats' eye, Tigers eyes, Aquamarine Cats eye, sillimanite Cats eye, Labradorite, Moss Agate, Amber,

Study of Natural crystals**:** Garnet, Emerald, Spinel, Tourmaline, Gypsum, Magnetite, Aquamarine, Ruby

Dichroscope for identifying gemstones: Andalusite, Tsavorite Garnet, Chrome Tourmaline, Green Tourmaline, Pink Tourmaline, Alexandrite, Sapphire, Natural Ruby, Synthetic Ruby, Tanzanite, Kyanite, Iolite.

Polariscope for identifying gemstones: Rose Quartz, Lemon Quartz, Rock crystal, Aquamarine, Iolite, Alexandrite, Scapolite.

Determination of Specific Gravity by Hydrostatic Method

Module IV **(15 hours)**

Spectroscope in gemstone identification: Cubic Zirconia (American Diamond), Zircon, Diamond, Synthetic Ruby, Natural Ruby, Synthetic Sapphire, Natural Sapphire.

Refractometer in gemstone identification: Aquamarine, Tourmaline, Quartz (Uniaxial), Iolite, Kyanite (Biaxial)

Ultra Violet lamp in gemstone identification: Synthetic and Natural Ruby, Synthetic and Natural Sapphire, Zircon, Cubic Zirconia, Colour Changing Sapphire.

Gemmological Microscope in gemstone identification: Tourmaline, Sillimanite, Emerald, Kyanite, Spectrolite

COURSE SCHEDULE

Lecture No	Topic
	MODULE I
1.	Introduction to Gemmology
2.	Association of Gemstones with rocks
3.	Factors deciding the cost of a gemstone - 1
4.	Factors deciding the cost of a gemstone - 2
5.	Causes of colour in gemstones - 1
6.	Causes of colour in gemstones - 2
8.	Causes of colour in gemstones – 3
9.	Causes of colour in gemstones – 4
10.	International Grading of diamonds - 1
12	International Grading of diamonds - 2
13	Composites – 1
14	Composites - 2
15	Continuous Assessment CA 1: Written Test (15 marks)
	MODULE II
16.	Enhancement and Treatments of gemstones – 1
17.	Enhancement and Treatments of gemstones – 2
19.	Enhancement and Treatments of gemstones – 3
20.	Enhancement and Treatments of gemstones - 4
21.	Synthesis of gemstones – 1
22.	Synthesis of gemstones – 2
23.	Synthesis of gemstones - 3

24. Need for Faceting – 1

25. Need for Faceting – 2

26. Styles of cut – 3

27. Styles of cut – 3

28. Continuous Assessment (CA)-3: Viva Voce

29. Continuous Assessment (CA)-3: Viva Voce

30. Continuous Assessment (CA)-3: Viva Voce

MODULE III

31. Visual observation of gemstones

32. Visual observation of gemstones

33. Visual observation of gemstones

34. Visual observation of gemstones

35. Study of Natural crystals

36. Study of Natural crystals

37. Dichroscope for identifying gemstones

38. Dichroscope for identifying gemstones

39. Polariscope for identifying gemstones

40. Polariscope for identifying gemstones

41. Determination of Specific Gravity by Hydrostatic Method

42. Determination of Specific Gravity by Hydrostatic Method

43. Determination of Specific Gravity by Hydrostatic Method

44. Practical Assessment – 1

MODULE IV

46. Spectroscope in gemstone identification – 1
47. Spectroscope in gemstone identification – 2
48. Spectroscope in gemstone identification – 3
49. Refractometer in gemstone identification – 1
50. Refractometer in gemstone identification – 2
51. Refractometer in gemstone identification – 3
52. Refractometer in gemstone identification – 4
53. Ultra Violet lamp in gemstone identification – 5
54. Ultra Violet lamp in gemstone identification – 6
55. Gemmological Microscope in gemstone identification – 1
56. Gemmological Microscope in gemstone identification – 2
57. Gemmological Microscope in gemstone identification – 3
58. Gemmological Microscope in gemstone identification – 4
59. Practical Assessment - 2
60. Feedback

List of books recommended for reference

- Fernandes S. and Choudhary G., (2010) Understanding Rough Gemstones, Indian Institute of Jewellery.
- Karanth, R V; (2000) Gem and Gem deposits of India, Geological Society of India.
- Read, P. G., (1991). Gemmology, Butterworth-Heinemann Ltd.
- Sinkankas, J., (1969) Mineralogy: A First Course, Van Nostrand Reinhold Company.
- Webster, R., edited by Anderson, B, W., (1983) Gems: Their Sources, Descriptions and Identification, Butterworth-Heinemann Ltd.

COURSE EVALUATION METHODOLOGY

MAXIMUM MARKS : 100

I. Continuous Assessments (CA) : 70 marks

Assessment	Mode	Maximum Marks (60)
CA1	Written test (Formative)	15
CA2	Viva Voce (Formative)	15
CA3	Practical Assessment – 1 (Compulsory)	20
CA4	Practical Assessment -2 (Compulsory)	20

The best one from CA1 and CA2 will be considered for the purpose of adding to maximum 10marks.

II. Semester End Examination (SEE) : 45 marks

A compulsory summative Semester End Examination involving theory will be conducted at the end of the semester.

