S.Y.B.A. English III (Optional) Syllabus





Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC 'College with Potential for Excellence' Status Awarded by UGC 'Best College Award' by University of Mumbai

Program: B.A.

Revised Syllabus of S.Y.B.A. English III (Optional) Choice Based Credit & Grading System (75:25) w.e.f. Academic Year 2020-2021 S.Y.B.A. English III (Optional) Syllabus

Details of the Course

Sr. No.	Heading	Particulars
1	Title of Course	American Literature Paper III (Semester III and IV)
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (75:25)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Syllabus:

The systematic and passionate study of English Literature plays an important role in the overall personality development of the learners. It becomes necessary to understand and appreciate various genres incorporated especially in the realm of American Literature. There is reflection of human life and its vicissitudes with the power of creative and imaginative faculty possessed by the writer. The salient personality traits of the people are communicated through the protagonist as well as an antagonist in literary masterpieces.

The learning of American Literature provides an insight into different perspectives of race, class, human values, materialism and spiritualism along with multiculturalism. It also empowers to the students to have an accurate perception about implications and applications of the so called "American Dream". It also gives an opportunity to explore different facets of identity prevalent in an American environment.

The syllabus aims at inculcation of moral and social values, gender equality and annihilation racial discrimination in the mind of students and make them rise and shine and achieve success through the wings of American Literature in academic as well as professional arena in today's digitization.

Bachelor of Arts (B.A.) in English is a under graduate course of department of English, Changu Kana Thakur Arts, Commerce & Science college, New Panvel (Autonomous) The Choice Based Credit and Grading System to be implemented through this curriculum would enable the students to examine various world classics belonging to American Literature and appreciate it for overall personality development in 21st century.

Objectives of the Course:

- To acquaint the learners with various genres and literary terms of Twentieth Century American Literature.
- To sensitize the students with prominent themes and styles of American Literature
- To study eminent literary works of American writers
- To introduce the students with socio- cultural milieu of Twentieth Century America through world famous literary texts
- To enhance students understanding of American, African American and multicultural sensibility through literary works.

Course Outcome: By the end of the course, a student should develop the Ability:

- To appreciate literary terms of Twentieth Century American Literature.
- To understand thematic concerns reflected in prominent American writers
- To develop gender equality in the personality of students
- To inculcate moral and social values in order to become better citizens
- To maintain equality and justice irrespective of race and class in the society.

Title of the Paper: American Literature S. Y. B. A. English Paper: III

For the subject of English there shall be two papers for 45 lectures each comprising of three units of 15 Lectures each.

Semester-III

- 1. Paper-III Unit-I will be on Terms
- 2. Paper-III Unit-II will be on Novel
- 3. Paper- III Unit-III will be on Short Stories

Semester- IV

- 1. Paper- III Unit-I will be on Terms
- 2. Paper- III Unit-II will be on Play
- 3. Paper- III Unit-III will be on Poetry

Scheme of Examination for Each Semester:

Internal Evaluation: 25 (20 marks internal test and 05 marks for attendance)

Semester End Examination: 75 Marks will be as follows -:

	Theo	ry:					
	Each theory paper shall be of two and half hour duration.						
Ι	All qu	uestions are compulsory and will have internal options.					
	All qu	uestions carry equal marks					
	Q-1	From Unit – I (Short Notes any Two out of Four) 15 Marks					
	Q-2	From Unit – II (Essay having Internal Options.) 15 Marks					
	Q-3	From Unit – III (Essay having Internal Options.) 15 Marks					
	Q-4	From Unit – II (Short Notes any Two out of Four) 15 Marks					
	Q-5	From Unit – III Short Notes any Two out of Four) 15 Marks					

Choice Based Credit Grading and Semester System (CBCGS) S. Y. B. A. English – American Literature Paper III Syllabus To be implemented from the Academic year 2020-2021 SEMESTER III

Course Code	Unit	Topics	Credits	Lectures
		i. Naturalism in 20th Century American		
		Fiction		
UAR1ENG1II	I Terms	ii. Lost Generation Writers		
		iii. African American Fiction		15
		iv. Jewish American Fiction		
		v. Literature of Chinese-American		
		Diaspora		
		vi. Literature of Indian Diaspora in	03	
		America	00	
	II Novel	• Toni Morrison: The Bluest Eye		
				15
		OR		
		• Ernest Hemingway: Pearl		
		i. John Steinbeck: The Chrysanthemums		
	III Short			
	Stories	ii. Alice Walker: Everyday Use		
		iii. Amy Tan: Two Kinds		15
		iv. Bernard Malamud: The German		
		Refugee		
		v. Jhumpa Lahiri: Unaccustomed Earth		

Choice Based Credit Grading and Semester System (CBCGS) S. Y. B. A. English – American Literature Paper III Syllabus To be implemented from the Academic year 2020-2021 SEMESTER IV

Course Code	Unit	Topics	Credits	Lectures
UAR2ENG1	I Terms	 i. American Dream, ii. Confessional Poetry iii. Expressionism in American Drama iv. African American Poetry of the 20th century v. African American Drama of the 20th Century vi. Broadway and Off Broadway Theatre 	3	15
	II Play	 Arthur Miller: Death of a Salesman OR James Baldwin: Blues for Mister Charlie 		15
	III Poetry	i) Langston Hughes: Mother to Son Democracy Dream Deferred I Too Sing American ii) Sylvia Plath: Mirror I am Vertical Tulips Age		15

Reference Books:

- 1 Abrams, M. H.A Glossary of Literary Terms. (8th Edition) New Delhi: Akash Press, 2007.
- 2. Baldick, Chris. The Oxford Dictionary of Literary Terms. Oxford: Oxford University

Press, 2001.

- 3. Bloom, Harold, ed. Short Story Writers and Short Stories. New York: Chelsea House, 2005
- 4. Boyars, Robert, ed. Contemporary Poetry in America. New York: Schocken, 1974.
- 5. Cook, Bruce. The Beat Generation. New York: Scribners, 1971.
- 6. Gould, Jean. Modern American Playwrights. New York: Dodd, Mead, 1966.
- 7. Drabble, Margaret and Stringer, Jenny. *The Concise Oxford Companion to English Literature*. Oxford: Oxford University Press, 2007.
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9. Harmon, Willliam; Holman, C. Hugh. *A Handbook to Literature*. 7th ed. Upper Saddle River, NJ: Prentice-Hall, 1996.

- 10. Hassan, Ihab. *Contemporary American Literature*, 1945-1972: An Introduction. New York: Ungar, 1973.
- Hassan, Ihab. Radical Innocence: Studies in the Contemporary American Novel.
 Princeton, N. J: Princeton University Press, 1961.
- 12. Henderson, Stephen, ed. Understanding the New Black Poetry. New York: William Morrow, 1973.
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- Hudson, William Henry. An Introduction to the Study of Literature. New Delhi: Atlantic, 2007.
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- 20. Pattee, Fred Lewis. *The Development of the American Short Story: An Historical Survey*. New York: Biblo and Tannen, 1975.
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- 22. Scholes, Robert. *Radical Sophistication: Studies in Contemporary Jewish American Novelists.* Athens: Ohio University Press, 1969.
- 23. Stepanchev, Stephen. American Poetry since 1945: A Critical Survey. New York: Harper and Row, 1965.
- 24. Vendler, Helen. Part of Nature, Part of Us: Modern American Poets. Cambridge, Mass.: Harvard University Press, 1980.
- 25. Voss, Arthur. The American Short Story: A Critical Survey. Norman: Univ. of Oklahoma





II ivaVa ivanayaona SaaoBato II

Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

ARTS, COMMERCE AND SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC 'College with Potential for Excellence' Status Awarded by UGC 'Best College Award' by University of Mumbai

Program: M. A.

Revised Syllabus of M.A. English Literature Part II Semester III and IV Under Choice Based Credit and Grading System (60:40) w.e.f. Academic Year 2020-2021

Sr.	Heading	Particulars
No.		
1	Title of Course	Poetry From Chaucer to Present
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Syllabus:

This paper entitled "Poetry from Chaucer to the Present" seeks to familiarize the students with the development of poetry over a vast period especially from Chaucer to the present. Therefore, it aims at studying certain poetic genres in relation to the chief tendencies and movements of the age. This is an attempt to acquaint the students with poetic forms, development of poetry and representative poets through the ages in the wider context of socio-cultural background of the time. The selected texts are to be studied for the poetic form as well as the poet's contribution to the age and their place/relation to the age/movement they represent. It also aims at developing sensitivity of the learners towards life and all that surrounds it. It seeks to foster qualities such as understanding and appreciation of other cultures and ways of life. This poetry paper believes in understanding different schools of poetry, its characteristics and important contributors in the development of poetry as a genre of English Literature.

Objectives of the Course:

- To acquaint with learners with various Schools of Poetry in English Literature
- To study different genres of poetry and its salient traits.
- To empower the students with the skill of appreciation of poetic beauty
- To familiarize the learners with socio and cultural background of the age
- To enable the students to distinguish between prominent trends in English poetry.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand importance of poetry as a genre in English Literature
- To recognize the relationship between nature and poetry
- To develop the skill of appreciation of different poetic forms amongst the students.
- To examine the contribution of representative poets of the age or movement.
- To empower the students to identify moral and social values reflected in English poetry.

M. A. English Literature Semester III

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

Semester-III

- 1. Paper-I Unit- I will be on Chaucer to the Metaphysical Poetry
- 2.Paper-I Unit- II will be on Milton to the Age of Transition

3. Paper- I Unit- III will be on Romantic Revival to Pre- Raphaelite Poets

4. Paper- I Unit- IV will be on Modernism and after

M.A. English Literature Part II Syllabus Under Choice Based Credit Grading and Semester System (CBCGS) To be implemented from the Academic year 2020-2021 SEMESTER III

Course Code	Unit	Topics	Credits	Lectures
PARENG301	Ι	Chaucer to the Metaphysical Poetry:	06	15
		• Geoffrey Chaucer : The		
		Wife of Bath's Tale From The		
		Canterbury Tales		
		• Edmund Spenser :		
		Prothalamion		
		• John Donne: The		
		Canonization		
		• Andrew Marvell: 10 His		
		Coy		
		A Dialogue between the Resolved		
		Soul and Created Pleasure		
	II	Milton to the Age of Transition:		15
		• John Milton: Paradise Lost Book II		
		• Alexander Pope: Essay on Man		
		(Epistle I)		
		• Thomas Gray: Elegy Written in		
		Country Churchyard		
	III	Romantic Revival to Pre- Raphaelite		15
		Poets:		
		• William Wordsworth:		
		Resolution and Independence		
		• P. B. Shelley: Ode to the		
		West Wind		
		• Alfred Tennyson: The Lady		
		of Shalott		
		• Robert Browning: Andrea		
		Del Sarto		
		• D. G. Rossetti: The Blessed		

IV	 Modernism and After T. S. Eliot: The Love Song of J. Alfred Prufrock W. B. Yeats: Amongst School Children Siegfried Sasoon: The Child at the Window W. H. Auden: The Unknown Citizen 	15
	Dylan Thomas: Fern HillPhilip Larkin: The Whitsun Weddings	

Scheme of Examination for Each Semester:

Internal Evaluation: 40

***** Scheme of Examination

The performance of the learners shall be evaluated into two parts. The learner's performance shall be assessed by Internal Assessment with 40% marks in the first part and by conducting the Semester End Examinations with 60% marks in the second part. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below-

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks	
01	One periodical class test / online examination to be conducted in the given semester	20 Marks	
02	One case study / project with presentation based on curriculum to be assessed by the teacher concerned		
	Presentation	10 Marks	15 Marks
	Written Document	05 Marks	
03	Active participation in routine class instructional de overall conduct as a responsible learner, man articulation and exhibit of leadership qualities in related academic activities	05 Marks	

Question Paper Pattern

(Periodical Class Test for the Courses at Post Graduate Programmes)

Maximum Marks: 20 Questions to be set: 02 All Questions are Compulsory **Duration: 40 Minutes**

Question
No.ParticularMarksQ-1Match the Column / Fill in the Blanks / Multiple Choice Questions/
Answer in One or Two Lines (Concept based Questions) (1 Marks /
2 Marks each)10
MarksQ-2Answer in Brief (Attempt any Two of the Three)
(5 Marks each)10
Marks

Following methods can be used for the for projects

- Class presentation on prominent poets and school of poetry
- Writing position papers
- Book review of poets
- Article review: selected from journals and books
- Seminar participation
- Writing research papers

Semester End Examination: 60 Marks will be as follows -:

	Theory	Marks			
Each theory paper shall be of two hours duration.					
All questions All questions	are compulsory and will have internal options. carry equal marks				
Q-1	From Unit I - Essay on the Poetry 1 out of 2	15 Marks			
Q-2	From Unit II - Essay on the Poetry 1 out of 2	15 Marks			
Q-3	From Unit III - Essay on the Poetry 1 out of 2	15 Marks			
Q-4	From Unit IV - Essay on the Poetry 1 out of 2	15 Marks			

References:

1. Abrams, M.H. A Glossary of Literary Terms. Harcourt College Publishers, Singapore.

2. Abrams, M.H. The Mirror and the Lamp: Romantic Theory and the Critical

Tradition. OUP. 1971

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4. Anderson J.J. (Ed): *The Canterbury Tales: A selection of Critical Essays*, Macmillan, *Casebook Series*, *Tiptree (Essex)*, 1974.

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Press, 1964

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- 14. Brettjames, Norman G. Introducing Chaucer. George G Harrap And Co Ltd
- 15. Brooks, Cleanth. *Modern Poetry and the Tradition*. The University of North Carolina Press, Chapel Hill.

16. Bush, Douglas: Introduction, Tennyson: selected Poetry, New York, 1951

- 17. Butt, John. The Augustan Age. London 1950
- 18. Butt, John. Wordsworth- Selected Poetry and Prose, OUP, 1964
- 19. Colins, A.S. English Literature of the Twentieth Century. University Tutorial Press

Ltd, London

- 20. Coulton, G G. Chaucer and His England. Methuen Drama Great Britain
- 21. Cox, C.B. & Dyson, A.E. (ed.) *The Twentieth Century Mind*, *Vol. 1-3*. OUP, London, 1972
- 22. Daiches, David. Present Age. The Cresset Press, London
- 23. Daiches, David. A Critical History of English Literature, Vol. 1-4. Allied Publishers ltd., New Delhi.
- 12 24. Drew, Elizabeth. T.S. Eliot: The Design of His Poetry. Eyre & Spottiswoode

Publishers Ltd., London

- 25. Durrant Geoffrey: William Wordsworth, Cambridge University Press, London, 1969
- 26. Ellman, Richard. Yeats- The man and the Masks. Faber & Faber Ltd., London
- 27. Elsford E.: Four Hymns and Epithalamion, Oxford, 1967
- 28. Faulkner, Peter. Modernism. (The Critical Idiom Series). Methuen & Co. Ltd. London
- 29. Ford, Boris.(Ed.) The Pelican Guide to English Literature Vol. 1-8, Penguin Books, England.
- 30. Fraser, G.S. The Modern Writer and His World. Penguin Books, England.
- 31. Gardner, Helen, The Art of T.S. Eliot. Faber & Faber Ltd., London
- 32. Gardner, Helen (Ed.). The Metaphysical Poets, Penguin Books, England
- 33. Grierson & Smith. Critical History of English Poetry. Chatto&Windus, London
- 34. Grierson Herbert, The Poems of John Donne- Introduction and Commentary, The
- Macmillan Press Ltd, London, 1973
- 35. Hamer, EnidMetres of English Poetry. Methuen Drama Great Britain

36. Hayward, John (Ed.). The Penguin Book of English Verse. Penguin books, England

37. Hudson, W.H.: Gray and His poetry, London, George G. Harrp& Co., 1927

38. Hudson, W.H. Introduction to the Study of English Literature. George G. Harrap&Co. Ltd. London.

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46. Mukherji S.B. : *The Poetry of Wordsworth*, Vikas Publishing House, New Delhi, 1976
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54. Starr, Herbert W.: Twentieth century Interpretation of Gray's Elegy, Englewood

Cliffs, New jersey, Prentice hall, Inc.,

55. Tedlock E.W. (ed.): Dylan Thomas: The Legend and the Poet, Heinemann, 1960

56. Tindall W.Y.: A Reader's Guide to Dylan Thomas, Syracuse University Press, 1962

57. Upham, A.H. Typical Forms of English Literature. Oxford University Press

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59. White Helen C.: The Metaphysical Poets, Collier Macmillan Ltd., 1962

60. Williamson, George. A Reader's Guide to T.S. Eliot. Thames & Hudson, London.

61. Willey, Basil, Nineteenth Century Studies, Chatto and Windus, 1964

62. Willey, Basil. The Seventeenth Century Background. Penguin Books, England.

Sr. No.	Heading	Particulars
1	Title of Course	Gender Perspectives on
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Syllabus:

It is extremely important to create an awareness about different dimensions of gender perspectives in the mind of students. It is apparent that the issues of gender, race, class and nation are closely interconnected with each other. Therefore, gender roles are inscribed in social forces rather than in natural or innate differences. This course entitled "Gendered Perspectives on Literature" primarily articulates contemporary concerns both academic and sociocultural systematically. It also exposes literary texts as a microcosm of beliefs and values that engineer gender ideologies and generate stereotypes. Similarly, it also explores the contesting or subversion of such ideologies and stereotypes by examining contemporary debates in the study of gender and sexuality as reflected in literature. The course further addresses the patterned gender representations and the politics of departure from these locations. In the light of intense debates the world over, on the above issues, the need for such a course at the post-graduate level is self-evident. The syllabus of this course aims at development of gender quality in the mind of students in order to become better citizens in the society.

Objectives of the Course:

- To open up new avenues in gender studies to the students
- To acquaint the student with the complexity and diversity involved in the process of construction of gender and sexuality.
- To encourage the students to interrogate the rigid frameworks of gender construction.
- To evaluate literary text in the light of gender perspectives
- To examine the projection of women characters in literary text
- To familiarize the learners with critical theories related to gender.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand importance gender equality in the real life.
- To recognize the relationship society and gender formation
- To appreciate prominent literary text on the basis of gender perspectives.
- To examine the status and identity of women in literature as well as society.
- To practice gender parity in society.

M. A. English Literature Semester III

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

Semester-III

- 1. Paper-I Unit-I will be on Critical Theories Related to Gender
- 2. Paper-I Unit-II will be on Poetry
- 3. Paper- I Unit-III will be on Fiction
- 4. Paper- I Unit-IV will be on Drama

M.A. English Literature Syllabus Under Choice Based Credit Grading and Semester System (CBCGS) To be implemented from the Academic year 2020-2021 SEMESTER III

Course Code	Unit	Topics	Credits	Lectures
PARENG 302	Ι	Critical Theories	06	15
		Critical Theory related to Candam (Equipidation Theorem)		
		Gender, (Feminist Thought, Masculinity Studies		
		Oueer/LGBTTheory)		
		Critical Approaches (Re-		
		reading, Re-visioning,		
		Gynocriticism, Trans-		
		 Gender in theories of popular 		
		culture		
	II	1. Catherine Acholonu		15
		• :"The Market Goddess"		
		• "The Way from <i>The</i>		
		Spring's Last Drop (1985)"		
		2. Arundhathi Subramaniam		
		• :"Meenakshi"		
		• "5:46, Andheri Local"		
		3. Sylvia Plath		
		• "Daddy"		
		• "Lady Lazarus"		
		4. W.H.Auden		
		• "The Common Life"		
		• "Lullaby"		
		5. Countee Cullen		
		• "Tableau"		
		• "Heritage"		
	III	• Karukku by Bama		15

	Or The Awakening by Kate Chopin	
IV	• <i>Sakharam Binder</i> by Vijay Tendulkar	15
	<i>A Streetcar named Desire</i> by Tennessee Williams	

Scheme of Examination for Each Semester:

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular		Marks
01	One periodical class test / online examination to be conducted in the given semester		20 Marks
	One case study / project with presentation based on c be assessed by the teacher concerned	urriculum to	15 Marks
02	Presentation	10 Marks	
	Written Document	05 Marks	
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities		05 Marks

Question Paper Pattern

(Periodical Class Test for the Courses at Post Graduate Programmes)

Maximum Marks: 20 Questions to be set: 02 All Questions are Compulsory Duration: 40 Minutes

Question No.	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

Semester End Examination: 60 Marks will be as follows -:

	Theory	Marks
Each theory paper shall be of two hours duration.		
All questions All questions	are compulsory and will have internal options. carry equal marks	
Q-1	From Unit I - Short notes on the terms 2 out of 4	15 Marks
Q-2	From Unit II - Essay on the poetry 1 out of 2	15 Marks
Q-3	From Unit III - Essay on the novels 1 out of 2	15 Marks
Q-4	From Unit IV - Essay on the drama 1 out of 2	15 Marks

References:

1. Auerbach, Nina. Communities of Women: An Idea in Fiction. Cambridge, Mass.:

Harvard University Press, 1978.

- 2. Barrett, Michele. Women and Writing. London: Women's Press, 1979.
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- 5. Fetterley, Judith. The Resisting Reader: A Feminist Approach to American Fiction.

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Delhi: Foundation Books, 1996

7. Gilbert, Sandra and Susan Gubar. *The Madwoman in the Gothic: The Woman Writer and the Nineteenth Century Literary Imagination*. New Haven: Yale University Press. 1979.

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Sr. No.	Heading	Particulars
1	Title of Course	Twentieth Century American Literature
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Course

It is considered as that the 20th century American Literature is a corpus of experimental and multicultural writings. It also reveals the impact of many movements such as Imagism, Modernism, Postmodernism and Feminism. It is necessary to identify various facets of racial discrimination and its impact on literature. There a need to explore sufferings of women characters especially in African American literature. A course on 20th Century American Literature is an opportunity for the students to familiarize with a variety of literary expressions. The interesting thematic concerns such as identity, immigrant experiences, multiculturalism, marginality, protest and hyphenated identities are reflected in this course.

Objectives of the Course:

- To acquaint the learners with various genres of twentieth century American Literature
- To familiarize the students with literary terms of twentieth century American Literature
- To introduce the students with socio- cultural milieu of twentieth century America
- To examine the complexity of identity crisis reflected in the texts.
- To understand the the nature and sufferings of minority people.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand various thematic concerns reflected in the realm of American Literature
- To recognize the importance of equality and freedom in the society.
- To appreciate the style of modern and post modern American writers.
- To understand the importance of multiculturalism depicted in the texts.
- To encourage the students to make presentations on prominent American writers.

M. A. English Literature Semester III

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

<u>Semester-III</u>
1. Paper- I Unit- I will be on Terms
2. Paper- I Unit- II will be on Poetry
3. Paper- I Unit- III will be on Novel
4. Paper- I Unit- IV will be on Drama

M.A. English Literature Part II Syllabus Under Choice Based Credit Grading and Semester System (CBCGS) To be implemented from the Academic year 2020-2021 SEMESTER III

Course Code	Unit	Topics	Credits	Lectures
PARENG303	Ι	Terms and Concepts	06	15
		• The Lost Generation		
		Southern Renaissance		
		Beat Generation		
		• The Harlem Renaissance		
		• The Civil Rights Movement		
		• Expressionism in American		
		Drama		
		• Impact of World Wars on		
		American Literature		
		Confessional Poetry		
		• Jewish American Literature		
		• African American Women's		
		Writing		
	II	Poetry		15
		Robert Frost: Out Out-		
		A Roadside Stand		
		Fire and Ice		
		Wallace Stevens: Anecdote of the		
		Jar		

	Another Weeping Woman	
	Domination of Black	
	A Rabbit as the King of the Ghosts	
	Nikki Giovanni: A Journey	
	Crutches	
	Life Cycles	
	I Wrote a Good Omelet	
III	Novel	15
	• Joseph Heller: Catch-22	
	• Gloria Naylor: Moma Day	
IV	Drama	15
	• Eugene O'Neill: The Hairy	
	Ape	
	• Angust Wilson: Fences	

Scheme of Examination for Each Semester:

Evaluation: 40

✤ Scheme of Examination

The performance of the learners shall be evaluated into two parts. The learner's performance shall be assessed by Internal Assessment with 40% marks in the first part and by conducting the Semester End Examinations with 60% marks in the second part. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below-

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks	
01	One periodical class test / online examination to be conducted in the given semester		20 Marks
	One case study / project with presentation based on curriculum to be assessed by the teacher concerned		
02	Presentation	10 Marks	15 Marks
	Written Document	05 Marks	
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities		05 Marks

Question Paper Pattern

(Periodical Class Test for the Courses at Post Graduate Programmes)

Maximum Marks: 20 Questions to be set: 02 All Questions are Compulsory

Question
No.MarksQ-1Match the Column / Fill in the Blanks / Multiple Choice Questions/
Answer in One or Two Lines (Concept based Questions) (1 Marks /
2 Marks each)10
MarksQ-2Answer in Brief (Attempt any Two of the Three)
(5 Marks each)10
Marks

Following methods can be used for the for projects

- Class presentation on prominent Twentieth Century American Writers
- Writing position papers
- Book review of poets
- Article review: selected from journals and books
- Seminar participation
- Writing research papers

Duration: 40 Minutes

• Interpretation of literary and cultural texts (films, drama and Television shows)

Semester End Examination: ou Marks will be as follow	WS -:
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	Theory	Marks	
Each theory paper shall be of two hours duration.			
All questions All questions	are compulsory and will have internal options. carry equal marks		
Q-1	From Unit I - Short notes on the terms 2 out of 4	15 Marks	
Q-2	From Unit II - Essay on the Poetry 1 out of 2	15 Marks	
Q-3	From Unit III - Essay on the Novel 1 out of 2	15 Marks	
Q-4	From Unit IV - Essay on the Drama 1 out of 2	15 Marks	

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Sr. No.	Heading	Particulars
1	Title of Course	Shakespeare
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Course:

English literature is inevitably associated with one the most influential and towering personality belonging to sixteenth century. The Bard of Avon has created his reputation as one the greatest actors, dramatists and sonneteers in the realm of English Literature. English and William Shakespeare is considered as two sides of the same coin. He has made his works admirable and appreciable to all the readers all over the universe. Therefore, according to his contemporary Ben Jonson "was not of an age but for all time." Indeed, Shakespeare has become a literary icon for all places and spaces: more than four hundred years after his death, his works continue to be staged, adapted into films and studied in Universities around the world. This paper will examine the ways in which Shakespeare's works may have been received against the philosophical and intellectual viewpoints of the Renaissance. The paper will also consider the literary scholarship which shaped the understanding of Shakespearean works. The paper will similarly help the learners consider Shakespeare's enduring global appeal through investigation into the rich, cultural and political complexities of Shakespeare adaptations. It also investigates

prominent themes and dramatic techniques depicted in the remarkable tragedies, romantic comedies and historical plays of William Shakespeare.

Objectives of the Course:

- To acquaint the learners with timeless dimensions of masterpieces of Shakespeare.
- To familiarize the students with features of Shakespearean tragedies
- To explore various universal truths incorporated in the works of Shakespeare
- To examine salient traits of Romantic comedies of William Shakespeare
- To understand the relevance of William Shakespeare in 21st century.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand various thematic concerns reflected in the masterpieces of Shakespeare.
- To identify effective use of iambic pentameter in the works of Shakespeare.
- To appreciate the tragedies, comedies and historical plays of William Shakespeare.
- To understand the contribution of William Shakespeare as a Sonneteer.
- To examine the how everybody is playing the role of Hamlet in one's life.

M. A. English Literature Semester III

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

Semester-III

- 1. Paper- IV Unit- I will be on Tragedies
- 2. Paper- IV Unit- II will be on Comedies
- 3. Paper- IV Unit- III will be on Historical Plays
- 4. Paper- IV Unit- IV will be on Sonnets

M.A. English Literature Syllabus Under Choice Based Credit Grading and Semester System (CBCGS) To be implemented from the Academic year 2020-2021 SEMESTER III

Course Code	Unit	Topics	Credits	Lectures
PARENG304	Ι	Tragedies	06	15
		• Hamlet		
		King Lear		
		Comedies		15
	II	As You Like It		
		Measure for Measure		
		Historical Plays		15
	III	Anthony and Cleopatra		
		• Henry IV – Part I		
		Poetry		15
	IV	• Venus and Adonis		
		• Sonnets		
		i. "Shall I compare thee		
		to a Summer's day" –		
		Sonnet 18		
		11. When in disgrace with		
		eves" Sonnet 29		
		iii "Since brass nor stone		
		nor earth. nor		
		boundless sea" –		
		Sonnet 65		
		iv. "That time of year thou		
		may'st in me behold"		
		– Sonnet 73		
		v. "Let me not to the		
		marriage of true		
		minds" – Sonnet 116		
		in a waste of shame" –		
		Sopnet 129		
		vii. "My mistress' eyes are		
		nothing like the sun" -		
		Sonnet 130		
		viii. "When my love swears		
		that she is made of		
		truth" –Sonnet 138		

Scheme of Examination for Each Semester:

A) Internal Assessment: 40 %

40 Marks

Duration: 40 Minutes

Sr. No.	Particular		Marks
01	One periodical class test / online examination to be conducted in the given semester		20 Marks
02	One case study / project with presentation based on c be assessed by the teacher concerned	urriculum to	15 Marks
	Presentation	10 Marks	
	Written Document	05 Marks	
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities		05 Marks

Question Paper Pattern

(Periodical Class Test for the Courses at Post Graduate Programmes)

Maximum Marks: 20 Questions to be set: 02 All Questions are Compulsory

Question No.	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

Semester End Examination: 60 Marks will be as follows -:

	Theory	Marks	
Each theory paper shall be of two hours duration.			
All questions All questions	All questions are compulsory and will have internal options. All questions carry equal marks		
Q-1	From Unit I – Essay on the Tragedy 1 out of 2	15 Marks	
Q-2	From Unit II – Essay on the Comedy 1 out of 2	15 Marks	
Q-3	From Unit III – Essay on the Historical 1 out of 2	15 Marks	
Q-4	From Unit IV – Essay on the Sonnets 1 out of 2	15 Marks	

Following methods can be used for the for projects

- Class presentation on prominent masterpieces of William Shakespeare
- Book review of poets
- Article review: selected from journals and books
- Seminar participation
- Writing research papers
- Interpretation of literary and cultural texts (films, drama and Television shows)

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The Comedies and Romances

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Tragedies

1. Dollimore, Jonathon. Radical Tragedy: Religion, Ideology, and Power in the Drama of Shakespeare and His Contemporaries. (1984)

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The Histories

1. Holderness, Graham. Shakespeare: The Histories (2000)

2. Levine, Nina S. Women's Matters: Politics, Gender and Nation in Shakespeare's

Early History Plays (1998)

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- 4. Rackin, Phyllis. Stages of History: Shakespeare's English Chronicles (1990)
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Sr. No.	Heading	Particulars
1	Title of Course	Indian Writing in Translation
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Course:

It is necessary to make the syllabus a more multidisciplinary and multilingual in order to cater the needs of contemporary society and nation in present day context. In the times of globalization and increasing competitions, many of our students aspire to seek jobs multilingual regions in India and abroad for which they are to be equipped with a capability of knowing the works in translation and an expertise in Indian Literature in English translation.

Keeping in mind this multilingual scenario, the present syllabus includes writers from various languages of India and available in the translated forms in English as students shall create possible interactions and develop the expertise in the said discipline.

It is apparent that no language is great or small and medium of English as link language to help regional literature of India reach out to the world in their accessible tongue. One has to know that regional languages in India have been affluent in literary tradition by rich historical collections they had since two centuries; people have been engaged in bringing this literature of various languages into English via translation. It is considered that translation is an important skill to be possessed by the students. There is a need to maintain golden balance in learning skills in domains of literary works from different languages in India.

Objectives of the Course:

- To provide an exhaustive study of Indian Literature in the various Indian languages especially through translation.
- To familiarize the students with major movement in India through English translations.
- To understand importance of translation and its mechanism in literature.
- To acquaint the students with the history of translation in India.
- To explore prominent poets, novelists and dramatists in Indian languages.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand various thematic concerns reflected in Indian Writing in Translation.
- To enable the students to delve deep in Indian literature in translation.
- To examine the nature of Indian ethos reflected in the various Indian languages.
- To understand the contribution of prominent writers in the realm of Indian languages.
- To empower the students to overcome the challenges of literary translation.

M. A. English Literature Semester IV

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

<u>Semester-</u> IV
1. Paper-I Unit-I will be on Background Study
2. Paper-I Unit-II will be on Poetry
3. Paper-I Unit-III will be on Drama
4. Paper- I Unit-IV will be on Fiction

M.A. English Literature Syllabus

Under Choice Based Credit Grading and Semester System (CBCGS) To be implemented from the Academic year 2020-2021 SEMESTER IV

Course Code	Unit	Topics	Credits	Lectures
PARENG401	Ι	Background Study	06	15
		1) Historical Review of Indian Writing		
		in translation – the spread of English		
		language and democratic values in		
		Post-Independence India, Partition		
		literature, the emergence of regional		
		and translated literatures in India,		
		East-West Encounters, Impact of		
		Western trends and movements on		
		Indian literature and culture.		
		2) Contemporary trends and		
		movements in Indian writing in		
		translation – beginning and growth of		
		marginalized literature, translated		
		works of native writers from different		
		languages in India and decolonization,		
		development of women's writings and		
		gender studies, subaltern voices, tribal		
		studies and protest literature.		
		Poetry		15
	II	1) Songs of Kabir by		
		Rabindranath Tagore		
		Song No. 01- mo ko kanan ununro bande		
		05- avadhû mâvâ tajî na jâv		
		12- hamsâ, kaho purâtan vât		
		21- ghar ghar dîpak barai		
		38- bhram kâ tâlâ lagâ mahal re		
		2) Arun Kolatkar: <i>Jejuri</i>		
		3) Selected poems from Poisoned		
		Bread edited by Arjun Dangle		

III	 Hunger An Ultimatum I will Belong to it In Our Colony To Be or Not To be Born Drama Mohan Rakesh: One Day in the Season of Rain Vijay Tendulkar: Ghashiram Kotwal 	15
IV	 Fiction Maya Pandit : Baby Kamble U. R. Anantha Murthy: Samskara 	15

Scheme of Examination for Each Semester:

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular		Marks
01	One periodical class test / online examination to be conducted in the given semester		20 Marks
02	One case study / project with presentation based on cr be assessed by the teacher concerned	urriculum to	15 Marks
	Presentation	10 Marks	
	Written Document	05 Marks	
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities		05 Marks

Question Paper Pattern Periodical Class Test for the Courses at Post Graduate Programmes)

Maximum Marks: 20 Questions to be set: 02 All Questions are Compulsory Duration: 40 Minutes

Question	Particular	
No.		
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

Semester End Examination: 60 Marks will be as follows -:

	Theory	Marks	
Each theory p	Each theory paper shall be of two hours duration.		
All questions All questions	are compulsory and will have internal options. carry equal marks		
Q-1	From Unit I - Short notes on the terms 2 out of 4	15 Marks	
Q-2	From Unit II - Essay on the Poetry 1 out of 2	15 Marks	
Q-3	From Unit III - Essay on the Drama 1 out of 2	15 Marks	
Q-4	From Unit IV - Essay on the Fiction 1 out of 2	15 Marks	

References:

1. Bassnett, Susan, Political Discourse, Media and Translation, Cambridge Scholars, 2010.

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Sr. No.	Heading	Particulars
1	Title of Course	Research Methodology
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Course:

There is an innate desire for searching and researching in the mind of students as well as human beings since time immemorial. It is apparent that curiosity and the spirit of questioning also contributes significantly in the development of research amongst the students. Research is an integral facet of learning process. Learning and research are considered as inevitable elements to be inculcated for better understanding and dissemination of knowledge.

Basically research is creative, innovative and systematic work undertaken to increase the stock of knowledge. It is a serious investigation aimed at the discovery and interpretation of data as well as facts with suitable methodology. Systematic enquiry of the questions is possible only with an amalgamation of research aptitude, critical acumen and application of relevant methodology in English language. The process of research involves identification of the problem, objectives, hypothesis, collection of data, interpretation of the data, literature review and interpretative and creative skills on the part of researcher. This journey of research requires lot of patience and inquisitiveness on the part of researcher.