Course Title: IGNEOUS PETROLOGY

Course Code: GEL-VI.C-8A

Credits: 03 (45 Contact hours: Theory) & 01 (15 Practical sessions)

Marks: 75 Theory + 25 Practical

Image: Pillow Lavas, Mardanhalli, Kasrnataka

Course Objectives

The course will help the students to understand petrologic processes and common rock types. In practical's, students learn to identify, describe and classify rocks using hand specimens and rock thin sections.

Dr. Meghana S Devli

Associate Professor,
Department of Geology
Parvatibai Chowgule College of Arts and Science (Autonomous)

Semester VI

Course Title : **IGNEOUS PETROLOGY**
Course Code : **GEL-VI.C-8A**
Credits : **3 (45 Contact hours)**
Marks : **75**

Learning Objectives

The course will help the students to understand petrologic processes and common rock types. In practical's, students learn to identify, describe and classify rocks using hand specimens and rock thin sections.

Course Outcomes

Upon completion of the course, the student will be able to :

CO1 Explain the composition of the Earth and relate it to magma generation.

CO2 Gain insight into the crystallization of melts by studying the various textures and microstructures.

CO3 Explain the diversity and differentiation of magmas to deduce the formation of various rock types and its associated characteristics.

CO4 Identify, describe and classify igneous rocks using hand specimen and thin sections.

CO5 Explain the formation of normative minerals from the chemical composition of an igneous rock.

Module I **(15 hours)**

Meteorites: Mineralogy and whole rock chemistry
Composition of the earth's interior = Primitive mantle Plate tectonics and igneous activity
Partial Melting and Generation of magma.
Magma Diversity:

Partial Melting: Mafic, Ultramafics

Basalts: Magma types, Basalt Tetrahedron.

Anatexis in Felsic rocks

Granites/Pegmatites: Mingling, Mixing and Crustal contamination

Igneous layering - crystal settling

Gabbroic rocks, Anorthosite

Layered complexes Differentiation: Fractional Crystallization, liquid immiscibility, flowage differentiation

Module II **(15 hours)**

Ascent and emplacement of magma
Textures and microstructures of igneous rocks:

a. Primary: Nucleation, Growth, Diffusion
b. Secondary: Oswald ripening, twinning, zoning

Classification and Description of Igneous Rocks:

The International Union of Geological Sciences (IUGS) Classification System: Gabbros, Granites (QAPF diagram).

Ternary System: Diopside-Albite-Anorthite (Di-Ab-An)

Module III **(15hours)**

Study of the following rock types (mineralogy, petrography and petrogenesis)

Ophiolites
Granitoids
Carbonatites
Kimberlites

Practical: 1 credit
Maximum Marks: 25

- Study of igneous rocks in hand specimen.
- Study of igneous rocks in thin sections
- CIPW Normative calculations

List of books recommended for reference

Mandatory reading

- Frost B R and Frost C D., (2014) Essentials of Igneous and Metamorphic Petrology, Cambridge University Press.
- Gill, R., (2010). Igneous rocks and process – A Practical Guide, Wiley-Blackwell
- Winter, J.D., (2009) Principles of Igneous and Metamorphic Petrology, Prentice Hall

Supplementary reading

- Best, M.G., (2002). Igneous and Metamorphic Petrology, 2nd edn., Blackwell, Oxford.
- Bose, M.K., (1997). Igneous Petrology, The World Press, Kolkata.
- Raymond, A. L., (1995). Petrology-The study of Igneous Sedimentary and Metamorphic rocks. Wm. C. Brown Communications, Inc.; USA.
- MacKenzie, W. S., Donaldson, C H., and Guilford, C., (1982). Atlas of Igneous Rocks and Their Textures, Wiley

Course Schedule: Theory

Lecture Number	Topic
	Module I
Lecture 1	Meteorites: Mineralogy and whole rock chemistry
Lecture 2	Composition of the earth's interior = Primitive mantle Plate tectonics and igneous activity
Lecture 3	Partial Melting and Generation of magma - 1
Lecture 4	Partial Melting and Generation of magma - 2
Lecture 5	Magma Diversity: 1

	Partial Melting: Mafic, Ultramafics
Lecture 6	Magma Diversity: 2 Partial Melting: Mafic, Ultramafics
Lecture 7	Magma Diversity: 1 Partial Melting: Basalts: Magma types, Basalt Tetrahedron.
Lecture 8	Magma Diversity: 2 Partial Melting: Basalts: Magma types, Basalt Tetrahedron.
Lecture 9	Anatexis in Felsic rocks 1 Granites/Pegmatites: Mingling, Mixing and Crustal contamination
Lecture 10	Anatexis in Felsic rocks 2 Granites/Pegmatites: Mingling, Mixing and Crustal contamination
Lecture 11	Igneous layering - crystal settling 1 Gabbroic rocks, Anorthosite
Lecture 12	Igneous layering - crystal settling 2 Gabbroic rocks, Anorthosite
Lecture 13	Layered complexes Differentiation: Fractional Crystallization, liquid immiscibility, flowage differentiation – 1
Lecture 14	Layered complexes Differentiation: Fractional Crystallization, liquid immiscibility, flowage differentiation – 2
Lecture 15	Continuous Assessment – Written Test
Module II	
Lecture 16	Ascent and emplacement of magma - 1
Lecture 17	Ascent and emplacement of magma - 2
Lecture 18	Ascent and emplacement of magma - 3
Lecture 19	Textures and microstructures of igneous rocks: 1 a. Primary: Nucleation, Growth, Diffusion b. Secondary: Oswald ripening, twinning, zoning
Lecture 20	Textures and microstructures of igneous rocks: 2 c. Primary: Nucleation, Growth, Diffusion d. Secondary: Oswald ripening, twinning, zoning
Lecture 21	Textures and microstructures of igneous rocks: 3 a. Primary: Nucleation, Growth, Diffusion

	b. Secondary: Oswald ripening, twinning, zoning
Lecture 22	Textures and microstructures of igneous rocks: 4 a. Primary: Nucleation, Growth, Diffusion b. Secondary: Oswald ripening, twinning, zoning
Lecture 23	Textures and microstructures of igneous rocks: 5 a. Primary: Nucleation, Growth, Diffusion b. Secondary: Oswald ripening, twinning, zoning
Lecture 24	Classification and Description of Igneous Rocks: 1 The International Union of Geological Sciences (IUGS) Classification System: Gabbros, Granites (QAPF diagram).
Lecture 25	Classification and Description of Igneous Rocks: 2 The International Union of Geological Sciences (IUGS) Classification System: Gabbros, Granites (QAPF diagram).
Lecture 26	Classification and Description of Igneous Rocks: 3 The International Union of Geological Sciences (IUGS) Classification System: Gabbros, Granites (QAPF diagram).
Lecture 27	Ternary System: Diopside-Albite-Anorthite (Di-Ab-An) - 1
Lecture 28	Ternary System: Diopside-Albite-Anorthite (Di-Ab-An) - 2
Lecture 29	Ternary System: Diopside-Albite-Anorthite (Di-Ab-An) - 3
Lecture 30	Continuous Assessment 2: Multiple Choice Question (MCQ)
Module III	
Lecture 31	Study of the following rock types (mineralogy, petrography and petrogenesis): Kimberlite 1
Lecture 32	Kimberlite 2
Lecture 33	Kimberlite 3
Lecture 34	Carbonatite 1
Lecture 35	Carbonatite 2
Lecture 36	Carbonatite 3
Lecture 37	Ophiolite 1

Lecture 38	Ophiolite 2
Lecture 39	Ophiolite 3
Lecture 40	Granitoids 1
Lecture 41	Granitoids 1
Lecture 42	Granitoids 1
Lecture 43	Continuous Assessment 3 -Presentation
Lecture 44	Continuous Assessment 3 -Presentation
Lecture 45	Continuous Assessment 3 -Presentation

Course Schedule: Practical

Practical Number	Practical
Practical 1	Study of igneous rocks in hand specimen - 1
Practical 2	Study of igneous rocks in hand specimen - 2
Practical 3	Study of igneous rocks in hand specimen - 3
Practical 4	Study of igneous rocks in hand specimen - 4
Practical 5	Study of igneous rocks in hand specimen - 5
Practical 6	Study of igneous rocks in thin sections - 1
Practical 7	Study of igneous rocks in thin sections - 2
Practical 8	Study of igneous rocks in thin sections - 3
Practical 9	Study of igneous rocks in thin sections - 4
Practical10	Study of igneous rocks in thin sections - 5
Practical 11	CIPW Normative calculations - 1
Practical 12	CIPW Normative calculations – 2
Practical 13	CIPW Normative calculations - 3
Practical 14	CIPW Normative calculations - 4

Practical 15	CIPW Normative calculations - 5

Modes of Assessment

Theory: (Best two out of three)

Continuous Assessment (CA) 1: Written Test : 15 marks
Continuous Assessment (CA) 2: Presentation based on Module III :15 marks
Continuous Assessment (CA) 3: Multiple Choice Questions (MCQ) : 15 marks

Practical:

Regular Assessments (PA): Minimum three PAs of 25 marks each.

METAMORPHIC PETROLOGY (Elective)

Faculty Details

Dr Meghana S Devli, Associate Professor, Department of Geology, Parvatibai Chowgule College (Autonomous) , Margao-Goa

COURSE DETAILS

Course Title : **METAMORPHIC PETROLOGY**
Course Code : **GEL-V. E-11A**
Credits : **3 (45 Contact hours)**
Marks : **75**

Course Objectives

To provide essential concepts of metamorphism and metamorphic rocks, to study metamorphic rocks w.r.t fabrics and types, to understand the concept of facies. Also to understand how metamorphism is related to plate tectonics

Course Learning Outcomes

CO1 Explain metamorphism, factors and relate to types of metamorphism with the products, represent metamorphic rocks graphically using Phase Diagrams and explain metamorphism wrt tectonics.

CO2 Apply fundamental principles of metamorphism to development of textures, classify metamorphic rocks based on mineral assemblage and fabric, interpret tectonic setting of Metamorphic Belts based on field characters and kinematic stress indicators.

CO3 Explain types of metamorphism. Also, differentiate between Barrovian and Buchan Zones, Apply the facies concept to progressive contact and regional including burial metamorphism.

CO4 Identification of metamorphic rocks w.r.t mineralogy, texture, type of metamorphism, facies, protolith megascopically and microscopically.

SYLLABUS

Module I **(15 hours)**

Definition and explanation of metamorphism (upper and lower limits) and metamorphic rocks.

Factors controlling metamorphism:

Heat (T): Geothermal gradient (in different crustal regions), radioactivity, magmatic intrusions, tectonics;
Pressure (P): Deviatoric, Lithostatic, Hydrostatic, Fluid pressure
Chemically active fluids (Xf): H_2O and CO_2
Composition of the parent rocks (X): Protoliths. - pelites, mafites, ultramafites, quartzofeldspathic, carbonate rocks, sandstones and greywackes.
Time (δt): Role of time in metamorphism.