This research paper primarily aims at developing interest in the mind of the students about nature, process and mechanism of research in English and become successful researchers in today's digital world.

Objectives of the Course:

- To introduce the learners with the concept of research.
- To familiarize the students with important stages involved in the process of research
- To inform the students about the the process of data collection and analysis.
- To acquaint the students with different research tools and methods present in English.
- To create thirst for research in the mind of students.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand importance the research of in the process of learning.
- To acquire the interpretative and analytical skills during the process of research.
- To understand the process of research systematically and successfully.
- To enable the students various conventions of documentation.
- To undertake research in English and become successful researcher.

M. A. English Literature Semester IV

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

Semester-IV

- 1. Paper-I Unit-I will be on Key Concepts
- 2. Paper-I Unit-II will be on Research Tools, Language and Plagiarism
- 3. Paper-I Unit-III will be on Research in Language and Literature
- 4. Paper- I Unit-IV will be on Process of Research

M.A. English Literature Syllabus Under Choice Based Credit Grading and Semester System (CBCGS) To be implemented from the Academic year 2020-2021 SEMESTER IV

Course Code	Unit	Topics	Credits	Lectures
PARENG402	Ι	Key Concepts	06	15
		• Investigation, exploration,		
		examination, analysis		
		• Hypothesis and Problem		
		Statement		
		• Methods and Modes of		
		Research		
		• Data Analysis (Collection and		
		Classification)		
		• Reference Lists and Footnotes		
		• Quotations and Citation		
		• Bibliography / Appendix /		
		Appendices		
		Research: Tools, Language and		15
	Π	Plagiarism		
		Primary and Secondary Data		
		• Research Language (Clarity,		
		Correctness, Conerence) Passarah Ethias		
		Research in Language and		15
	III	Literature		10
		Methods in Language		
		Research		
		• Trends and Approaches in		
		Literary Research		
		Process of Research		15
	IV	Selection of Research Topic		10
	·	• Chapterisation: Sections and		
		Sub-sections of Chapters		
		Findings and Conclusion		

Scheme of Examination for Each Semester:

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular		Marks
01	One periodical class test / online examination to be conducted in the given semester		20 Marks
02	One case study / project with presentation based on cube assessed by the teacher concerned	urriculum to	15 Marks
	Presentation	10 Marks	
	Written Document	05 Marks	
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities		05 Marks

Question Paper Pattern

(Periodical Class Test for the Courses at Post Graduate Programmes)

Duration: 40 Minutes

Maximum Marks: 20 Questions to be set: 02 All Questions are Compulsory

Question	Particular	Marks
N0.		
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

Semester End Examination: 60 Marks will be as follows -:

	Theory	Marks
Each theory paper shall be of two hours duration.		
All questions are compulsory and will have internal options. All questions carry equal marks		
Q-1	From Unit I - Short notes on the Concepts 2 out of 4	15 Marks
Q-2	From Unit II – Essay on Research tools 1 out of 2	15 Marks
Q-3	From Unit III – Essay on Research language 1 out of 2	15 Marks
Q-4	From Unit IV – Essay on Process of Research 1 out of 2	15 Marks

References:

1. Ahuja, Ram. (2005), Research Methods. Rawat Publications.

- 2. Altick, R.D. (1963), The Art of Literary Research, New York: Norton.
- 3. Bawarshi, Anis S. and Reiff, Mary Jo. (2010), Genre: An Introduction to History,

Theory, Research, and Pedagogy. Parlor Press.

4. Booth, Wayne C. (2003), The Craft of Research, University of Chicago Press.

5. Eliot, Simon. (1998), A Handbook of Literary Research. Psychology Press.

6. Ellis, Jeanne (2010), Practical Research Planning and Design, Ormond, Merrill.

 Gibaldi, Joseph. (2003), MLA Handbook for Writers of Research Papers, New York: MLA Association.

8. Gorman, G. E. and Clayton, Peter. (2005), *Qualitative Research for the Information Professional* by London: Facet Publishing. 95

9. Harner, James L. (2002), Literary Research Guide: An Annotated Listing of

Reference Sources in English Literary Studies, New York: MLA of America.

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11. Lenburg, Jeff. (2007), Guide to Research. Viva Books.

12. Miller R.H. Handbook of Literary Research. Methuen.

13. McMillan, James H. (1996). Educational Research: Fundamentals for the Consumer.
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17. Sameer, Kumar. (2005), Research Methodology. Springer: US.

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19. Rahim, Abdul F. (2005), *Thesis Writing: A Manual for Researchers*. New Delhi: NewAge International.

20. Tunnell, Michael O. and Jacobs, James S. Using "Real" Books: Research Findings on LiteratureBased Reading Instruction. The Reading Teacher Vol. 42, No. 7 (Mar., 1989)

Sr. No.	Heading	Particulars
1	Title of Course	Political Reading of Literature
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Course:

It is has been regarded that the study of English literature is directly or indirectly associated with the politics involved in it. Historically speaking, literature has been perceived as a domain of truth and knowledge. Particularly, the canonical texts are read and revered for their ability to come to grips with as well as reflect the timeless essence of universal human experience.

A great writer is seen as a genius who has transcended history, thus showcasing his ability to grapple with and unravel the eternal riddles of human Life. However, our exposure to some of the new radical theories like Marxism, Feminism, Postcolonialism, Cultural Studies etc. has taught us that literature as an institution is transfixed in the matrix of politics. In other words, literature which includes even canonical texts, mediates the dominant ideologies of the times and therefore, the 'political unconscious' [a term made famous by Fredric Jameson] is the built-in feature of a literary text. At the same time, the writer's world view is also conditioned and structured by the dominant politico-ideological framework of his/her times. There is plenty of conflict involved in between the protagonist and antagonist on account of the pivotal role of the so called politics. The writer also describes issues of class, race and gender politics present in the literary texts. The syllabus of this paper highlights on the manner in which different characters involved in the process of politics in order to accomplish the desired ambitions and missions.

Objectives of the Course:

- To introduce the learners with nature of monarchic ideology.
- To familiarize the students with emergence of colonialism and imperialism
- To inform the students about issues of race, class and gender politics
- To acquaint the students with different texts as an embodiment of power politics.
- To explore various pros and cons of power politics present in the literary texts.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand various nuances of power politics present in the literary texts.
- To examine the dominant ideology reflected in the realm of literature.
- To understand the mechanism of power politics and its implementation.
- To empower the students with the skill of coping managing with the power politics.
- To identify the power politics present in the literary works as well as real life.

M. A. English Literature Semester IV

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

Semester-IV

- 1. Paper-I Unit-I will be on Macbeth
- 2. Paper-I Unit-II will be on Mansfield Park
- 3. Paper-I Unit-III will be on Wuthering Heights
- 4. Paper- I Unit-IV will be on A Passage to India

M.A. English Literature Syllabus Under Choice Based Credit Grading and Semester System (CBCGS) To be implemented from the Academic year 2020-2021 SEMESTER IV

Course Code	Unit	Topics	Credits	Lectures
PARENG403	Ι	Elizabethan Age	06	15
		• The Rise and Consolidation		
		of Monarchic Ideology		
		• How Shakespeare's		
		texts uphold and		
		authenticate absolutist		
		monarchic ideology		
		• William Shakespeare:		
		Macbeth		
	П	 Emergence and spread of Colonialism and Imperialism How colonial ideology is embedded in and transmitted by the canonical texts Gendering the Subject and Social Construction of Woman Jane Austen: Mansfield Park 		15
		Patriarchal ideology and		15
	ш	 Fathachar heorogy and powerHow it is operational in family relationships Emile Bronte: Wuthering Heights Ideology of Race & OthernessHow it facilitates the hegemony of the dominant groups/race [Heathcliff in relation to other characters in the text] 		
	IV	 Representing the Oriental Other and the legitimation of colonial ideology E M Forster: A Passage to India 		15

Scheme of Examination for Each Semester:

A) Internal Assessment: 40 %

Sr. No.	Particular		Marks
01	One periodical class test / online examination to be conducted in the given semester		20 Marks
02	One case study / project with presentation based on c be assessed by the teacher concerned	urriculum to	15 Marks
	Presentation	10 Marks	
	Written Document	05 Marks	
03	Active participation in routine class instructional de overall conduct as a responsible learner, man articulation and exhibit of leadership qualities in related academic activities	liveries and nerism and organizing	05 Marks

Question Paper Pattern

(Periodical Class Test for the Courses at Post Graduate Programmes)

Duration: 40 Minutes

Maximum Marks: 20 Questions to be set: 02 All Questions are Compulsory

Question No.	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

Semester End Examination:	60 Marks will be as follows -:
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	Theory	Marks
Each theory paper shall be of two hours duration.		
All questions are compulsory and will have internal options. All questions carry equal marks		
Q-1	From Unit I – Essay on the Play 1 out of 2	15 Marks
Q-2	From Unit II – Essay on the Novel 1 out of 2	15 Marks
Q-3	From Unit III – Essay on the Novel 1 out of 2	15 Marks
Q-4	From Unit IV – Essay on the Novel 1 out of 2	15 Marks

References:

1. Archibald, Diana C. Domesticity, Imperialism, and Emigration in the Victorian Novel. University of Missouri Press, 2002.

2. Cornell, Susan Meyer Imperialism at Home: Race and Victorian Women's Fiction.

University Press, 1996.

 Donaldson, Laura E. Decolonizing Feminisms: Race, Gender & Empire Building. University of North Carolina Press, 1992.

4. Gikandi, Simon Maps of Englishness: Writing Identity in the Culture of Colonialism Columbia University Press, 1996.

5. Hodgkins, Christopher Reforming Empire: Protestant Colonialism and Conscience in British Literature. University of Missouri Press, 2002.

6. Low, Gail Ching-Liang. White Skins/Black Masks: Representation and Colonialism Routledge, 1996.

7. Parry, Benita Postcolonial Studies: A Materialist Critique. Routledge, 2004.

8. Rajan, Gita Postcolonial Discourse and Changing Cultural Contexts: Theory and

Criticism Radhika Mohanram Greenwood Press, 1995.

Sr. No.	Heading	Particulars
1	Title of Course	Project
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Sr.	PARENG404	Paper IV
No.	Topics/ Areas of the Project Work	
1	Comparative Literature	
2	Re-reading Canonical Texts	
3	Language and Literature	
4	Film Appreciation	
5	Art and Literature	
6	Study of Popular Culture	
7	Subaltern in Literature	
8	Literature and Environment	
9	Gendered Reading of Literature	
10	Literature of Diaspora	
11	Queer and LGBT Studies	
12	Folk Literature	
13	Mythology	
14	Spirituality and Literature	
15	Journalism and Literature	
16	Marginality and Protest Literature	
17	Feminism and Literature	

Project Based Courses:

The objective of the Project Based Courses is to evaluate the critical competence, logical

reasoning and scholarly composition of the students at the end of the M.A. Programme. At the end of the course students are expected to have sound theoretical knowledge so that they can apply it to a particular area of study selected from the Project Based Course. They should develop the skills of identifying an area of investigation, reviewing literature, analyzing concepts, comparing alternative theories and perspectives, understanding the difference between primary and secondary sources in the area of their research, collecting and organizing data and articulating their arguments coherently and clearly.

Final Dissertation must be written as per the current edition of the Modern Language

Association (MLA) Handbook.

Detailed Regulations for Project Based Courses:

3.1 Project based courses will be offered in the fourth semester. Every learner will have to choose one project based course, which will be for ten credits. The project based course will be in the form of a dissertation based on a live project or a research assignment related to the specific discipline of the parent department.

3.2: The student will submit a list of his/her three most preferred topics in the order of

preference by the fifth week of the third semester to the Head of the parent department.

3.3: Each Department will constitute a project committee consisting of the Head of the

Department (Chairperson) and two other teachers from the department. The purpose of this

committee is to oversee the functioning of the project component in the department.

3.4: All post graduate teachers in the Department will be guides for the project component.

3.5: The project committee will allocate students to guides within the department in order of

the average of marks obtained in semesters 1 and 2.

3.6: If it is felt necessary, the project committee can assign a co-guide to a student, depending upon specific disciplinary needs.

3.7: The student will make a preliminary presentation in the seventh week of the fourth semester. The presentation will be attended by the guide and a committee consisting of two other teachers from the department. The committee will make necessary suggestions to improve the dissertation.

3.8: The student will make a final presentation in the 10th to the 12th week of semester four.

The presentation will be evaluated by the same committee that evaluated the preliminary presentation. The criteria for evaluation will be as follows:

134 135

i) 10 marks for the quality of presentation

ii) 15 marks for answers to questions

The marks given by the three members of the evaluation committee will be averaged in each

head and the total marks decided by totalling the averages under the three heads.

3.9: The student will submit a bound hard copy of the dissertation to the Department by the end of the fourth semester, along with a soft copy on a CD/DVD.

3.10: The final dissertation will have a word limit of 5000-8000 words and will be typed in

one and a half spacing on one side of the paper.

3.11: The final dissertation will be evaluated out of 75 marks by the guide.

3.12: The project will be given a grade point as per the following scheme:

10 Point Grading System

Marks	Grade	Grade	Performance
	Points		
Less than 40	0	F	Fail
40-44.99	4	D	Pass
45 - 49.99	5	С	Average
50 - 54.99	6	В	Above
			Average
55 - 59.99	7	B+	Good
60 - 69.99	8	A	Very Good
70 – 79.99	9	A+	Excellent
80 & Above	10	0	Outstanding

3.13: A student who gets a letter grade F in the course will be deemed to have failed in the course.

3.14: A student who feels aggrieved by the grading received will have the option of applying

to the project committee for re-evaluation of the project within a period of one week after the declaration of the result. If the project committee feels that the claim is justified, it shall appoint a fresh examiner who will submit his/her evaluation in a weeks time. If the marks by the re-evaluating examiner exceed the marks of the original examiner by a margin of 10% or more, the latter set of marks will be considered final.

3.15: The student who has got a letter grade F in the project course will have the option of resubmitting a revised version within 2 months from the date of declaration of the result. If a student fails this time too, he/she will not get any more chances and will be ineligible to be awarded the MA degree.

3.16: If a student is unable to submit his/her dissertation in the stipulated time or fails to make the presentations at the appointed time, he/she will be deemed to have failed the course and will have the option given in 3.16.

- 3.17: The schedule for preliminary presentation, final presentation and dissertation Submission is displayed in the first week of the fourth semester.
- 3.18: Ethical Standards regarding Dealing with Human Participants:

Students should refrain from acts which he or she knows, or under the circumstances has reason to know, spoil the academic integrity of the academic program. Violations of academic integrity include, and not limited to: plagiarism; violation of the rights and welfare of human participants in research and practice; cheating, knowingly furnishing false information; misconduct as a member of department or college, and harm to self and others.

।। विद्या विनयेन शोभते ।। Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

Arts, Commerce and Science College, New Panvel Autonomous



Scheme of Evaluation for Continuous Assessments and Semester End Examinations for Under-graduate Programmes under Faculty of Arts Subject: Hindi

Under Autonomous status with Credit Based Semester and Grading System ।। विद्या विनयेन शोभते ।। Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

Arts, Commerce and Science College, New Panvel Autonomous

Affiliated to University of Mumbai





Bachelor of Arts (B.A.) Revised Syllabus For

S.Y.B.A. – Hindi- Paper No - II and III

Choice Based Credit Grading and Semester System (CBCGS) (75:25) With effect from the Academic Year 2020-2021 to 2022-2023

Board of Examinations and Evaluation, C.K. Thakur A.C.S. College, New Panvel 2 | P a g e



Board of Examinations and Evaluation, C.K. Thakur A.C.S. College, New Panvel 3 | P a g e

॥ विद्या विनयेन शोभते ॥ Janardan Bhagat Shikshan Prasarak Sanstha's CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Affiliated to University of Mumbai

Re-accredited 'A+' Grade by NAAC 'College with Potential for Excellence' Status Awarded by UGC 'Best College Award' by University of Mumbai

Choice Based Credit Grading and Semester System (CBCGS) (75:25) With effect from the Academic Year 2019-20

Faculty of Humanities

Semester III & Semester IV

Guidelines

Syllabus Structure:

- 1. In S.Y.B.A. Hindi Paper II (CCCS) in Semester III and Semester IV, there will be one paper each with 4 Credits in each Semester.
- 2. In S.Y.B.A. Hindi Paper III (CBCGS) in Semester III and Semester IV, there will be one Paper each with 4 credits in each semester.

Scheme of Examination (Under-graduate Programmes)

Credit Based Evaluation System

Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 25% marks in the first component by conducting the Semester End Examinations with 75% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 25 %

25 Marks

(For Courses without Practical)

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be	
	conducted in the given semester	20 Marks
02	Active participation in routine class instructional deliveries and	05 Marks
	overall conduct as a responsible learner, mannerism and	
	articulation and exhibit of leadership qualities in organizing	
	related academic activities	

Question Paper Pattern

(Periodical Class Test for the Courses at Under Graduate Programmes)

Maximum Marks: 20

Questions to be set: 02

Duration: 40 Minutes

All Questions are Compulsory



Question	Particular	
No		
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks
B) Semester End Examination: 75 %

75 Marks

• Duration: The examination shall be of $2\frac{1}{2}$ hours duration.

Question Paper Pattern

Theory question paper pattern

- 1. There shall be five questions each of 15 marks.
- 2. All questions shall be compulsory with internal options.
- 3. Question may be subdivided into sub-questions a, b, and the allocation of marks depends on the weightage of the unit.

Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 10 out of 25) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 30 Out of 75) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Note: All other rules regarding Standard of Passing, ATKT, etc, will be as per those decided by the Faculty of Humanities passed by the Academic Council from time to time

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Affiliated to University of Mumbai

CONTENT

Programme - Bachelor of Arts (B.A.) Semester-III

Sr.No	Class	Course Name of the Paper	Paper No.	Paper Code	Credits
1	S.Y.B.A.	मध्ययुगीन तथा आधुनिक कविता	II	UAR3HN2	03
		Medieval and Modern Poetry			
2	S.Y.B.A.	आधुनिक गद्य Modern Prose	III	UAR3HN3	03

Semester-IV

Sr.No	Class	Course Name of the Paper	Paper No.	Paper Code	Credits
1	S.Y.B.A.	मध्ययुगीन तथा आधुनिक कविता Medieval and Modern Poetry	II	UAR4HN2	03
2	S.Y.B.A.	आधुनिक गद्य Modern Prose	III	UAR4HN3	03

<u>पादयकम की प्रस्तावना:</u>

हिंदी में कला स्नातक (बैचलर ऑफ आर्ट्स) (बी.ए.हिन्दी), चांगू काना ठाकूर कला, वाणिज्य और विज्ञान महाविद्यालय, नवीन पनवेल (स्वायत्त) के हिंदी विभाग का स्नातक पाठ्यकम है। इस पाठ्यकम के माध्यम से लागू किया जाने वाला Choice Based Credit Grading and Semester System (CBCGS) छात्रों को मूल सिद्धांतों में मजबूत आधर विकसित करने और उनकी पसंद और क्षमता के अनुसार विषयों में विशेषज्ञता हासिल करने का अवसर देंगे।

यह पाट्यकम स्नातक विद्यार्थियों को बी.ए.हिन्दी डिग्री पाटय्कम के द्वितीय वर्ष में हिंदी का ठोस ज्ञान और समझ प्रदान करने के लिए तैयार किया गया है। इस पाट्यकम का लक्ष्य हिंदी के अध्ययन को यथासंभव प्रेरक, रोचक और प्रासंगिक बनाना है। अकादमिक और सामाजिक पाट्यकमों में विद्यार्थी हिंदी पढ़ने में सक्षम हो, इस उददेश्य को ध्यान में रखकर यह पाट्यकम तैयार किया गया है। साथ ही विद्यार्थी हिंदी पढ़ने में सक्षम हो, इस परिचय करवाने और उनकी रूचि विकसित करने के उददेश्य से यह पाट्यकम तैयार किया गया है। इस पाट्यकम को पढने वाले विद्यार्थियों को हिंदी के विभिन्न पहलुओं की समझ विकसित करनी होगी। वैचारिक समझ, प्रायोगिक कौशल का विकास, शैक्षणिक और व्यावहारिक कौशल के लिए योग्यता विकसित करना, बहुआयामी तकनीकियों के बुनियादी विचारों और समझ को ग्रहण करना, मूलभूत भाषा प्रकिया को समझना और सामाजिक और भाषाई ज्ञान के अनुप्रयोग के लिए तर्कपूर्ण तत्परता आदि महत्वपूर्ण पहलू हैं।

Board of Examinations and Evaluation, C.K. Thakur A.C.S. College, New Panvel 7 | P a g e

पाठ्यकम के उददेश्य:

- हिंदी के प्रति उत्साह को बनाए रखते हुए हिंदी में आधारभूत तथ्यों और अवधारणाओं की समझ को बढ़ावा देना।
- २• विद्यार्थियों को अकादमिक और सामाजिक विषयों में हिंदी पढ़ने में सक्ष बनाना**।**
- ३. विद्यार्थियों को हिंदी के विभिन्न उभरते नए क्षेत्रों से परिचित करवाना और भविष्य में उनके अध्ययन में उनकी व्यापकता और हिंदी भाषा के विभिन्न क्षेत्रों में उनके उपयोग से अवगत कराना।
- ४ · छात्रों में समस्या निवारण कौशल विकसित कराना।
- ५٠ छात्रों को हिंदी के प्रतिनिधि गद्यकारों एवं कवियों से परिचित कराना
- ६٠ छात्रों में राष्ट्र के प्रति प्रेम एवं सामाजिक प्रतिबद्धता की भावना विकसित करनाl
- ७٠ छात्रों को हिंदी के समुच्चारित शब्दों (शब्दयुग्मों) से परिचित कराकर हिंदी भाषा की अर्थभेद की सूक्ष्म छाटाओं से अवगत कराना।
- ८. छात्रों में हिंदी भाषा के श्रवण, पठन तथा लेखन की क्षमताओं को विकसित कराना
- ९ · छात्रों की विचार क्षमता तथा कल्पनाशीलता को बुढ़ावा देना।
- १0. सैद्धांतिक ज्ञान को व्यावहार में लागू करते हुए विश्लेषणात्मक कौशल और सूक्ष्म चिंतन विकसित कराना l
- ११. हिंदी के ज्ञान का निर्माण करना और उसे लागू करना और हिंदी तथा अन्य विषयों के बीच संबंधों की सराहना करना।
- १२ · छात्रों में हिंदी साहित्य के प्रति अभिरूचि संवर्धित करना l
- १३ · विद्यार्थियों में भाषा कौशल का विकास करना |
- १४ विद्यार्थियों के मन में राष्ट्रभाषा हिंदी के प्रति सम्मान व प्रेम का निर्माण
- १५ · स्वभाषा के प्रति गौरव बोध का निर्माण |
- १६ · भारतीय संस्कृति की समझ का विकास |

<u>पादयकम का परिणाम:</u>

- १• पाट्यकम की समाप्ति पर विद्यार्थियों में अग्रलिखित योग्यता विकसित हो जानी चाहिए l
- २٠ हिंदी की विभिन्न विधाओं के बारे में सुसंगत और प्रभावी समझ निर्माण होनी आवश्यक है l
- ३٠ हिंदी के क्षेत्र में विद्यार्थियों की समझ और रूचि विकसित होनी चाहिए l
- ४ व्यावहारिक हिंदी और इसके व्यावसायिक अनुप्रयोग में बुनियादी कौशल विकसित करना |
- ५٠ पाठ्यकम के माध्यम से विद्यार्थियों में सामाजिक, राजनीतिक, धार्मिक, सांस्कृतिक विश्वदृष्टि का विकास होगा I
- ६ · विद्यार्थियों में रसास्वाद के कौशल का विकास होगा |
- ७٠ हिंदी हेतु उपलब्ध रोजगारों के लिए आवश्यक गुणों का विकास होगा तथा ज्ञानात्मक आधार पुष्ट होगा l

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Syllabus

Question Paper Pattern (75:25)

Choice Based Credit Grading and Semester System (CBCGS) With effect from the Academic Year 2020-21

Semester III

Program S.Y.B.A.

Course: Hindi

Sr.No	Class	Course Name of the Paper	Paper No.	Paper Code	Credits
1	S.Y.B.A.	मध्ययुगीन तथा आधुनिक कविता	II	UAR3HN2	03
		Medieval and Modern Poetry			

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शैक्षणिक उह्तेश्य-

- १. मध्यकालीन एवं आधुनिक कवियों के व्यक्तित्व एवं कृतित्व का परिचय।
- २. मध्यकालीन एवं आधुनिक कविता की समझ एवं समीक्षा का विकास।
- ३. आधुनिक कवि एवं उनकी कृतियों का परिचय।
- ४. आधुनिक साहित्य की समझ एवं समीक्षा का विकास।
- ५ . रचनात्मकता की प्रवृत्ति का विकास।

परिणाम-

- १ पाट्यक्रम के माध्यम से विद्यार्थियों में सामाजिक, राजनैतिक, धार्मिक एवं सांस्कृतिक विश्वदृष्टि का विकास होगा।
- २. विद्यार्थियों में रसास्वादन के कौशल्य का विकास होगा।
- ३. हिन्दी हेतु उपलब्ध रोजगारों के लिए आवश्यक गुणों का विकास होगा।
- ४ . ज्ञानात्मक आधार पुष्ट होगा।

<u>अध्ययन पद्धतिः</u>

- १. व्याख्यान तथा विश्लेषण I
- २. सस्वर काव्य पाठ |
- ३. गद्य एवं काव्य को भावानुसार पढ़न्ती
- ४. ग्रंथालयों के माध्यम से संबंधित लेखकों, विषयों को मौलिक कृतियों से छात्रों का परिचय कराना l

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Semester- III S.Y.B.A. (पेपर नंबर II) मध्ययुगीन तथा आधुनिक कविता

Name of the Programme	: B.A.
Name of the Course	: मध्ययुगीन तथा आधुनिक कविता
Course Code	: UAR3HN2
Total Lectures	: 45
Total credit	: 03

List of Text Books

 १. मध्ययुगीन तथा आधुनिक कविता संपादक- डॉ.भुरे बालाजी श्रीपती एवं डॉ.भंडारे उद्धव तुकाराम
 २.यशोधरा- मैथिलीशरण गुप्त लोकमारती प्रकाशन
 पहली मंजिल, दरबारी विल्डिंग, महात्मा गांधी मार्ग, इलाहाबाद-211001

प्रादयकम के लिए निर्धारित कवि

इकाई	-१	व्याख्या	₹ - १0
۶.	सत नामदेव:- °	त्री गंग तीम तमे गंग तीम । तमे जंग नगतेन प्रती माम । ४ ।।	
	े. २.	रार मान हारा हार मान हाराजग जीवन सिंउ जीउ समानां।। 3।। सफल जनम मो कउ गर कीनाजग जीवन सिंउ जीउ समानां।। 3।।	
२.	कबीरदास	१.गरूदेव की अंग	
	8.		
	, , , , , , , , , , , , , , , , , , ,	सतगुरू का माहमा अनतअनत ।दखावणहार ।।	
	۲.	पीछें लागा जाइ थादीपक दीया हाथि।।	
	२.	कवीर गुरू गरवा मिल्या,, नॉव धरौगे कौण।।	
	۲.	जाका गुरू भी अंधला,, दून्यूं कूप पड़ंत।।	
		२ माया को अंग	
	لر .	कबीर माया मोहिनी,, नहीं तो करती भॉड़।।	
ç	ک و .	माया मुई न मन मुवा,, यौं कहि गया कबीर।।	
इकाइ	-२ ग्रहीम	व्याख्यान	-80
२•	रलाग १-	कटली सीप भारतंग मुख्य तैसोई फल दीन ।।	
	<u>२</u> .	तरूवर फल नहिंखाए हैं संपति सँचहि सजान।।	
۲.	तुलसीदास		
	۶.	शबरी प्रसंग	
५.	संत मीराबाई		
	१.	मेरे तो गिरधर गोपाल, दूसरो न कोईदधि मथि मरत काढ़ि लियो, डारि दयी छोई।।	
	२.	हे री में तो दरद दिवानी, मेरा दरद न जाणे कोय ।मीरॉ की प्रभु पीर मिटे जब बैद सॉवलिया होय।।	
٤.	सूरदास		
	۶.	निर्गुन कौन देश को बासी ?सुनत मौन है रह्यो ठग्यो सो सूर सबै मति नासी।।	
	२.	ऊधो! जोग सुन्यो हम दुर्लभ ।सुर स्याम ज्यों देत हमें सुख, त्यों तुमको सोउ मोहत।।	
इकाई	-३	व्याख्या	₹ - १0
6.	बिहारी		
	१.	मेरी भव-बाधा हरौ,स्यामु हरित-दुति हाई।।	
	२.	नहिं परागु नहिं मधुर मधु, आगैं कौन हवाल।।	
	३.	या अनुरागी चित्त की, त्यौं त्यौं उज्चलु हाइ।।	
	Υ.	बड़ न हूज गुननु बिनु, गहनों गढ्यों न जाइ।।	

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५. ८. संत रविदास	बतरस-लालच लाल की, दैन कहैं नटि जाइ।।	११३	
۶.	अब कैसे छूटै, राम नाम रट लागी।। टेक। प्रभु जी तुम स्वामी हम दासा, ऐसी भक्ति करै रैदासा।।५।। २ ग्यशोधरा- मैथिलीशरण गुप्त (खण्ड काव्य)		
इकाई -४ ९.	पृष्ठ १९ से ५९	व्याख्यान ४१	-શ્પ

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॥ विद्या विनयेन शोभते ॥ Janardan Bhagat Shikshan Prasarak Sanstha's CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

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Question Paper Pattern (75:25)

Choice Based Credit Grading and Semester System (CBCGS) With effect from the Academic Year 2020-21

Semester IV

Program S.Y.B.A.

Course: Hindi

Sr.No	Class	Course Name of the Paper	Paper No.	Paper Code	Credits
1	S.Y.B.A.	मध्ययुगीन तथा आधुनिक कविता	II	UAR4HN2	03
		Medieval and Modern Poetry			

Semester- IV

S.Y.B.A.

मध्ययुगीन तथा आधुनिक कविता (पेपर नंबर II)

Total credit	: 03
Total Lectures	: 45
Course Code	: UAR4HN2
Name of the Course	: मध्ययुगीन तथा आधुनिक कविता
Name of the Programme	: B.A.

List of Text Books

१ • साये में धूप - दुष्यन्त कुमार राधाकृष्ण प्रकाशन पाइवेट लिमिटेड 7/31 अंसारी मार्ग, देरियोगंज, नई दिल्ली- ११०००२ २. मध्ययुगीन तथा आधुनिक कविता संपादक- डॉ • भुरे बालाजी श्रीपती, डॉ • भंडारे उद्धव तुकाराम

प्रादयकम के लिए निर्धारित कविताएँ

इकाई १. २. ३. इकाई १. २.	-१ कहाँ द भूख है हो गई -२ सिर्फ है केसे उ सामान	तो तय था चिरागॉ नहीं शहर के लिप हे तो सब कर, ज़ेरे बहस ये मुददआ हे है पीर पर्वत-सी गंगा निकलनी च हंगामा ख़डा ये सूरत बदलनी चाहिए आकाश में तबीयत से उछालो यारो। कुछ नहीं है पास कोई संविधान है	र् । । ।हिए । । ।	व्याख्यान व्याख्यान	-११ -११
		प्राट्यकम के लिए निर्धा	रेत कवितााएँ		
इकाई	-३ १.	हिमाद्री तुंग	: जयशंकर प्रसाद	व्याख्यान	-0६
इकाई	२. -४	नदी के हीप	: अज्ञेय	व्याख्यान	-88
	१. २. ३.	काव कुछ एसा तान सुनाआ मारे जाएँगे सड़क दर सड़क	: बालकृष्ण शमा नवान : राजेश जोशी : भुवनेश्वर उपाध्याय		
इकाई	-४ १. २.	अध्यों का संताप किसान	: ओमप्रकाश वाल्मीकि : मैथिलिशरण गुप्त	व्याख्यान	-0 ६

संदर्भ ग्रंथ सूची :					
अनु क	किताब का नाम	लेखक का नाम	प्रकाशक का नाम		
۶.	साये में धप -	दष्यन्त कमार	राधाकृष्ण प्रकाशन प्राइवेट लिमिटेड		
	(11 1 X 1	3.4.(1.3.11/	7/31 अंसारी मार्ग दरियागंज नई		
			दिल्ली- 110002		
२.	यशोधरा-	मैथिलीशरण गुप्त	लोकभारती प्रकाशन पहली मंजिल, दरबारी		
		-	बिल्डिंग, महात्मा गांधी मार्ग,		
			इलाहाबाद-२११001		
२.	आधुनिक प्रतिनिधि कवि	डॉ . हरिचरण शर्मा	मलिक एण्ड कंपनी		
	-		३३७,चौड़ा रास्ता, जयपुर-३0२00३		
۲.	मध्ययुगीन हिन्दी काव्य	संपादक-डॉ दिलीप के	ज्ञान प्रकाशन		
		मेहरा	१२८/९ 0 , ' $\mathbf{G'}$ व्लाक किदवई नगर,		
			कानपुर-२०८०११		
५.	आधुनिक हिन्दी काव्य में	डॉ . अनीता	निर्मला पव्लिकेशन्स्		
	स्वप्न- विधान		A-१३९ गली नं .३,कबीर नगरशाहदरा		
			दिल्ली-९४		
٤.	कबीर ग्रंथावली	डॉ.एल.बी.राम	रीगल बुक डिपो, नई सडक, दिल्ली-६		
		'अनंत' 📂			
6.	मीरा पदावली	सं . नीलोरपल	प्रकाशन प्रभात पेपर्वैक्स		
		CILL	४/१९ आसफ अली रोड, नई		
	с · с	·	दिल्ली-११000२		
٤.	रहीम ग्रंथावली	सपादक विद्यानिवास	वाणी प्रकाशन, ४६९५, २१-ए,		
	c c	मिश्र, गोविन्द रजनीश	दरियागज, नई दिल्ली-११000२		
९.	बिहारा रलाकर	श्रा जगन्नाथदास (प्रकाशक- प्रकाशन संस्थान		
		रत्नाकर	४२६८-८/३, असारा रोड, दरियागज		
	0		नइ दिल्ला-११000२		
१ 0 .	कबार	हजाराप्रसाद द्विवदा			
			१-वा, नताजा सुभाष माग नइ		
0.0	}		दिल्ली-११000२		
<u> </u>	रदास रचनावला	गाविद रजनाश	अमरसत्य प्रकाशन		
			रण्ड, ब्लाक वा, प्रात विहार		
٥ <u>२</u>	कतीर गंशाननी	टॉ गानेश्वागणाट	।५००१-२२७७२२ गुक्राश्वन केंट्र रेलने कर्गाण गीवणग गेव		
ζ۲.	कवार ग्रयावला	७। • राज२वरप्रसाद जनर्वेटी	अफारान केंद्र रलव क्रांसिंग, सातापुर राइ,		
		વતુવરા	णखनऊ-४२६ ७ २७		

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Program S.Y.B.A.

Semester III

Course: Hindi

Sr.No	Class	Course Name of the Paper	Paper No.	Paper Code	Credits
1	S.Y.B.A.	आधुनिक गद्य Modern Prose	III	UAR3HN3	03

शैक्षणिक उह्तेश्य-

- १. आधुनिक कथाकारों एवं उनकी कृतियों का परिचय।
- २. रचनात्मकता की प्रवृत्ति का विकास।
- आधुनिक साहित्य की समझ एवं समीक्षा का विकास।
- ४. कहानी एवं उपन्यास विधा का क्रमिक विकास।
- ५. ऑचलिकता को समझना तथा ऑचलिक उपन्यासों के विकासक्रम को समझना।
- विभिन्न कहानीकारों के व्यक्तित्व एवं कृतित्व को जानना।
- ७. जगदीशचंद्र माथुर के व्यक्तित्व एवं कृतित्व को जानना।

परिणाम-

- पादयक्रम के माध्यम से विद्यार्थियों में सामाजिक, राजनैतिक, धार्मिक एवं सांस्कृतिक विश्वदृष्टि का विकास होगा।
- २. विद्यार्थियों में रसास्वादन के कौशल्य का विकास होगा।
- ३ . ज्ञानात्मक आधार पुष्ट होगा।

<u>अध्ययन पद्धति:</u>

- १• व्याख्यान तथा विश्लेषण l
- २• गद्य एवं काव्य का भावानुसार पढ़ना l
- ३. ग्रंथालयों के माध्यम से संबंधित लेखकों, विषयों को मौलिक कृतियों से छात्रों का परिचय कराना l

Semester- III S.Y.B.A. आधुनिक गद्य (पेपर नंबर III)

Total credit	: 03
Total Lectures	: 45
Course Code	: UAR3HN3
Name of the Course	: आधुनिक गद्य (पेपर नंबर III)
Name of the Programme	: B.A.