Phase Rule and Phase diagrams Graphical representation of metamorphic rocks.

Types of metamorphism: Regional metamorphism its characteristics and products, burial metamorphism its characteristics and products, contact metamorphism its characteristics and products.

Relationship of brittle and ductile deformation with grade of metamorphism metasomatism, cataclastic metamorphism and their products, impact/shock metamorphism.

Metamorphism in relation to plate tectonics:

Divergent(constructive) boundary
Convergent (Destructive) boundary: subduction zone (sensu lato)
Continent-Continent Collision zones
Intra-plate environments

Module II (15 hours)

Metamorphic textures: Inherited/Relict fabric lepidoblastic, nematoblastic, granoblastic, equigranular mosaic, Porphyroblastic; cataclastic and mylonitic textures. Kinematic stress indicators and their role in interpreting tectonic history.

Nomenclature and classification based on mineralogy and fabric

Field characters of metamorphic rocks:

Variations in mineralogy and fabric. Prograde and Retrograde metamorphism, metamorphic zones and index/critical minerals, their significance in mapping and understanding tectonic history.

Module III (15 hours)

Facies: Concept after Goldschmidt and Eskola; Zonation in mineralogy – Buchanan (Low pressure) Barrovian (high pressure).

Facies of progressive contact metamorphism: characteristic mineral assemblages in pelites and carbonates (pure and impure) protolith

Facies of progressive regional metamorphism – characteristic mineral assemblages wrt facies (Zeolite, Prehnite-Pumpellyite, Greenschist, Amphibolite, Granulite,) in pelitic, mafic protolith.

Facies of burial metamorphism: Blueschist, Eclogite

Paired Metamorphic Belts

Practical Course: 1 credit

Maximum Marks: 25

Megascopic study and identification of metamorphic rocks w.r.t mineralogy, texture, type of metamorphism, facies, protolith.

Microscopic study and identification of metamorphic rocks wrt to mineralogy, texture type of metamorphism, facies and protolith.

Plotting ACF diagrams and commenting on the protolith.

List of books recommended for reference

Mandatory Reading

Winter J D., (2011) Principles of Igneous and Metamorphic Petrology. PHI Learning Pvt. Ltd.

Winkler, G. F., (1987) Petrogenesis of Metamorphic rocks 5th edition Narosa Publishing House, New Delhi.

Yardley, B W. D., (1989) An introduction to Metamorphic Petrology, Longman Group Publishers Pvt. Ltd.

Turner, F., (1980) Metamorphic Petrology: Mineralogical, Field and Tectonic Aspects, CRC Press.

Vernon, R H. and Clarke, G.L., (2008) Principles of Metamorphic Petrology, Cambridge University Press

Best, M., (2003). Igneous and Metamorphic Petrology, Blackwell Publishing.

Raymond, A. L., (1995) Petrology-The study of Igneous Sedimentary and Metamorphic rocks. Wm. C. Brown Communications, Inc.; USA.

COURSE SCHEDULE - Theory

Lecture No	Topic
	MODULE I
1.	Introduction
2.	Metamorphism
3.	Factors affecting Metamorphism: Temperature
4.	Factors affecting Metamorphism: Temperature
5.	Factors affecting Metamorphism: Pressure
6.	Factors affecting Metamorphism: Protolith
7.	Factors affecting Metamorphism: Protolith
8.	Factors affecting Metamorphism: Chemically active fluids
9.	Types of Metamorphism: Local
10.	Types of Metamorphism: Characteristics of Contact Metamorphism
11.	Types of Metamorphism: Contact Aureole
12.	Types of Metamorphism: Products of Contact Metamorphism
13.	Types of Metamorphism: Regional-Dynamothermal
14.	Types of Metamorphism: Characteristics of Regional Metamorphism
15.	CA1: Reasoning -15marks
	MODULE II
16.	Types of Metamorphism: Products of Regional Metamorphism
17.	Types of Metamorphism: Ocean Floor Metamorphism
18.	Types of Metamorphism: Dislocation and Impact Metamorphism
19.	Relationship of brittle and ductile deformation with grade of metamorphism
20.	Metamorphism wrt tectonics - Divergent

21.	Metamorphism wrt tectonics - Subduction
22.	Metamorphism wrt tectonics - Intraplate
23.	Phase Diagrams: ACF
24.	Phase Diagrams: AFM
25.	Metamorphic Textures:
26.	Metamorphic Textures
27.	Metamorphic Textures
28.	Kinematic stress indicators and their role in interpreting tectonic history
29.	Nomenclature and classification based on mineralogy and fabric
30.	CA2 – Viva Voce: 15 marks
	MODULE III
31.	Field characters of Metamorphic rocks
32.	Field characters of Metamorphic rocks
33.	Facies
34.	Facies of Progressive Contact Metamorphism
35.	Facies of Progressive Contact Metamorphism
36.	Facies of Progressive Regional Metamorphism
37.	Facies of Progressive Regional Metamorphism
38	Facies of Progressive Regional Metamorphism
39.	Facies of Burial Metamorphism
40.	Facies of Burial Metamorphism
41.	Facies of Burial Metamorphism
42.	Paired Metamorphic Belts
43.	Paired Metamorphic Belts
44.	CA3: Written Test: 15 marks
45.	Semester End Examination (SEE): 45 marks