List of Text Books

१•बाबा बटेसरनाथ : बाबा नागार्जुन (उपन्यास) राजकमल प्रकाशन १-बी, नेताजी सुभासू पार्घ, नई दिल्ली-११000२

२ • कहानी किरीट: (चयनित कहानियॉ) संपादक डॉ • उषा पाठक/ डॉ • अचला पाण्डेय राधाकृष्ण प्रकाशन, प्रायवेट लिमिटेड

7/31 अंसारी मार्ग, दरियागंज, नई दिल्ली-110002

इकाई	-8			व्याख्यान	-80
	१.	बाबा बटेसरनाथ	: बाबा नागार्जुन		
इकाई	-२			व्याख्यान	-80
	१.	बाबा बटेसरनाथ	: बाबा नागार्जुन		
इकाई	-3			व्याख्यान	-0 પ્
	१.	बाबा बटेसरनाथ	: बाबा नागार्जुन		
			प्रादयकम हेतु निर्धारित कहानियाँ		
	~				0.0
হকাহ	-8			વ્યાख્યાન	-{0
	१.	उसने कहा था	: चन्द्रधर शर्मा 'गुलेरी'		
	२.	कफ़न	: मुंशी प्रेमचंद		
	२ .	चीफ़ की दावत	: भीष्म साहनी		
इकाई	- 4			व्याख्यान	-80
	१.	वापसी	🖒: उषा प्रियम्वदा		
	२.	पिता	्रानरंजन		
	२.	सिलिया	🔊 🎽 : सुशीला टाकभौरे		
			प्रादयकन के लिए निर्धारित रचना		

॥ विद्या विनयेन शोभते॥ Janardan Bhagat Shikshan Prasarak Sanstha's CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Affiliated to University of Mumbai



Syllabus Question Paper Pattern (75:25)

Choice Based Credit Grading and Semester System (CBCGS) With effect from the Academic Year 2020-21

Program S.Y.B.A.

Semester IV

Course: Hindi

Sr.No	Class	Course Name of the Paper	Paper No.	Paper Code	Credits
1	S.Y.B.A.	आधुनिक गद्य Modern Prose	III	UAR4HN3	03

Semester- IV S.Y.B.A. आधुनिक गद्य (पेपर नंबर III)

Name of the Programme	: B.A.		
Name of the Course	: आधुनिक गद्य (पेपर नंबर III)		
Course Code	: UAR4HN3		
Total Lectures	: 45		
Total credit	: 03		
List of Text Books १.कोणाक : जगदीश चन्द्र माथुर (नाटक) राधाकृष्ण प्रकाशन प्राइवेट लिमिटेड जी-१७, जगतपरी, दिल्ली-११00५१			
२.रंग-कलश: (चयनित एकांकी)			
संपादक डॉ भ्श्रीहरि वि	त्रेपाठी/नवीन चन्द पटेल		
राजकमल प्रकाशन, नई दिल्ली, प्रा	यवेट लिमिटेड, १-नेताजी सुभाष मार्ग,		

दरियागंज- नई दिल्ली-११000२

प्रादयकम के लिए निर्धारित रचना



संदर्भ ग्रंथ सूची : आधुनिक गद्य (पेपर नंबर III)

अनु क	किताब का नाम	लेखक का नाम	प्रकाशक का नाम
۶.	कोणार्क :	जगदीश चन्द्र माथुर	राधाकृष्ण प्रकाशन प्राइवेट लिमिटेड जी-१७,जगतपुरी, दिल्ली-११ 00 ५१
२.	रंग-कलश:	संपादक डॉ .श्रीहरि त्रिपाठी/नवीन चन्द पटेल	राजकमल प्रकाशन, नई दिल्ली, प्रायवेट लिमिटेड, १-नेताजी सुभाष मार्ग, दरियागंज-नई दिल्ली-११000२
२ .	वावा वटेसरनाथ :	बावा नागार्जुन	राजकमल प्रकाशन १-बी, नेताजी सुभास मार्ग, नई दिल्ली-११000२
Υ.	कहानी किरीट:	संपादक डॉ . उषा पाठक/ डॉ . अन्नूना पाण्डेय	राधाकृष्ण प्रकाशन, प्रायवेट लिमिटेड ७/३१ अंसारी मार्ग, दरियागंज, नई दिल्ली-११000२
لر .	दलित चेतना की कहानियॉ बदलती परिभाषाऍ	राजमणि अम	वाणी प्रकाशन, ४६९५, २१-ए, दरियागंज, नई दिल्ली-११000२
£ .	दलित कथा साहित्य में स्त्री-विमर्श एक नई दृष्टि	डॉ . हेमलता सिंह	भावना प्रकाशन १0९-A, पटपड़गंज, दिल्ली-११00९१
७.	उत्तर आधुनिकता और समकालीन हिन्दी उपन्यास	चमन लाल गुप्ता	किशोर- विद्या- निकेतन बी-२/२३६-ए, भदैनी, वाराणसी-२२१00१
८.	जगदीश चंद्र का व्यक्तित्व एवं कृतित्व	डॉ •भडारे उद्धव तुकाराम	ऐक्सि बुक प्राइवेट लिमिटेड ४३७८/ ४ बी, अंसारी मार्ग, दरियागंज, नई दिल्ली-११000२
९.	हिन्दी उपन्यास नये आयाम	डॉ.दिलीप के. मेहरा	ज्ञान प्रकाशन १२८/९0, जी ब्लाक किदवई नगर कानपुर,२0८0११
१ 0 .	हिन्दी के कालजयी उपन्यास	डॉ . ओमप्रकाश त्रिपाठी	विद्या प्रकाशन सी-४४९, गजैनी, कानपुर-२२
११ •	आधुनिक हिन्दी उपन्यास साहित्य में संस्कृति	सं . प्रा . के . एम . मायावंशी	चिंतन प्रकाशन ३A/११९ आवास विकास, हंसपुरम्, कानपुर- २0८0२१

Board of Examinations and Evaluation, C.K. Thakur A.C.S. College, New Panvel 25 | P a g e

१२.	२१ वीं शती का	पुष्पपाल सिंह	राधाकृष्ण प्रकाशन	न, प्रायवेट लिगि	ਸੋਟੇਡ
	हिन्दी उपन्यास		७/३१ अंसारी मार्ग	í, दरियागंज, न	र्इ
83.	सरेन्द वर्मा के	डॉ . जयश्री सिंह	।५०००२ ज्ञान प्रकाशन		
	जुर्र् <u>ज</u> ्या ग		१२८/९ ० , जी ब्ल	गाक किदवई नग	ार
	अनुशीलन		कानपुर,२०८०११		
		तृतीय एवं चतुर्थ सत्र	<u>परीक्षा प्रारूप</u> -		
		पेपर नंबर II a	nd III		
		(Semester –	III & IV)		
				कुल अंक १	હષ
				समय १	२/ ३0 घंटे
प्रश्न-१	संदर्भ सहित व	व्याख्या (दोनों पुस्तकों रं	ते अंतरिक विकल्प के	साथ)	१६
प्रश्न-२	दीर्घोत्तरी प्रश्न	न (दोनों पुस्तकों से अंत	रिक विकल्प के साथ)		२४
प्रश्न-३	सामान्य प्रश्न	(दोनों पुरस्कों से एक उ	उत्तर अपेक्षित)		१५
प्रश्न-४	टिप्पणियॉ (द	ोनों पुस्तकों से अंतरिक	विकल्प के साथ)		१०
प्रश्न-५	एक वाक्य में	उत्तर (दोनों पुस्तकों से	पॉच-पॉच)		१०
			N		
		आतरिक पर	<u>क्षिण</u>		कच शंक २७
					कुल अक-२५
क	एक कक्ष परीक्षा _/	/आलेख लेखन/ चर्चा/	/ वाचन तथा अन्य रच	वनात्मक कार्य	२0
	तथा कम्प्यूटर पर	हिंदी में कार्य			
ख	संक्रिय सहभागित	ा, नेतृत्व कुशलता,शिष्ट	ाचार तथा समग्र आच	रण	0 પ્

क एक कक्ष परीक्षा:-

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प्रश	न–१	आधुनिक कहानिकारों एवं निबंधकारों की रचनाओं व जीवन का अध्ययन तथा	0 પ્
		समीक्षा ।	
प्रश	न-२	आलेख लेखन	0 પ
সং	न - ३	उपलब्ध रचनाकारों का साक्षात्कार	१0
		A RED V	
		C.A.	

SYBCOM/SEM-III & IV/ ACCOUNTANCY AND FINANCIAL MANAGEMENT PAPER – III AND IV/SYLLABUS/QP PATTERN/FROM-2020-21





Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC 'College with Potential for Excellence' Status Awarded by UGC 'Best College Award' by University of Mumbai

Program: B.Com.

Revised Syllabus of S.Y.B.Com. – Semester IIIrd and IVth Accountancy and Financial Management Paper III and IV Choice Based Credit & Grading System (75:25) w.e.f. Academic Year 2020-21

SYBCOM/SEM-III & IV/ ACCOUNTANCY AND FINANCIAL MANAGEMENT PAPER – III AND IV/SYLLABUS/QP PATTERN/FROM-2020-21

Sr.	Heading	Particulars
No.		
	Title of Course	Accountancy and Financial
1		Management
1		ivianagement
	Eligibility for Admission	F.Y.BCOM PASSED
2		FROM ANY
2		RECOGNISED
		UNIVERSITY
2	Passing marks	40%
3	C	
1	Ordinances/Regulations (if any)	
5	No. of Semesters	III rd and IV th
6	Level	U.G.
0		
7	Pattern	Semester (75:25)
'		
8	Status	Revised
Q	To be implemented from	2020-2021
	Academic year	

Preamble

In new era our accounting statements preparation also changed and need to be improved. New methods of accounting have been emerging. So to make the students more train in the modern accounting environment this syllabus revision is must.

Objectives

SN	Objectives
1	To enhance the abilities of learners to develop the concept of partnership Final account and how to maintain it.
2	To enable the learners to understand, develop and apply the techniques of piece meal distribution of cash.
3	To enable the learners in understanding, preparing and presenting the amalgamation of firms and Hire Purchase system.

Outcomes

SN	Outcomes
1	It will enhance the abilities of learners to develop the concept of partnership Final account and how to maintain it.
2	It will enable the learners to understand, develop and apply the techniques of piece meal distribution of cash.
3	It will enable the learners in understanding, preparing and presenting the amalgamation of firms and Hire Purchase system.

SYBCOM/SEM-III & IV/ ACCOUNTANCY AND FINANCIAL MANAGEMENT PAPER – III AND IV/SYLLABUS/QP PATTERN/FROM-2020-21

S. Y. B. Com. Accountancy and Financial Management

For the subject of Accountancy and Financial Management there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

Semester-III

- 1. Paper-III Module-I will be for 15 Lectures
- 2. Paper-III Module-II will be for 15Lectures
- 3. Paper-III Module-III will be for 15 Lectures
- 4. Paper-III Module-IV will be for 15 Lectures

Semester-IV

- 1. Paper-IV Module-I will be for 15 Lectures
- 2. Paper-IV Module-II will be for 15Lectures
- 3. Paper-IV Module-III will be for 15 Lectures
- 4. Paper-IV Module-IV will be for 15 Lectures

Scheme of Examination for Each Semester:

Internal Evaluation: 25 (20 marks internal test and 05 marks for attendance)

Semester End Examination: 75 Marks will be as follows -:

Each	Each paper shall be of two and half hour duration.			
All q	uestions are compulsory and will have internal options.			
O -1	Practical Problem from any Module 15 M			
	OR			
	Practical Problem from any Module 15 M			
Q-2	Practical Problem from any Module 15 M			
	OR			
	Practical Problem from any Module 15 M			
Q-3	Practical Problem from any Module 15 M			
	OR			
	Practical Problem from any Module 15 M			
Q-4	Practical Problem from any Module 15 M			
	OR			
	Practical Problem from any Module 15 M			
Q-5	Two questions of theory Questions from all Module15 M			
	OR			
	Short Notes out of 5 any 3 15 M			

SYBCOM/SEM-III & IV/ ACCOUNTANCY AND FINANCIAL MANAGEMENT PAPER – III AND IV/SYLLABUS/QP PATTERN/FROM-2020-21

Choice Based Credit Grading and Semester System (CBCGS) S.Y.B. Com. Accountancy and Financial Management Syllabus To be implemented from the Academic year 2020-2021 SEMESTER III

Course Code	Unit	Topics	Credits	L / Week
UCM3FA3	Ι	Partnership Final Accounts based on Adjustment of Admission or Retirement/Death of a Partner during the year	4	15
	II	Piecemeal Distribution of Cash		15
	III	Amalgamation of Firms		15
	IV	Accounting for Hire Purchase		15

Choice Based Credit Grading and Semester System (CBCGS) S.Y.B. Com. Accountancy and Financial Management Syllabus To be implemented from the Academic year 2020-2021 SEMESTER IV

Course Code	Unit	Topics	Credits	L / Week
	Ι	Introduction to Company		15
		Accounts		
UCM4FA4	II	Redemption of Preference Shares	4	15
	III	Ascertainment and Treatment of		15
		Profit Prior to Incorporation		
	IV	Accounting with the use of		15
		Accounting		
		Software		

Semester - III – Accountancy and Financial Management - III

Sr. No.	Modules / Units				
1	Partnership Final Accounts based on Adjustment of Admission or Retirement/Death of a Partner during the year				
	i) Simple final accounts questions to demonstrate the effect on final Accounts when a partner is admitted during the year or when partner Retires / dies during the year.				
	ii) Allocation of gross profit prior to and after admission / retirement / death when stock on the date of admission / retirement is not given and apportionment of other expenses based on time / Sales/other given basis.				
	iii) Ascertainment of gross profit prior to and after admission/retirement/death when stock on the date of admission/retirement is given and apportionment of other expenses based on time / Sales / other given basis Excluding Questions where admission / retirement / death takes place in the same year.				
2	Piecemeal Distribution of Cash				
	i) Excess Capital Method only				
	ii) Asset taken over by a partner				
	iii) Treatment of past profits or past losses in the Balance sheet				
	iv) Contingent liabilities / Realization expenses / amount kept aside for expenses and				
	adjustment of actual				
	v) Treatment of secured liabilities				
	vi) Treatment of preferential liabilities like Govt. dues / labour dues etc. Excluding				
	Insolvency of partner and Maximum Loss Method				
3	Amalgamation of Firms				
	i) Realization method only				
	ii) Calculation of purchase consideration				
	iii) Journal / ledger accounts of old firms				
	iv) Preparing Balance sheet of new firm				
	v) Adjustment of goodwill in the new firm				
	vi) Realignment of capitals in the new firm by current accounts / cash or a combination thereof Excluding Common transactions between the amalgamating firms				
4	Accounting for Hire Purchase				
	Meaning Calculation of interest Accounting for hire purchase transactions by asset purchase method based on full cash price				
	vendor (excluding default, repossession and calculation of cash price)				

Semester – IV – Accountancy and Financial Management - IV

Sr. No.	Modules / Units				
1	Introduction to Company Accounts				
	Introduction of basic terms: Types of companies, nature and formation of companies, Shares, Debentures, Share Capital, Reserves and surplus, types of assets and liabilities, dividen, format of Balance Sheet Issue of shares: Different modes IPO, Private Placements, Preferential, Rights, ESO, SWEAT and ESCROW account, Issue of shares at par, premium and discount, Under subscription and Over subscription of shares, forfeiture and reissue of forfeited shares, issue of shares for consideration other than cash. (Practical problem) Issue of Debenture and Redemption ; At par, Premium, discount types of Debentures (no practical problems on redemption of debentures)				
2	Redemption of Preference Shares				
	Redemption of Preference: Provision of the Companies Act for redemption of Preference Shares (Sec 55 of the Companies Act, 2013), Companies (Share and Debentures) Rules. Methods of Redemption of fully paid up Preference Shares as per Companies Act, 2013: The proceed of a fresh issue of shares, the capitalisation of undistributed profits and a combination of both, calculation of minimum fresh issue to provide the fund for redemption, (Question on journal entries and/or Balance Sheet) Note: Companies governed by Section 133 of the Companies Act, 2013 and comply with the accounting standards prescribed for them. Hence, the balance in security premium account not to be utilised for premium payable on redemption of preference shares.				
3	Ascertainment and Treatment of Profit Prior to Incorporation				
	 (i) Principles for ascertainment Preparation of separate combined, columnar Profit and Loss A/c including different basis of allocation of expenses and income and Balance sheet 				
4	Accounting with the use of Accounting Software				
	Advance accounting & Inventory Voucher: Purchase and Sales order, reorder, delivery notes, Budgeting Control, Invoice product invoice and service invoice Shortcut keys : special combination, special functional key combination. Management Information System (MIS)				

SYBCOM/SEM-III & IV/ ACCOUNTANCY AND FINANCIAL MANAGEMENT PAPER – III AND IV/SYLLABUS/QP PATTERN/FROM-2020-21

Reference Books

Reference Books

Accountancy and Financial Management

• Introduction to Accountancy by T. S. Grewal, S. Chand and Company (P) Ltd., New Delhi Advance

Accounts by Shukla & Grewal, S. Chand and Company (P) Ltd., New Delhi

- Advanced Accountancy by R. L Gupta and M Radhaswamy, S. Chand and Company (P) Ltd., New Delhi
- Modern Accountancy by Mukherjee and Hanif, Tata Mc. Grow Hill & Co. Ltd., Mumbai Financial

Accounting by LesileChandwichk, Pentice Hall of India Adin Bakley (P) Ltd.

• Financial Accounting for Management by Dr. Dinesh Harsalekar, Multi-Tech. Publishing Co. Ltd.,

Mumbai.

• Financial Accounting by P. C. Tulsian, Pearson Publications, New Delhi Accounting Principles by

Anthony, R.N. and Reece J.S., Richard Irwin Inc.

- Financial Accounting by Monga, J.R. Ahuja, GirishAhujaandShehgal Ashok, Mayur Paper Back
- Compendium of Statement & Standard of Accounting, ICAI.
- Indian Accounting Standards, Ashish Bhattacharya, Tata Mc. Grow Hill & Co. Ltd., Mumbai Financial

Accounting by Williams , Tata Mc. Grow Hill & Co. Ltd., Mumbai

• Company Accounting Standards by ShrinivasanAnand, Taxman. Financial Accounting by V.

Rajasekaran, Pearson Publications, New Delhi. Introduction to Financial Accounting by Horngren,

Pearson Publications.

• Financial Accounting by M. Mukherjee.M. Hanif. Tata McGraw Hill Education Private Ltd; New Delhi





Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

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Program: B.Com.

Revised Syllabus of S.Y.B.Com. – Semester IIIrd and IVth Financial Accounting and Auditing Paper V (Management Accounting) Paper VI (Auditing) Choice Based Credit & Grading System (75:25) w.e.f. Academic Year 2020-21

Sr. No.	Heading	Particulars
1	Title of Course	Financial Accounting and Auditing- 1.Management Accounting 2. Auditing
2	Eligibility for Admission	FYBCOM PASSED FROM ANY RECOGNISED UNIVERSITY
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	III rd and IV th
6	Level	U.G.
7	Pattern	Semester (75:25)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble

Managerial decision making is a process depends on various managerial techniques and tools so to understand that technique and tools our learners should train in that way so revision of management accounting and Auditing course syllabus is necessary.

Objectives

SN	Objectives		
1	To enhance the abilities of learners to develop the concept of		
	Management Accounting.		
2	To enable the learners to understand, develop and apply the		
	techniques of Ratio Analysis and interpretation.		
3	To enable the learners in understanding, Cash flow and Capital		
	Budgeting.		
4	To enable the learners in understanding the concept of Auditing.		
5	To enable the learners in understanding Audit planning and Procedure		
6	To enable the learners in understanding Internal Audit and vouching		
	and verification.		
	and verification.		

Outcomes

SN	OUTCOMES			
1	It will enhance the abilities of learners to develop the concept of Management Accounting.			
2	It will enable the learners to understand, develop and apply the techniques of Ratio Analysis and interpretation.			
3	It will enable the learners in understanding, Cash flow and Capital Budgeting.			

4	It will enable the learners in understanding the concept of Auditing.
5	It will enable the learners in understanding Audit planning and Procedure
6	It will enable the learners in understanding Internal Audit and vouching and verification.

S. Y. B. Com. – Semester – III- Financial Accounting and Auditing – Paper – V (Management Accounting)

For the subject of Financial Accounting and Auditing i.e. Management accounting there shall be One paper for 45 lectures.

- 1. Paper-V Module-I will be for 10 Lectures
- 2. Paper- V Module-II will be for 15Lectures
- 3. Paper- V Module-III will be for 10 Lectures
- 4. Paper- V Module-IV will be for 10 Lectures

S. Y. B. Com. – Semester – IV- Financial Accounting and Auditing – Paper – VI (Auditing)

For the subject of Financial Accounting and Auditing i.e. Auditing there shall be One paper for 45 lectures.

- 1. Paper-VI Module-I will be for 10 Lectures
- 2. Paper-VI Module-II will be for 15Lectures
- 3. Paper-VI Module-III will be for 10 Lectures
- 4. Paper-VI Module-IV will be for 10 Lectures

Scheme of Examination for Each Semester:

Internal Evaluation: 25 (20 marks internal test and 05 marks for attendance)

Semester End Examination: 75 Marks will be as follows -:

For Financial Accounting and Auditing- V-(Management Accounting)				
Each Practical paper shall be of two and half hour duration.				
All questions are c	All questions are compulsory and will have internal options.			
Q-1	Full length practical question 15 M			
	OR			
	Full length practical question 15 M			
Q-2	Full length practical question 15 M			
	OR			
	Full length practical question 15 M			
Q-3	Full length practical question 15 M			
	OR			
	Full length practical question 15 M			
Q-4	Full length practical question 15 M			
	OR			
	Full length practical question 15 M			
Q-5	A) Theory question			
	B) Theory question			
	OR			
	Short Notes15 M			
	To be asked 5			
	To be answered 3			

	For Financial Acc	ounting and Auditing- VI (Auditing)			
	Each Theory paper shall be of two and half hour duration.				
Ι	I All questions are compulsory and will have internal options.				
	Q-1	Full length question	. 15 M		
		OR			
		Full length question	. 15 M		
	Q-2	Full length question	. 15 M		
OR		OR			
		Full length question	. 15 M		
	Q-3	Full length question	. 15 M		
		OR			

	Full length question	15 M	
Q-4	Full length question	15 M	
	OR		
	Full length question	15 M	
Q-5	A) Theory question	07 M	
-	B) Theory question	08 M	
	OR		
	Short Notes	15 M	
	To be asked 5		
	To be answered 3		

Choice Based Credit Grading and Semester System (CBCGS) S.Y.B. Com. Financial Accounting and Auditing Syllabus To be implemented from the Academic year 2020-2021 SEMESTER III (Management Accounting)

Course Code	Unit	Topics	Credits	L / Week
	I	Introduction to Management Accounting		10
UCM3FA5	II	Ratio Analysis and Interpretation	3	15
	III	Cash Flow Statement		10
	IV	Capital Budgeting		10
Choice Based Credit Grading and Semester System (CBCGS) S.Y.B. Com. Financial Accounting and Auditing Syllabus To be implemented from the Academic year 2020-2021 SEMESTER IV (Auditing)

Course Code	Unit	Topics	Credits	L / Week
	Ι	Introduction to Auditing		10
	II	Audit Planning, Procedures and		15
UCM4FA6		Documentation	3	
	III	Auditing Techniques and Internal Audit Introduction		10
	IV	Auditing Techniques : Vouching & Verification		10

Semester - III

Sr. No.	Modules / Units		
1	Introduction to Management Accounting		
	 A. Introduction to Management Accounting – Meaning, Nature, Scope, Functions, Decision Making Process, Financial Accounting V/s Management Accounting B. Analaysis and Interpretation of Financial Statements i) Study of Balance sheet and Income statement / Revenue statements in vertical form suitable for analysis ii) Relationship between items in Balance Sheet and Revenue statement iii) Tools of analysis of Financial Statements (i) Trend analysis (ii) Comparative Statement Common Size Statement Note : (i) Problems based on trend analysis (ii) Short Problems on Comparative and Common sized statements 		
2	Ratio Analysis and Interpretation		
	 (Based on Vertical Form of Financial statements) – Meaning, classification, Du Point Chart, advantages and Limitations) A. Balance Sheet Ratios : i) Current Ratio ii) Liquid Ratio iii) Stock Working Capital Ratio iv) Proprietary Ratio v) Debt Equity Ratio vi) Capital Gearing Ratio B. Revenue Statement Ratio: i) Gross Profit Ratio ii) Operating Ratio iii) Operating Ratio iii) Operating Ratio iv) Net Profit Ratio vi) Net Profit Ratio vi) Net Profit Ratio vi) Stock Turnover Ratio A. Combined Ratio : i) Return on capital employed (Including Long Term Borrowings) ii) Return on Equity Capital vi) Dividend Pay-out Ratio vi) Debt Service Ratio vi) Debt Service Ratio vi) Debtors Turnover (Practical Question on Ratio Analysis) 		
3	Cash Flow Statement		
	Preparation of Cash Flow Statement with reference to Ind AS-7 (Indirect method only)		
4	Capital Budgeting		

A. Introduction:

B. The classification of capital budgeting projects

C. Capital budgeting process

D. Capital budgeting techniques - Payback Period, Accounting Rate of Return, Net Present Value, The Profitability Index, Discounted Payback. (Excluding calculation of cash flow)

Reference Text :

1. Cost and Management Accounting - Colinn Dury 7th Edition

- 2. Cost and Management Accounting- Dbarshi Bhattacharyya pearson Publications 2013 edition
- 3. Management Accounting M.Y.Khan
- 4. Management Accounting I.M.pandey

Semester – IV

Sr. No.	Modules / Units
1	Introduction to Auditing
	 A. Basics – Financial Statements, Users of Information, Definition of Auditing, Objectives of Auditing, Inherent limitations of Audit, Difference between Accounting and Auditing, Investigation and Auditing. B. Errors & Frauds – Definitions, Reasons and Circumstances, Types of Error, Types of frauds, Risk of fraud and Error in Audit, Auditors Duties and Responsibilities in case of fraud. C. Principles of Audit, Materiality, True and Fair view D. Types of Audit – Meaning, Advantages, Disadvantages of Balance sheet Audit, Interim Audit, Continuous Audit, Concurrent Audit and Annual Audit, Statutory Audit E. Audit Of ledger – General Consideration, Scrutiny of ledger of Assets, personal, revenue accountants.
2	Audit Planning, Procedures and Documentation
	 A. Audit Planning – Meaning, Objectives, Factors to be considered, Sources of obtaining information, Discussion with Client, Overall Audit Approach B. Audit Program – Meaning, Factors, Advantages and Disadvantages, Overcoming Disadvantages, Methods of Work, Instruction before commencing Work, Overall Audit Approach. C. Audit Working Papers – Meaning, importance, Factors determining Form and Contents, Main Functions / Importance, Features, Contents of Permanent Audit File, Temporary Audit File, Ownership, Custody, Access of Other Parties to Audit Working Papers, Auditors Lien on Working Papers, Auditors Lien on Client's Books.
3	Auditing Techniques and Internal Audit Introduction
	 A. Test Check – Test Checking Vs Routing Checking, test Check meaning, features, factors to be considered, when Test Checks can be used, advantages, disadvantages, precautions. B. Audit Sampling – Audit Sampling, meaning, purpose, factors in determining sample size – Sampling Risk, Tolerable Error and expected error, methods of selecting Sample Items Evaluation of Sample Results auditors Liability in conducting audit based on Sample C. Internal Control – Meaning and purpose, review of internal control, advantages, auditors duties, review of internal control, Inherent Limitations of Internal control, internal control samples for sales and debtors, purchases and creditors, wages and salaries. Internal Checks Vs Internal Control, Internal Checks Vs Test Checks. D. Internal Audit : Meaning, basic principles of establishing Internal audit, objectives,
	evaluation of internal Audit by statutory auditor, usefulness of Internal Audit, Internal Audit

	Vs External Audit, Internal Checks Vs Internal Audit				
4	Auditing Techniques : Vouching & Verification				
	A. Audit of Income : Cash Sales, Sales on Approval, Consignment Sales, Sales Returns				
	Recovery of Bad Debts written off, Rental Receipts, Interest and Dividends Received				
	Royalties Received				
	B. Audit of Expenditure : Purchases, Purchase Returns, Salaries and Wages, Rent, Insurance				
	Premium, Telephone expense Postage and Courier, Petty Cash Expenses, Travelling				
	Commission Advertisement, Interest Expense				
	C. Audit of Assets Book Debts / Debtors, Stocks – Auditors General Duties; Patterns, Dies				
	and Loose Tools, Spare Parts, Empties and Containers Quoted Investments and Unquoted				
	Investment Trade Marks / Copyrights Patents Know-How Plant and Machinery Land and				
	Buildings Furniture and Fixtures				
	D. Audit of Liabilities : Outstanding Expenses, Bills Payable Secured loans Unsecured				
	Loans, Contingent Liabilities				

Reference Books

- 1. B.N. Tondan, A Hand book on Practical Auditing,
- 2. Ravinder Kumar and Virendra Sharma, Auditing: Principles and Practices
- 3. Varsha Ainapure and Mukund Ainapure, Auditing and Assurance
- 4. T. J. Rana, Auditing -1





Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC 'College with Potential for Excellence' Status Awarded by UGC 'Best College Award' by University of Mumbai

Program: B. Com.

Revised Syllabus S. Y. B. Com. Business Economics III and IV Choice Based Credit & Grading System (75:25) w. e. f. Academic Year 2020-21

Sr. No.	Heading	Particulars
1	Title of Course	Business Economics – III and IV
2	Eligibility for Admission	Passing of First year B. Com.
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (75:25)
8	Status	Revised
9	To be implemented from	2020-21
	Academic year	

Preamble of the Syllabus:

An overall approach to macroeconomics is to examine the economy as a whole. This course is an introduction to the basic analytical tools of macro economics and public finance to evaluate macro economic conditions such as inflation, unemployment and growth. It is designed to make system of overall economy understandable and relevant. The aim is to provide a clear explanation of many aspects of aggregate economic variables to inspire a consistent way of thinking about key macroeconomic phenomena and public finance. It intends to familiarize the commerce learners with certain common features of economic occurrence in the real world.

Objectives for new Curriculum:

1. To help the learners to understand the concepts related to Macro Economics and Public finance

2. To familiarize the commerce learners with certain common features of economic occurrence in the real world.

3. To integrate the concepts of macroeconomics in order to analyze and understand the policies of the state.

4. To study the concepts of macroeconomics in order to analyze and understand the functioning of the economy.

5. To study the role of state in an economy.

6. To study the fiscal policy of the state.

7. To study the fiscal federalism in India

Course Outcome: By the end of the course, a learner should develop the Ability:

1. To understand the basic concepts of Macro Economics and Public finance.

2. To understand certain common features of economic occurrence in the real world.

3. To integrate the concepts of macroeconomics in order to analyze and understand the policies of the state.

4. To integrate the concepts of macroeconomics in order to analyze and understand the functioning of the economy.

5. To understand the role of state in an economy.

6. To know the fiscal policy of the state.

7. To understand the structure of fiscal federalism in India.

SY B Com. Business Economics –III and IV

For the subject of Business Economics there shall be two papers of 45 lectures each comprising of four units each.

Semester- III- Paper No. III

Sr. No.	Units	No. of Lectures
1	Introduction	10
2	Basic Concepts ff Keynesian Economics	15
3	Post Keynesian Developments In Macro Economics	10
4	Money, Prices and Inflation	10

Semester-IV, Paper-IV

Sr. No.	Units	No. of Lectures
1	The Role of Government in an	10
	Economy	
2	Public Revenue	15
3	Public Expenditure and Public	10
	Debt	
4	Evaluating capital projects	10

Scheme of Examination for Each Semester: For F. Y. /S. Y. / T.Y. B. Com Semester I, II, III, IV, V and VI

Internal Evaluation: 25 (20 marks internal test and 05 marks for active participation and overall conduct)

Question. No	Particular	Marks
0-1	Write Short Notes on any two of the following	15
	A), B), C) and D)	
0-2	Any 2 out of 3	15
	1. Full Length Question	
	2. Full Length Question	
	3. Full Length Question	
Q-3	Any 2 out of 3	15
	1. Full Length Question	
	2. Full Length Question	
	3. Full Length Question	
0-4	Any 2 out of 3	15
	1. Full Length Question	
	2. Full Length Question	
	3. Full Length Question	
0-5	Any 2 out of 3	15
	1. Full Length Question	
	2. Full Length Question	
	3. Full Length Question	

External evaluation: Semester End Examination: 75 Marks will be as follows -:

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B. Com. Business Economics Syllabus

To be implemented from the Academic Year 2019-2020

Semester- III - Paper No. - III

Course	Unit	Topics/ Modules		L / Week
Code				
UCM3B	Ι	Introduction	3	10
Е3	II	Basic Concepts Of Keynesian Economics		15
	III	POST Keynesian Developments In Macro Economics		10
	IV	Money, Prices and Inflation		10

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B. Com. Business Economics Syllabus

To be implemented from the Academic Year 2019-2020

Semester-IV- Paper No. IV

Course	Unit	Topics/ Modules	Credits	L / Week
Code				
UCM4B	Ι	The Role of Government in an	3	10
E4		Economy		
	II	Public Revenue		15
	III	Public Expenditure and Public		10
		Debt		
	IV	Fiscal Policy and Management	1	10

S.Y.B.COM Semester –III

Business Economics- Paper- III- Introduction to Macroeconomics

Module-I: Introduction: 10L

• Macroeconomics: Meaning, Scope and Importance.

• Circular flow of aggregate income and expenditure and its Importance- closed and open economy models

• Green GNP and NNP concepts- Importance and Measurement

•Trade Cycles: Features and Phases

• Classical Macro economics: Say's law of Markets - Features, Implications and Criticism

Module-II: - Basic Concepts of Keynesian Economics: 15L

- The Principle of Effective Demand: Aggregate Demand and Aggregate Supply
- Consumption Function: Properties, Assumptions and Implications
- Investment function and Marginal Efficiency of capital
- Investment Multiplier effect on Income and Output: Assumptions, Working,

Leakages, Criticism and Importance - paradox of thrift

• Relevance of Keynesian theory tools to the developing countries

Module-III: POST Keynesian Developments In Macro Economics: 10L

- The IS-LM model of integration of commodity and money markets
- Inflation and unemployment: Philips curve
- Stagflation: meaning, causes, and consequences
- Supply side economics: Basic propositions and critical appraisal

Module-IV - Money, Prices and Inflation- 10L

• **Money Supply:** Determinants of Money Supply - Factors influencing Velocity of Circulation of Money

• **Demand for Money:** Classical and Keynesian approaches and Keynes' liquidity preference theory of interest - Friedman's restatement of Demand for money

• Inflation: Demand Pull Inflation and Cost Push Inflation - Effects of Inflation-Nature of inflation in a developing economy - policy measures to curb inflationmonetary policy and inflation targeting

Reference Books of S Y B Com. Business Economics Paper-III

1. Ackley.G (1976), Macro Economic Theory and Policy, Macmillan Publishing Co. New York

2. Ahuja. H.L.(2015), Modern Economics - S.Chand Company Ltd. New Delhi.

3. Blanchard Olivier (2000), Macro Economics, Englewood Elitt, Prentice Hall

4. Bouman John, Principles of Macro Economics

5. Dornbush , Rudiger, Fisher Stanley and Startz, Richards Macroeconomics, Nineth edition

2004 Tata-Mac Graw Hill, New Delhi.

6. Dwivedi, D.N. (2001), Macro Economics: Theory and Policy, Tata-Mac Graw Hill, New Delhi.

7. Friedman Hilton (1953) Essays in Positive Economics, University of Chicago Press, London.

8. Gregory .N. Mankiw, Macroeconomics, Fifth Edition (2002) New York:Worth Publishers

9. Jhingan, M.L., Principles of Economics — Vrinda Publications (P) Ltd.

10. Shapiro, E (1996), Macro-Economic Analysis , Galgotia Publication, New Delhi.

S.Y.B.COM Business Economics

Public Finance Paper-IV, Semester –IV

Model No. I - The Role of Government in an Economy: 10L

• Meaning and Scope of Public finance.