COURSE SCHEDULE – Practical

Practical Number	Session
1.	Megascopic study and identification of metamorphic rocks w.r.t mineralogy, texture.
2.	Megascopic study and identification of metamorphic rocks w.r.t mineralogy, texture.
3	Megascopic study and identification of metamorphic rocks w.r.t type of metamorphism, facies, protolith.
4.	Megascopic study and identification of metamorphic rocks w.r.t type of metamorphism, facies, protolith.
5.	Practical Assessment – 1

6.	Microscopic study and identification of metamorphic rocks wrt to mineralogy, texture.
7.	Microscopic study and identification of metamorphic rocks wrt to mineralogy, texture.
8.	Microscopic study and identification of metamorphic rocks wrt to mineralogy, texture.
9.	Microscopic study and identification of metamorphic rocks wrt to mineralogy, texture.
10.	Microscopic study and identification of metamorphic rocks wrt to mineralogy, texture.
11.	Microscopic study and identification of metamorphic rocks wrt to mineralogy, texture type of metamorphism, facies and protolith.
12.	Practical Assessment -2
13.	Plotting ACF diagrams and commenting on the protolith.
14.	Plotting ACF diagrams and commenting on the protolith.
15.	Practical Assessment 3

COURSE EVALUATION METHODOLOGY

I. Continuous Assessments (CA) : 30 marks

Assessment	Mode	Maximum Marks
CA1	Written Test	15
CA2	Open Book Test	15
CA3	Multiple Choice Questions	15

The best two will be considered for the purpose of adding to maximum 30marks.

II. Semester End Examination (SEE) : 45 marks

A written examination of 45marks involving the entire syllabus will be conducted at the end of the semester.

III. Practical Assessments (PA) : 25 marks

The conduct and assessments of practical will be intimated subsequently.

COURSE TITLE: OPTICAL MINERALOGY

Course Title : Optical Mineralogy
Course Code : GEL- III.E-6A
Email : msd001@chowgules.ac.in

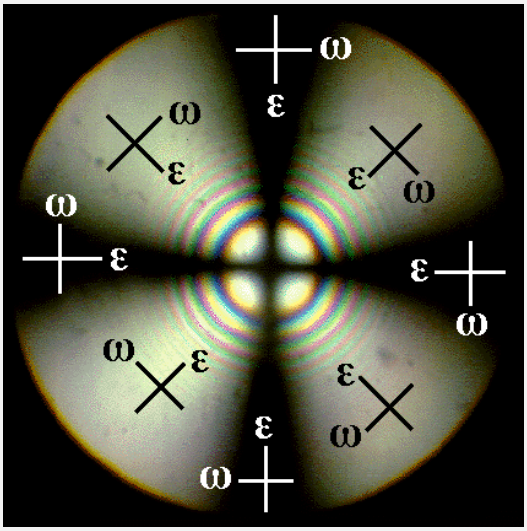


Fig. Uniaxial Interference Figure

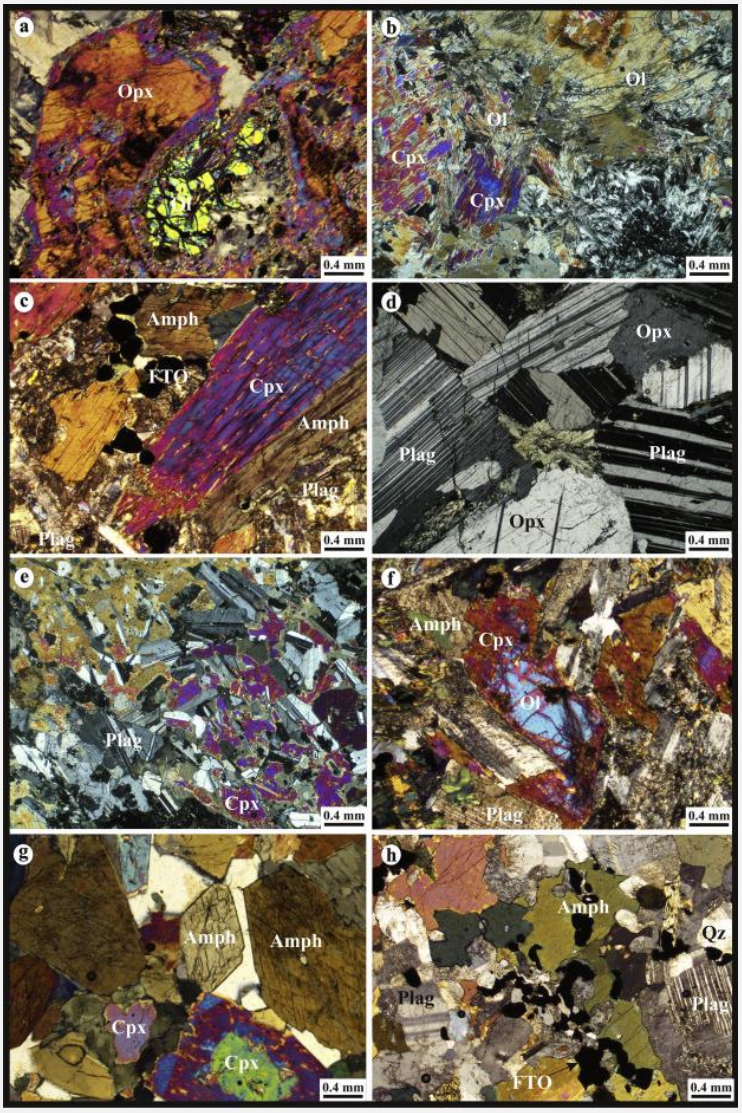


Fig. Mafic-Ultramafic rocks under Petrological Microscope

COURSE SCHEDULE

Lecture no.	Title	Reference	
		Book no	Chapter
MODULE I			
Lect.	Introduction to Crystal Optics *Nature of light, wave Motion, monochromatic & Polychromatic light, Polarised Light, Interference*	1 3, 7, 8	Part II, 4, 4, 3,4
Lect.	RI, Critical angle, TIR, Wave surface *Refractive Index, Critical angle & Total Internal Reflection, Wave Surface*	1 3, 7, 8	Part II, 4, 4, 3,4
Lect.	Double Refraction	1 3, 7, 8	Part II, 4, 4, 3,4
Lect.	Polarising microscope *Parts & working of a Petrological Microscope*	1 3 4 8 9 10	Part II 5 10 2 1 4
Lect.	Relief, Becke's Effect & Becke's Test, Twinkling *Properties in plane polarised light: Relief: what is relief? Why is relief observed? Determining which grain has a higher relief using the Becke's Effect & Becke's Test. Property of Twinkling*		
Lect.	Pleochrosim & Pleochroic halos *Property of Pleochroism in plane polarised light & Pleochroic halos*	1 3 8	Part II 4 4
Lect.	Discussion		
Lect.	**CA-1: Written Test**		
MODULE II			
Lect.	Isotropic and Anisotropic minerals Between Crossed	1	Part II

	Polars (BXP) *Properties between crossed polars*	3 7 8	4,5 4 5
Lect.	Interference colours, Newtons Scale & Anomalous Interference colours. *Property between crossed polars: Interference colours, Newtons Scale & Anomalous interference colours.*	1 3 7 8	Part II 4,5 4 5
Lect.	Extinction & Extinction angle, Twinning, Zoning *Types of extinction: Straight, Oblique & Symmetrical;* *Types of twinning & Why twinning is observed, Zoning*	1 3 7 8	Part II 4,5 4 5
Lect.	Uniaxial Indicatrix *Optical indicatrix with one optic axis.*	1 3 7 8 10	Part II 4 4 5 6, 12
Lect.	Biaxial Indicatrix *Optical indicatrix with two optic axes.*	1 3 7 8 10	Part II 4 4 5 6, 12
Lect.	Optical Accessories *Study and Use of Quartz wedge, Gypsum plate & Mica plate.*	1 3 4 8 10	Part II 8 9 6 9, 13
Lect.	Discussion **CA-2: Test on Reasoning**		
MODULE III			
Lect.	Use of convergent light *Significance of using convergent light in the study of minerals.*	1 3 4 8 10	Part II 6 11 6 11, 14
Lect.	Uniaxial Interference figure *Use of convergent light in the study of uniaxial minerals.*	1 3 4 8 10	Part II 8 9 6 9, 13

Lect.	Determination of optic sign for uniaxial minerals *Determining the optic sign for uniaxial minerals using the three accessory plates.*	1 3 4 8 10	Part II 8 9 6 9, 13
Lect.	Biaxial Interference figure *Use of convergent light in the study of biaxial minerals.*	1 3 4 8 10	Part II 8 9 6 9, 13
Lect.	Determination of optic sign for biaxial minerals *Determining the optic sign for biaxial minerals using the three accessory plates.*	1 3 4 8 10	Part II 8 9 6 9, 13
Lect.	2V & 2E *Determining the true optic axial angle (2V) & Apparent optic axial angle (2E).*	1 3 4 8 10	Part II 8 9 6 9, 13
Lect.	Discussion **CA-3: Objective Test**		

LIST OF BOOKS REFERRED

1. Dana, J. D and Ford, W. E. (1932). *A Textbook of Mineralogy* (4th Ed.). John Wiley and Sons Inc. NY.
2. Phillips, F. C. (1971). *An Introduction to Crystallography* (4th Ed.). Oliver & Boyd, Edinburgh.
3. Hartshorne, N. H. And Stuart, A. (1970). *Optical Crystallography*. Edward Arnold (Publ.) Ltd., London.
4. Wood, E. A. (1964). *Crystals & Light: An Introduction to Optical Crystallography.* Van Nostrand Co. Inc., NY
5. Buerger, M. J (1960). *Introduction to Crystal Geometry.* McGraw-hill Publishing Company Ltd., NY.
6. Flint, *Essentials of Crystallography*. McGraw-Hill Book Co. Inc., NY.
7. Battey. *Mineralogy.* CBS publishers and Distributors, New Delhi.
8. Kerr, P. (1977). *Optical Mineralogy* (4th Ed.). McGraw-hill Book Co. Inc., NY.
9. Gribble and Hall. *Practical Introduction to Optical Mineralogy*

10. Wahlstrom, E. E. (1969). *Optical Crystallography* (4th Ed.). John Wiley and Sons Inc., NY.

11. Hurlburt & Klein. (1979). *Manual of Mineralogy.* John Wiley and Sons, NY.

SYLLABUS

Course Title : **OPTICAL MINERALOGY**
Course Code : **GEL-IV.E-6A**
Marks : **75**
Credits : **3 (45 Contact hours)**

Course Objectives

The objective of the course is to provide the basics of geoscientific studies in Optical Mineralogy involving optical properties of minerals in plane polarized light, in between crossed polars and convergent light. Further, it will strengthen their knowledge in understanding of optical indicatrices and determination of optic sign of minerals.