• **Major fiscal functions**: allocation function, distribution function & stabilization function

• **Principle of Maximum Social Advantage:** Dalton and Musgrave Views - the Principle in Practice, Limitations.

- Relation between Efficiency, Markets and Governments
- The concept of Public Goods and the role of Government

Module-II- Public Revenue: 15

- Sources of Public Revenue: tax and non-tax revenues
- Objectives of taxation Canons of taxation
- Direct taxes- Merits and demerits- Indirect taxes- Merits and demerits
- **Shifting of tax burden:** Impact and incidence of taxation Processes- factors influencing incidence of taxation

• Economic Effects of taxation: on Income and Wealth, Consumption, Savings, Investments and Production.

• Redistributive and Anti – Inflationary nature of taxation and their implications

Module –III- Public Expenditure and Public Debt: 10L

• **Public Expenditure:** Canons - classification - economic effects of public spending - on production, consumption, distribution, employment and stabilization

- Theories of Public Expenditure: Wagner's Hypothesis and Wiseman Peacock

Hypothesis - Causes for Public Expenditure Growth - Significance of Public Expenditure: Low Income Support and Social Insurance Programmes.

• **Public Debt:** Classification - Burden of Debt Finance: Internal and External-Public Debt and Fiscal Solvency

Module- IV- Fiscal Policy and Management: 10L

• Fiscal Policy: Meaning, Objectives, constituents and Limitations.

• **Budget-** Meaning objectives and types - Structure of Union budget - Deficit concepts

• Study of current year budget

• Intergovernmental Fiscal Relations: fiscal federalism and fiscal decentralization - central-state financial relations

Reference Books of S Y B Com. Business Economics Paper-IV

1. Bhatia H.L.: Public Finance. Vikas Publishing House Pvt. Ltd.

2. David N. Hyman : Public Finance A Contemporary Application of theory of policy, Krishna Offset, Delhi

3. Hoiughton E.W.(1998) : Public Finance, Penguin, Baltimore

4. Hajela T.N: Public Finance – Ane Books Pvt.Ltd

5. Jha, R (1998) : Modern Public Economics, Route Ledge, London

6. Musgrave, R.A and P.B. 17. Musgrave (1976) : Public Finance in Theory and Practice, Tata McGraw Hill, Kogakusha, Tokyo

7. Mithani, D.M (1998) : Modern Public Finance, Himalaya Publishing House, Mumbai

8. Singh.S.K. (2014): Public finance in Theory and Practice, S.Chand &co Pvt Ltd, New Delhi





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Department of Accounting & Finance

Board of Studies in Accounting & Finance

Program: B.Com. Accounting & Finance

Revised Syllabus of S.Y.B.Com. Accounting & Finance Choice Based Credit & Grading System (60:40) w.e.f. Academic Year 2020-21

Sr.	Heading	Particulars
No.		
	Title of Programme	B.Com. Accounting &
1		Finance
	Eligibility for Admission	12^{th} Commerce of all
2		racognized Poard
3	Passing marks	40%
5		
4	Ordinances/Regulations (if any)	
	No. of Semesters	Siv
5	No. of Semesters	51X
6	Level	U.G.
	D. //	
7	Pattern	Semester (60:40)
8	Status	Revised
0		
0	To be implemented from	2020-2021
7	Academic year	

B.Com. (Accounting and Finance) Programme Under Choice Based Credit, Grading and Semester System Course Structure

S.Y.B.Com. (Accounting and Finance)

(To be implemented from Academic Year- 2020-2021)

No. of	Semester III	Credits	No. of	Semester IV	Credits
1	1 Elective Courses (EC)		1	Elective Courses (EC)	
1,2 & 3	*Any three courses from the	09	1,2 & 3	**Any three courses from the	09
	following list of the courses			following list of the courses	
2	Ability Enhancement Courses (A	EC)	2	Ability Enhancement Courses (A	EC)
24	Ability Enhancement Compulsor	у У	24	Ability Enhancement Compulsor	у
273	Course (AECC)		-/.	Course (AECC)	
4	Information Technology in	03	4	Information Technology in	03
	Accountancy - I			Accountancy – II	
2B	*Skill Enhancement Courses (SE	C)	2B	**Skill Enhancement Courses (Sl	E C)
5	Any one course from the	02	5	Any one course from the	02
	following list of the courses			following list of the courses	
3	Core Courses (CC)		3	Core Courses (CC)	
6	Business Law (Business	03	6	Business Law (Company Law) –	03
	Regulatory Framework) – II			Ш	
7	Research Methodology in	03	7	Business Economics- II (Macro	03
	Accounting and Finance			Economics)	
Total Credits		20		Total Credits	20

*List of Skill Enhancement Courses (SEC) for Semester III (Any One)		**List of Skill Enhancement Courses (SEC) for Semester IV (Any One)	
1	Foundation Course in Commerce (Financial	1	Foundation Course in Management
	Market Operations) – III		(Introduction to Management) - IV
2	Foundation Course- Contemporary Issues- III	2	Foundation Course- Contemporary Issues- IV
3	Foundation Course in NSS – III	3	Foundation Course in NSS – IV
4	Foundation Course in NCC – III	4	Foundation Course in NCC – IV
5	Foundation Course in Physical Education –	5	Foundation Course in Physical Education -IV

*List of Elective Courses (EC) for Semester III (Any Three)		**List of Elective Courses (EC) for Semester IV (Any Three)		
1	Financial Accounting (Special Accounting	1	Financial Accounting (Special Accounting	
	Areas) – III		Areas) – IV	
2	Cost Accounting (Methods of Costing) – II	2	Management Accounting (Introduction to	
			Management Accounting)	
3	Auditing (Techniques of Auditing and Audit	3	Auditing – III	
	Procedures) – II			
4	Taxation - I (Direct Taxes Paper- I)	4	Taxation - II (Direct Taxes- II)	
5	Principles & Practices of Banking	5	Wealth Management	
No	Note: Course selected in Semester III will continue in Semester IV			

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Syllabus

To be implemented from the Academic year 2020-2021

Semester III

Sr.No.	Course Code	Course Title	Credits	L / Week
1	UAF3FA3	Financial Accounting (Special Accounting Areas) – III	3	4
2	UAF3CA2	Cost Accounting (Methods of Costing) – II	3	4
3	UAF3TX1	Taxation - I (Direct Taxes Paper- I)	3	4
4	UAF3IT1	Information Technology in Accountancy - I	3	4
5	UAF3BL2	Business Law (Business Regulatory Framework) – II	3	4
6	UAF3RMA	Research Methodology in Accounting and Finance	3	4
7	UAF3FC3	 Any one course from the following list of the courses a. Foundation Course – III b. Foundation Course in NSS – III c. Foundation Course in NCC – III d. Foundation Course in Physical Education – III 	2	4

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester –III Syllabus

To be implemented from the Academic year 2020-2021

1. Elective Courses (EC)

1. Financial Accounting (Special Accounting Areas)– III

1	Preamble of the syllabus
	B.Com. in Accounting & Finance is an under graduation course of the Department of
	B.Com. (Accounting & Finance), Changu Kana Thakur Arts, Commerce & Science College,
	New Panvel, Affiliated to University of Mumbai (MH). The Choice Based Credit, Grading,
	and Semester System to be implemented through this curriculum would allow students to
	develop a strong footing in the fundamentals and specialize in the disciplines of his/her
	liking and abilities. The students pursuing this course would have to develop an
	understanding of various aspects of the Accounting & Finance. The conceptual
	understanding, development of experimental skills, developing the aptitude for academic
	and professional skills, acquiring basic concepts and understanding of hyphenated
	techniques, understanding the fundamental Accounting & Finance processes and rationale
	towards the application of Accounting & Finance knowledge is among such important
	aspects. The performance of the learners shall be evaluated into two components i.e.
	internal and external. The learner's performance shall be assessed by Internal Assessment
	with 40 marks and external assessment with 60 marks.

2	Objectives of the course
٠	The main objective is to describe the pattern of final accounts
٠	It also describes the process of liquidation which is included in the company account
•	To provide the knowledge of amalgamation of the partnership firms
٠	To give practical knowledge of accounts
•	To understand the conversion of foreign currency into reporting currency

3	Outcomes of the course
•	Learners understand the dissolution of firms
•	Got the knowledge of the piecemeal distribution of cash for settlement of liabilities
•	Understanding conversion of a firm into a ltd company
•	Learners learned to maintain accounts in the books of purchasing firm
•	Helps to understand the application of rate for foreign currency into reporting

4	Detailed Syllabus	
	Financial Accounting - Elements of Financial Accounting - Paper I	
Sr. No.	Modules / Units	No. Of Lectures
1	Partnership Final Accounts based on Adjustment of Admission or Retirement / Death of a Partner during the Year	15
	Simple final accounts questions to demonstrate the effect on the final Accounts when a partner is admitted during the year or when partner Retires / dies during the year Allocation of gross profit prior to and after admission/retirement / death when stock on the date of admission/retirement is not given and apportionment of other expenses based on time / Sales/other given basis Ascertainment of gross profit prior to and after admission/retirement / death when stock on the date of admission / retirement is given and apportionment of other expenses based on time / Sales / other given basis	10
2	Piecemeal Distribution of Cash	10
	Asset took over by a partner Treatment of past profits or past losses in the Balance sheet Contingent liabilities / Realization expenses/amount kept aside for expenses and adjustment of actual, Treatment of secured liabilities Treatment of preferential liabilities like Govt. dues/labour dues etc Excluding: Insolvency of partner and Maximum Loss Method	
3	Amalgamation of Firms	15
	Realization method only Calculation of purchase consideration Journal/ledger accounts of old firms, Preparing a Balance sheet of a new firm Adjustment of goodwill in the new firm Realignment of capitals in the new firm by current accounts / cash or a combination thereof	
4	Conversion / Sale of a Partnership Firm into a Ltd. Company	10
	Realization method only Calculation of New Purchase consideration, Journal / Ledger Accounts of old firms. Preparing Balance sheet of new company	
5	Ascertainment and Treatment of Profit Prior to Incorporation	10
	Principles for ascertainment Preparation of separate, combined and columnar Profit and Loss Account including different basis of allocation of expenses/incomes	

Note: Relevant Law/Statute/Rules in force and relevant Accounting Standards in force on 1st April immediately preceding commencement of Academic Year is applicable for ensuring examination after the relevant year.

5	References Books
	Financial Accounting - Elements of Financial Accounting - Paper I
•	• Introduction to Accountancy by T.S. Grewal, S. Chand and Company (P) Ltd., New Delhi
	• Advance Accounts by Shukla and Grewal, S. Chand and Company (P) Ltd., New Delhi
	• Advanced Accountancy by R.L Gupta and M. Radhaswamy, S. Chand and Company (P) Ltd., New Delhi
	• Modern Accountancy by Mukherjee and Hanif, Tata Mc. Grow Hill and Co. Ltd., Mumbai
	• Financial Accounting by LesileChandwichk, Pentice Hall of India AdinBakley (P) Ltd., New Delhi
	• Financial Accounting for Management by Dr. Dinesh Harsalekar, Multi-Tech. Publishing Co. Ltd., Mumbai
	• Financial Accounting by P.C. Tulsian, Pearson Publications, New Delhi
	• Accounting Principles by R.N. Anthony and J.S. Reece, Richard Irwin, Inc
	• Financial Accounting by Monga, J.R. Ahuja, GirishAhuja and Ashok Shehgal, Mayur Paper Back, Noida
	• Compendium of Statement and Standard of Accounting, ICAI
	• Indian Accounting Standards, Ashish Bhattacharya, Tata Mc. Grow Hill and Co. Ltd., Mumbai
	• Financial Accounting by Williams, Tata Mc. Grow Hill and Co. Ltd., Mumbai
	• Company Accounting Standards by ShrinivasanAnand, Taxman, New Delhi
	• Financial Accounting by V. Rajasekaran, Pearson Publications, New Delhi
	• Introduction to Financial Accounting by Horngren, Pearson Publications, New Delhi
	• Financial Accounting by M. Mukherjee and M. Hanif, Tata McGraw Hill Education Pvt. Ltd., New Delhi
	• Financial Accounting a Managerial Perspective, Varadraj B. Bapat, MehulRaithatha, Tata McGraw Hill Education Pvt. Ltd., New Delhi

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester –III Syllabus

To be implemented from the Academic year 2020-2021

1. Elective Courses (EC)

2. Cost Accounting (Methods of Costing) – II

1	Preamble of the syllabus
	B.Com. in Accounting & Finance is an under graduation course of Department of B.Com. (Accounting & Finance), Changu Kana Thakur Arts, Commerce & Science College, New Panvel. Affiliated to University of Mumbai (MH) The Choice Based on Credit, Grading, and Semester System to be implemented through this curriculum, would allow students to develop a strong footing in the fundamentals and specialize in the disciplines of his/her liking and abilities. The students pursuing this course would have to develop an understanding of various aspects of Accounting & Finance. It helps for the ascertainment of cost, fixation of selling price, proper recording and presentation of cost data to management for measuring efficiency and for cost control and cost reduction, ascertaining the profit of each activity, assisting management in decision making. The performance of the learners shall be evaluated into two components i.e. internal and external. The learner's performance shall be assessed by Internal Assessment with 40 marks and external assessment with 60 marks.

2.	Objectives of the course
٠	To make students aware of cost structures & elements
•	To understand various techniques & methods of cost accounting
٠	To understand various aspects of material control & wastages
•	To understand the reasons for the difference in two sets of books
•	To let them know about the cost sheet & tender price
٠	To make them aware of the different process of costing

3	Course Outcome
٠	Define various components of the total cost [Direct/Indirect/Fixed/Variable]
•	Determine the various types of centers i.e. cost centers
•	Use cost sheet for computing per unit cost & total cost
•	Determine the basis for computing tender price of contract

S.Y.E	S.Y.B.Com. A&F Syllabus			
4	Detailed Syllabus			
	Cost Accounting (Methods of Costing) – II			
Sr. No.	Modules / Units	No. Of Lectures		
1	Classification of Costs and Cost Sheet	10		
	Classification of costs, Cost of Sales, Cost Centre, Cost Unit, Profit Centre and Investment Centre Cost Sheet, Total Costs and Unit Costs, Different Costs for different purpose Problems on the preparation of cost sheet& Estimated Cost sheet			
2	Unit costing, Job Costing & batch costing	15		
	Unit Costing – introduction, Unit costing method, Prepare & calculate cost under Unit costing method Job Costing-Introduction, accounting entries for cost elements, calculate cost per job Batch costing –introduction, batch costing methods, accounting entries for cost elements, calculate the cost for a batch Practical Problems			
3	Contract Costing	15		
	Meaning of Contract Costing, Recording of contract cost, Progress payments, Retention money, Contract accounts, Accounting for material, Accounting for Tax deducted at source by the contractee, Accounting for plant used in a contract, treatment of profit on incomplete contracts, Contract profit, and Balance sheet entries. Escalation clause Practical Problems			
4	Process Costing	10		
	Meaning of Process Costing, Costing procedure, Treatment of Normal loss, Abnormal gains, and losses. Excluding Equivalent units, Inter-process profit Practical Problems Process Costing			
5	Joint products & by-product costing	10		
	Meaning of Joint products & by-product costing Differentiate between Joint products & by-product costing Methods of apportionment of joint costs to joint products and to by- products Treatment of by-products cost in cost accounting Practical Problems			

5	References Books
	Cost Accounting - Introduction and Element of Cost – I
•	 Lectures on Costing by Swaminathan: S. Chand and Company (P) Ltd., New Delhi Cost Accounting by C.S. Rayudu, Tata Mc. Grow Hill and Co. Ltd., Mumbai Cost Accounting by JawaharLal and SeemaSrivastava, Tata Mc. Grow Hill and Co. Ltd., Mumbai Cost Accounting by Ravi M. Kishore, Taxmann Ltd., New Delhi Principles and Practices of Cost Accounting by N.K. Prasad, Book Syndicate Pvt. Ltd., Calcutta Cost Accounting Theory and Practice by B.K. Bhar, Tata Mc. Grow Hill and Co. Ltd., Mumbai Cost Accounting Principles and Practice by B.K. Bhar, Tata Mc. Grow Hill and Co. Ltd., Mumbai Cost Accounting Principles and Practice by M.N. Arora, Vikas Publishing House Pvt. Ltd., New Delhi Advanced Cost and Management Accounting: Problems and Solutions by V.K. Saxena and C.D. Vashist, S. Chand and Company (P) Ltd., New Delhi Cost Accounting by S.P. Jain and K.L. Narang, Kalyani Publishers, Ludhiana Modern Cost and Management Accounting by M. Hanif, Tata McGraw Hill Education Pvt. Ltd., New Delhi

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester –III Syllabus

To be implemented from the Academic year 2020-2021

1. Elective Courses (EC)

3. Auditing (Techniques of auditing and audit procedures) - II

1	Preamble of the syllabus
	B.Com. in Accounting & Finance is an under graduation course of Department of B.Com. (Accounting & Finance), Changu Kana Thakur Arts, Commerce & Science College, New Panvel. Affiliated to University of Mumbai (MH) The Choice Based Credit, Grading, and Semester System to be implemented through this curriculum would allow students to know about various vouching, verification techniques, also will make them aware of the standards to be followed for auditing & also the procedural compliances that are followed while appointing/removing an auditor. The performance of the learner's Performance shall be assessed by Internal Assessment with 40 marks and external assessment with 60 marks.