Course Outcomes

Upon completion of the course, the student will be able to :

CO1 Explain basic concepts in optical mineralogy and relate them to study of minerals in Plane Polarised Light (PPL)

CO2 Explain basic concepts in optical mineralogy and relate them to study of minerals Between Crossed Polars (BXP).

CO3 Distinguish Uniaxial and Biaxial Indicatrix and study behaviour of minerals under convergent light.

CO4 Identify major rock-forming minerals in microsections.

CO5 Detect Optic Sign for Uniaxial and Biaxial Minerals using Interference Figures, Determine Anorthite content of Plagioclase and calculate Optic Axial Angle.

Module I **(15 hours)**

Introduction: Nature of light, Polarized light, Refractive Index, Critical angle and Total

Internal reflection, Wave Surface, Double Refraction.

Parts and working of a Polarizing / Petrological microscope

Properties of minerals in Plane Polarised Light (PPL): Colour, Form, Cleavage/Cracks;

Relief, Twinkling; Pleochroism,

Pleochroic halos.

Module II **(15 hours)**

Optical characters of minerals: Isotropism and Anisotropism

Properties of minerals Between Crossed Polars (BXP): Interference colours: Formation,

Newton's Scale, Anomalous interference colours;

Extinction and Extinction types.

Twinning and Zoning

Alteration, Inclusions.

Module III **(15 hours)**

Optical accessories

Uniaxial indicatrix

Biaxial indicatrix

Convergent Light: Principle

Uniaxial Interference Figure

Biaxial Interference Figure

Optic sign of Uniaxial and Biaxial Minerals

2V and 2E

Practical: 1 credit
Maximum Marks: 25

- Identification of common rock forming minerals based on optical properties
- Interference figures (Demonstration)
- Determination of optic sign (demonstration)
- Determination of An-content using extinction angles (demonstration)

List of books recommended for reference

Mandatory Reading

- Kerr, P., 1977, Optical Mineralogy, McGraw Hill Publishers.
- Nesse, D. W., 2012, Introduction to Optical Mineralogy, Oxford University Press.
- Perkins, Dexter. Mineralogy. Pearson New International Edition

ASSESSMENTS

THEORY: 03 CREDITS: 75 MARKS

- CA1 : Written Test : 15 marks
- CA2 : Reasoning and Objective Test : 15 marks
- CA3 : MCQ : 15 marks

BEST TWO OF THREE FOR TOTAL OF 30 MARKS

- SEE : 45 marks

PRACTICAL: 01 CREDIT: 25 MARKS

Continuous Assessments of 25 Marks each

Chowgule Education Society's

Parvatibai Chowgule College of Arts and Science Autonomous

Accredited by NAAC with Grade 'A+'

Best Affiliated College-Goa University Silver Jubilee Year Award

TEACHING PLANS

EVEN SEMESTER

Lecture No	Topic/SubTopics	Reference List
1	E-Commerce -History	Electronic commerce –Strategy,Technologies & Applications by David Whitely (text book & ppt slides) Electronic Commerce by Ravi Kalakote
2	E-Commerce -Scope,Types	-do-
3	E-Commerce -Technology	Electronic commerce –Strategy,Technologies & Applications by David Whitely (text book & ppt slides)
4	E-Commerce- Trading Exchanges	-do-
5	The Value Chain	-do-
6	Potter's Model	-do-
7	Competitive Advantage -Basic Strategies	-do-
8	Competitive Advantage	-do-
9	Business Strategy	-do-
10	Business Strategy	-do-
11	EDI - Trade Cycle	-do-
12	EDI - Benefits	-do-
13	EDI - Standards	-do-
14	EDI - Standards	-do-
15	EDI - Standards	-do-
16	EDI - Networks	-do-
17	EDI - Implementation	-do-
18	EDI -Agreements	-do-
19	EDI - Trading Patterns	-do-
20	EDI - Transactions	-do-
21	EDI - Adoption & Maturity	-do-
22	InterOrganizational E-Commerce	-do-
23	E-Business- Internet Bookshops	-do-
24	E-Business - Grocery Supplies	-do-
25	E-Business - Electronic Newspapers	-do-
26	E-Business -Internet Banking	-do-
27	E-Business - Online Share Dealing	-do-
28	Electronic Payment Systems -Electronic Token Based systems	Electronic commerce –Strategy,Technologies & Applications by David Whitely (text book & ppt slides) Electronic Commerce by Ravi Kalakote
29	Electronic Payment Systems -Digital Currency	-do-
30	Electronic Payment Systems -E-Cheques	-do-

31	Firewalls - Transaction Security	Electronic commerce –Strategy,Technologies & Applications by David Whitely (text book & ppt slides) Electronic Commerce by Ravi Kalakote
32	Firewalls - WWW & Security	-do-
33	WWW- Concepts & Technology	Electronic commerce –Strategy,Technologies & Applications by David Whitely (text book & ppt slides) Electronic Commerce by Ravi Kalakote
34	WWW- Concepts & Technology	-do-
35	WWW- Concepts & Technology	-do-
36	WWW- Concepts & Technology	Electronic Commerce a Managers Guide by Ravi Kalakota and Andrew B.Whinston published by Pearson Education. www.wikipedia.org (for some elementary definitions like servlets,applets,etc)
37	WWW- Concepts & Technology	-do-
38	WWW- Concepts & Technology	-do-
39	WWW - Applications - Web Architecture	Electronic Commerce-A Managers Guide by Ravi Kalakota and Andrew B.Whinston Pearson Education
40	WWW - Applications - Intra Business Commerce	-do-
41	www-applications	
42	www-applications	
43	www-applications	
44	www-applications	
45	www-applications	

TEACHING PLAN

Course-Software Engineering

Lec No	Topic	Reference
1	SEProcess - Obj of SE ,Component sw processes	An integrated approach to SE by Pankaj Jalote
2	SE Process - sw process characteristics	An integrated approach to SE by Pankaj Jalote
3	SE Process -sw development Processes	1.An integrated approach to SE by Pankaj Jalote, 2.Applying UML and Patterns- An Introduction to Object oriented analysis & design and the Unified Process by Craig Larman
4	SE Process -Unified Process,Agile Manifesto	-do-
5	OOAD- OOAD, Imp of modelling, Principles, UML	Applying UML and Patterns- An Introduction to Object oriented analysis & design and the Unified Process by Craig Larman
6	UmL -Building Blocks of UML-structural things	-do-
7	UmL -Building Blocks of UML-Things Behavioural,Grouping	-do-
8	UML - Relationships,diagrams	1.Applying UML and Patterns- An Introduction to Object oriented analysis & design and the Unified Process by Craig Larman 2. UML Distilled: A Brief Guide to the Standard Object Modeling Language, Third EditionBy Martin Fowler
9	UML- diagrams,Rules	Unified Modeling Language- By Mahesh Matha
10	UML - Common Mechanisms	Applying UML and Patterns- An Introduction to Object oriented analysis & design and the Unified Process by Craig Larman
11	UML - Classes	Unified Modeling Language- By Mahesh Matha
12	UML - Model Vocabulary of System	Applying UML and Patterns- An Introduction to Object oriented analysis & design and the Unified Process by Craig Larman
13	UmL - Class Diagrams	Unified Modeling Language- By Mahesh Matha

14	UML - Use case Diagrams	Unified Modeling Language- By Mahesh Matha
15	UML - CRC cards	Applying UML and Patterns- An Introduction to Object oriented analysis & design and the Unified Process by Craig Larman
16	Software Requirements - Requirements Engineering Process	-do-
17	Software Requirements - Requirements Mgmt,Charac of reqs	-do-
18	Software Requirements - Use Case Modelling - Include,Extend	-do-
19	Software Requirements - Use Case Modelling - Generalization	-do-
20	Software Requirements - Types - Supplementary specs	-do-
21	Software Requirements - Elicitation Techniques -Workshops,interviews	-do-
22	Software Requirements - Elicitation Techniques -Storyboards,Prototypes	-do-
23	Software Requirements - FURPS- Functional Reqs	-do-
24	Software Requirements - FURPS-Non Functional Reqs	-do-
25	Domain Model & CRC	-do-
26	GRASP Patterns - IE	-do-
27	GRASP Patterns - Creator	-do-
28	GRASP Patterns - Controller	-do-
29	Design Model - Class Diagrams	1. Applying UML and Patterns- An Introduction to Object oriented analysis & design and the Unified Process by Craig Larman 2. UML Distilled: A Brief Guide to the Standard Object Modeling Language, Third Edition By Martin Fowler
30	Design Model - Interfaces	-do-
31	Design Model - Interaction Diagrams	-do-

32	Design Model - Sequence Diagrams	-do-
33	Design Model - Seq Diagrams- Synchronous & Asynchronous diags	-do-
34	Design Model - Activity & State mc Diagrams	-do-
35	Design Model - Deployment Diagrams	-do-
36	HCI- defn, user categories	Roger Pressman, Software Engineering: A Practitioners Approach, McGraw Hill, (6th Edition), 1997.
37	Interface Design Guidelines	-do-
38	Coding-styles, standards	Steve Mc Connell, Code Complete, Microsoft Press, ISBN 978-0-7356-1967-8 Second Edition (June 2004)
39	Peer reviews, checklist,refactoring	-do-
40	Testing- strategies	Software Testing- Principles & Practices –Srinivasan Desikan, Gopalaswamy Ramesh
41	Testing Metrics	GlenfordJ. Myers, — The Art of Software Testing —, John Wiley & Sons, 1979.
42	Documentation	Software Engineering- Sommerville
43	Maintenance	-do-
44	Reengineering-BPR, Reverse Engineering	Roger Pressman, Software Engineering: A Practitioners Approach, McGraw Hill, (6th Edition), 1997.
45	Restructuring, Forward Engineering, Economics of Reengineering	-do-

Prac No	Topic	Reference
1,2	Requirements Gathering Techniques	An integrated approach to SE by Pankaj Jalote
3,4	Use Case Diagrams	Unified Modeling Language- By Mahesh Matha
5	Use case Description	Unified Modeling Language- By Mahesh Matha
6,7	Class Diagram	Unified Modeling Language- By Mahesh Matha
8,9	Sequence Diagram	Unified Modeling Language- By Mahesh Matha
10,11	Activity Diagram	Unified Modeling Language- By Mahesh Matha
12,13	State Chart Diagram	Unified Modeling Language- By Mahesh Matha
14,15	Gantt Chart	Roger Pressman, Software Engineering: A Practitioners Approach, McGraw Hill, (6^{th} Edition), 1997