2.	Objectives of the course	
•	To make students aware of vouching for income & expenditure	
•	To understand how assets & liabilities shown in the books are verified	
•	To understand various Auditing standards to be followed while auditing	
•	To make them aware of the procedural compliances of appointing/removing an	
	auditor	

3	Course Outcome
•	Define various components of total cost [Direct/Indirect/Fixed/Variable]
•	Determine the various types of centers i.e. cost centers
•	Use cost sheet for computing per unit cost & total cost
•	Determine the basis for computing tender price of contract

S.Y.B.Com. A&F Syllabus **Detailed Syllabus** 4 Auditing (Techniques of auditing and audit procedures) - II No. Of Sr. No. Modules / Units Lectures 1 Vouching 15 Audit of income: 1.1 Revenue from Sales and Services, Rental Income, Interest& Dividends Income. Royalties Income, Recovery of Bad debts written off, Commission Received Audit of Expenditure: 1.2 Purchases, Salaries & Wages, Rent, Insurance Premium, Telephone expense, Petty cash payment, Advertisement, Travelling Salesmen's Commission, Freight Carriage and Custom Duties 2 15 Verification Audit of assets: 2.1 Plant & Machinery, Furniture and fixtures, Accounts Receivable, Investments. Inventory, Goodwill, Patent Rights Audit of Liabilities: 2.2 Outstanding Expenses, Accounts Payable, Secured loans, Unsecured Loans, Contingent Liabilities, Public Deposits **Auditing Standards** 3 15 Meaning 3.1 Procedure of issuing Auditing Standards in India Brief overview of Auditing Standards in India Scope of SAS Significance of the Auditing Standards Responsibility of auditor for auditing standards Understanding of following standards: 3.2 SA 200. SA210, SA230, SA240, SA 250, SA300, SA315, SA320, SA505 4 Audit of Companies 15 Qualifications, Disgualifications, Appointments, Reappointment, Removal of auditors. Special auditors Branch auditors Rights and duties of company auditors

Note: Relevant Law/statute/Rules in force and relevant Standards in force on 1st April immediately preceding commencement of Academic Year is applicable for ensuring examination after the relevant year.

Board of Studies-in-Accountancy, University of Mumbai

5	References Books	
	Auditing (Techniques of auditing and audit procedures) - II	
	 Contemporary Auditing by Kamal Gupta published by Tata McGraw Hills A Handbook of Practical Auditing by B N Tandon published by S Chand & Co. New Delhi Fundamentals of auditing by Kamal Gupta and Ashok Arora published by Tata McGraw Hills Textbook of Auditing by Batra and Bagradia published by Tata McGraw Hills 	

Choice Based Credit Grading and Semester System (CBCGS) S.Y.B.Com. Accounting & Finance Semester –III Syllabus To be implemented from the Academic year 2020-2021

Elective Courses (EC) Taxation - I (Direct Taxes Paper- I)

1	Preamble of the syllabus
	B.Com. in Accounting & Finance is a under graduate course of Changu Kana
	Thakur Arts, Commerce & Science College, New Panvel affiliated to
	University of Mumbai. There is Choice Based Credit, Grading and Semester
	System to be implemented through this curriculum, developing learners
	towards basic fundamentals in the area of direct taxes. Learners who will
	pursue this course will understand the provisions and procedure to compute
	total income under different heads of income. The conceptual understanding
	will help in developing real-life situations involving taxation & to equip them
	with techniques for taking tax-sensitive decisions. The performance of the
	learners shall be evaluated into two components i.e. internal and external. The
	learner's performance shall be assessed by Internal Assessment with 40
	marks and external assessment with 60 marks.

2	Objectives of the course
•	To acquaint the students with basic principles underlying the provisions of
	direct & indirect taxes laws & to develop a broad understanding of the tax
	laws & accepted tax practices
•	To give an understanding of the relevant provisions of direct tax code
•	To introduce practical aspects of tax planning as an important managerial
	decision-making process.
•	Expose the participants to real-life situations involving taxation & to equip
	them with techniques for taking tax sensitive decisions
•	To understand the provisions and procedure to compute total income under
	five heads of income i.e. Salaries, house property, profit & gains from
	business & profession, capital gains, and other sources.

3	Course Outcome	
•	By the end of the course students will able to describe how the provisions of	
	direct tax laws and to develop a broad understanding of the tax laws &	
	accepted tax practices	
•	Students of the course will be able to explain different types of incomes &	
	their taxability & expenses & their deductibility	
•	Students who complete this course will be able to learn various direct taxes &	
	their implication in practical situations	
•	Students of the course will able to state the use of various deductions to	
	reduce the taxable income.	

<i>S.Y.B.</i>	Com. A&F Syllabus	
4	Detailed Syllabus	
	Taxation-II (Direct Taxes Paper- I)	
Sr. No.	Modules / Units	No. of Lectures
1	Basic Concepts, Residential Status, Scope of Total Income and Income which do not part of total income	10
	 Basic Concepts- Basic related to Income Tax Definitions u/s – 2: Assessee, Assessment Year, Assessment, Annual value, Business, Capital asset, Income, Person, Previous Year, Transfer Basis of Charge : Section 3 – 9 – Previous Year, Residential Status, Scope Of Total Income, Deemed Income Income which does not part of total income: Section 10 Note -Exemptions related to specific Heads of Income to be covered with Belevant Provisions 	
2	Heads of Income	30
	Various Heads of Income Salary Income: Section 15 – 17, Including relief under section 89 Income From House Property : Section 22 – 27, Including Section 2 – Annual Value Profits & Gains From Business & Profession : Section 28-44D excluding section 35AD, 35 2(AA)35 (2AB),35CCA, 35CCC, 35CCD,35D,35DDA Capital Gains : Section 45- 55 Income from Other Sources: Section 56 – 59	
3	Deductions under Chapter VI – A	8
	80 A- Restriction on a claim in Chapter VI- A deductions	
Δ	Computation of Total Income & Tax liability	10
4	Computation of Total Income of Individual and HUF with respect to	12

Note: Relevant Law/Statute/Rules in force and relevant Standards in force on 1st April immediately preceding commencement of Academic Year is applicable for ensuring examination after relevant year.

5	Reference Books
	 Direct Taxes Law &Practice by V. K. Singhania – Taxman Systematic Approach to Direct Tax by Ahuja & Gupta – Bharat Law House Income Tax Ready Recknoner by Dr. V. K. Singhania – Taxman Direct Tax Laws by T. N. Manoharan – Snow White

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester –III Syllabus

To be implemented from the Academic year 2020-2021

1. Elective Courses (EC)

5. Principles & Practices of Banking

1	Preamble of the syllabus
	B.Com. in Accounting & Finance is an under graduate course of Changu Kana
	Thakur Arts, Commerce & Science College, New Panvel affiliated to University of
	Mumbai. There is Choice Based Credit, Grading and Semester System to be
	implemented through this curriculum, developing learners towards basic
	fundamentals in the area of Banking. Learners who will pursue this course will be
	able to acquire the knowledge about various functions associated with banking,
	Practice & procedures relating to deposit & credit, documentation, monitoring &
	control, also an insight into the marketing of banking services & banking
	technology. The performance of the learners shall be evaluated into two
	components i.e. internal and external. The learner's performance shall be assessed
	by Internal Assessment with 40 marks and external assessment with 60 marks.

2	Objectives of the course
•	To introduce students to principles & practices of modern banking
•	To introduce students to banking and its regulation in an international context.
•	To make students explore the structure of banking & topical issues in banking
•	To expose students in the various ways of estimating bank performance, risk, competition and other relevant measures by using bank data.

3	Course outcomes
•	Students by the end will be able to identify and review banks' major risks,
	risk management techniques and strategies
•	Students will be able to estimate bank performance, risk, and efficiency and
	competition measures and understand their relevance in explaining issues of
	systemic risk, regulation, and the financing conditions in the economy.
•	Students will be able to understand the dynamic changes of the banking
	industry and the policy responses because of the recent crisis
•	Students will be able to learn ethical issues in banking and consider their
	implications for conduct of business.

5	Detailed Syllabus	
	Principles & Practices of Banking	
Sr.		No. of
No.	Modules / Units	Lectures
1	Indian Financial Systems	15
	Indian Financial Systems – An overview	
	Banking regulations	
	Introduction to retail banking, wholesale banking & international	
	banking	
	Role of money market, debt market, capital market, Forex market &	
	SEBI	
	Mutual Funds, Insurance Companies & IRDA	
	Factoring, Forfaiting services & off balance sheet items	
	Risk management, Introduction to Basel norms	
	CIBIL, Fair Practices code for debt collection	
2	Functions of Banks & related issues	20
	Banker customer relationship	
	KYC/AMF/CFT norms	
	Bankers special relationship	
	Consumer Protection – COPRA, Banking Ombudsman Scheme	
	Payment & collection of cheque and other negotiable instruments	
	Opening accounts of various types of customers	
	Ancillary services	
	Cash operations	
	Principles of lending, working capital assessment & credit monitoring	
	Agricultural finance	
	Agricultural infance Micro Small & Modium ontorprisos, MSMED Act the Policy package	
	Government sponsored schemes, SGSV SISRV PMRV SLRS	
	Self-beln groups	
	Credit cards home loans personal loans & consumer loans	
	Documentation	
	Different types of charging securities	
	Types of collaterals & their characteristics	
	Non-performing assets	
	Financial inclusion	
3	Banking Technology	15
	Payment Systems & Electronic Banking	
	Data Communication & EFT System	
	Role of Technology & its impact on Banks	
4	Marketing & Services of Banking	10
	Marketing, Social Marketing Consumer Behaviour & Product Pricing,	
	Distribution & Channel management	

5	Reference Books
	Principles & Practices of Banking
	• Bank Financial Management Paperback- 2010 by IIBF (Indian Institute of Banking & Finance)
	• Money banking and financial Paperback- 2009 by N K Sinha
	• Principles and practices of banking Paperback- 2015 by IIBF (Indian Institute of Banking & Finance)
	• Principles and practices of banking 11 edition Paperback – 2015 by N S Toor, Arun Deep Toor
	 Principles of banking (with case studies) Hardcover – 2009 by Rakesh Kumar Modern Banking in India. Gupta

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester –III Syllabus

To be implemented from the Academic year 2020-2021

2A. Ability Enhancement Courses (AEC)

1. Information Technology in Accountancy - I

1	Preamble of the syllabus
1	Preamble of the syllabus B.Com. in Accounting & Finance is an under graduation course of Department of B.Com. (Accounting & Finance), Changu Kana Thakur Arts, Commerce & Science College, New Panvel. Affiliated to University of Mumbai (MH). The course is designed to guide students of B.Com accounting and finance with the knowledge of Indian business law. It helps to provide the brief idea about the legal framework of Indian Business Law and to know the role of law in an economic and business context. It also helps to acquaint knowledge of the legal environment of business and corporate laws. The performance of the learners shall be evaluated into two components i.e. internal and external. The learner's performance shall be assessed by Internal Assessment with 40 marks and external assessment with 60 marks.

2	Objectives of the syllabus
•	To understand the basics of computer & communication system
•	To understand database management
•	To understand web & its uses
•	To understand how the network works

3	Course Outcome
•	To learn the basics of computer & communication system
•	To learn knowledge data delivery
•	To learn the concept of application in business
•	To learn database & storage management
•	To learn various types of memory

4	Detailed Syllabus	
	Information Technology in Accountancy - I	
Sr. No.	Modules / Units	No. of Lectures
1	Introduction to Computers	08
	History of Computers, Parts of Computers Hardware: Specifications and Data Storage Management Software: Concept of System Software and Applications Networking: Introduction and types of network topologies	
2	Office Productivity Tools	20
	 MS Word: Creating, Editing, Formatting and Printing of Documents, Using Tools, Mail-merge and Print Review and Set-up MS Excel: Creating Worksheet, Creating Various Formulae, Creating Charts, Rename and Copy of Worksheets, Using Tools, Printing Review and Set-up PowerPoint: Create Project Report, Create Slides, Animation, Page Designing, Insert Image, View Page, and Print Review, and Set-up. Use of Tools In Accounting :- Preparation of vouchers, invoices, and reports, Calculation of Interest, Depreciation, TDS, Salary, Taxes, inventory, and reconciliation 	
3	Web	08
	Use of Various Web Browser, Information Searching Tools Downloading, Create New email ID, Sending Data through email Search engine optimisation	
4	Introduction to Internet and other emerging technologies	08
	Introduction – Internet components – electronic commerce – e- commerce applications – Electronic Data Exchange – Extranet – Payment systems – Risks and security considerations – Legal issues Other emerging technologies – Cloud computing, Mobile computing, Artificial Intelligence & Machine learning	
5	Electronic Commerce	08
	Meaning, Advantages and Limitations of E-Commerce, The role of Strategy in E-Commerce, Value chains in E-Commerce, Infrastructure for Electronic Commerce Web-Based Tools for Electronic Commerce, Electronic Commerce software, Security Threats to electronic Commerce Implementing Security for Electronic Commerce, Electronic Payment Systems, Strategies for Marketing, Sales & Promotion Strategies for Purchasing Logistics & Support Activities, Electronic Markets & Communities, Business Plans for Implementing Electronic Commerce.	
6	Mobile Commerce	08
	Introduction, History, Concepts, Characteristics, components, supporting technology, Mobile security, mobile application, payment system.	

5	Reference Books
•	 Fundamentals of Computers – Rajaram V – Prentice Hall Computer today (3rd edition) – Sanders, Donald H – McGraw Hill Computers and Common sense – Hunt, Roger and Shelly John – Prentice Hall Computers – Subramaniam N – Wheeler Introduction to Computers – Xavier C. – New Age Computer in Business – Sanders D – McGraw Hill Computers and Information Management – S C Bhatnagar & V Ramant – Prentice Hall Internet for Business – Brummer, Lavrej – Cambridge
	• E-mail for Everyone – Leon Alexis & leon – Methews Basic Computer Programmes for Business – Sternberg C – New Jersey Hayden
Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester –III Syllabus

To be implemented from the Academic year 2020-2021

3. Core Courses (CC)

1. Business Law (Business Regulatory Framework) – II

1	Preamble of the syllabus
	B.Com. in Accounting & Finance is an under graduation course of Department
	of B.Com. (Accounting & Finance), Changu Kana Thakur Arts, Commerce &
	Science College, New Panvel. Affiliated to University of Mumbai (MH). The
	course is designed to guide students of B.Com accounting and finance with the
	knowledge of Indian business law. It helps to provide a brief idea about the legal
	framework of Indian Business Law and to know the role of law in an economic
	and business context. It also helps to acquaint knowledge of the legal
	environment of business and labour laws. The performance of the learners shall
	be evaluated into two components i.e. internal and external. The learner's
	performance shall be assessed by Internal Assessment with 40 marks and
	external assessment with 60 marks.

2	Objectives of the Syllabus
•	To help the learner to understand the legal environment in a country.
•	To enable the learner to know the functioning of a different form of business like LLP and Partnership Act.
•	To provide the students with knowledge of legal principles.
•	To study the nature and scope of business economics.

3	Course Outcomes
•	It enable the learner to appreciate the relevance of business law to individuals
	and business.
•	Learners are able to identify the fundamental legal principles behind contractual
	agreements
•	Learner acquired problem solving techniques and to be able to present coherent,
	concise legal argument.

4	Detailed Syllabus	
	Business Law (Business Regulatory Framework) - II	
Sr. No.	Modules / Units	No. of Lectures
1	The Indian Partnership Act – 1932	10
	 Concept of Partnership, Kinds of partnership Partnership and Company Test for determination of existence for partnership Registration and effects of non-registration of Partnership Rights and Duties of Partners Authority and Liability of partners Admission, Retirement and Expulsion of Partner Dissolution of Partnership 	
2	Limited Liability Partnership Act – 2008	08
	 Nature of Limited Liability Partnership Incorporation of Limited Liability Partnership Extent and Limitation of Liability of Limited Liability Partnership and Partners Contributions Conversion Into Limited Liability Partnership Winding Up and Dissolution 	
3	Industrial Law	20
	 Industrial Disputes Act, 1947: Definition, Authorities, Awards, Settlements, Strikes Lockouts, Lay Offs, Retrenchment and Closure The Trade Union Act,1926: Objectives, Function, Formation, Regulation, Rights, and Liabilities The Factory Act 1948: Definitions, Provisions pertaining to Health, Safety, and Welfare Employee State Insurance Act 1948: Definition and Employees Provident Fund The payment of Wages Act 1948: Objectives, Definition, Authorised Deductions 	12
4	Intellectual Property Rights	12
	 IPR definition/objectives Patent definition. What is patentable & not patentable? Invention And its Attributes, Inventors and Applications Trademarks, definition, types of trademarks, infringement, and passing off. Copy right definition and subject in which copyright exists, Originality, Meaning and Content, Authors and Owners, Rights, and Restrictions. Plagiarism 	

5	Reference Books
•	• An introductory guide to Central Labour Legislation – WA Dawson
	• Industrial Law – P L Malik
	• Personnel Management and Industrial relations – Kapur S, Punia B – Gurgaon SK
	• Labour participation in Management – Mhetras V Manaklals
	• Law of Partnership, by J P Singhal (Author)
	Partnership Act, 1932 with State Amendments
	• The Law Of Partnership, P.C. Markanda
	Indian Partnership Act 1932
	Limited Liability Partnership Act 2008

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester –III Syllabus

To be implemented from the Academic year 2020-2021

3. Core Courses (CC)

2. Research Methodology in Accounting and Finance

Preamble of the Syllabus

B.Com. in Accounting & Finance is an under graduation course of Department of B.Com. (Accounting & Finance), Changu Kana Thakur Arts, Commerce & Science College, New Panvel. Affiliated to University of Mumbai (MH). The course is designed to guide students of B.Com accounting and finance to develop the research skill. It helps to analyze and enhance the ability of learners for better understanding, interpretation, analysis, and presentation of Research Report. The performance of the learners shall be evaluated into two components i.e. internal and external. The learner's Performance shall be assessed by Internal Assessment with 40 marks and external assessment with 60 marks.

2	Objectives of the Syllabus
•	To enhance the abilities of the learners to develop the research skill.
•	To enable the learners to understand, develop and apply the techniques of the research design for various researches.
•	To analyze and enhance the ability of learners for better understanding, interpretation, analysis, and presentation of Research Report.

3	Course Outcomes
•	Use Literature while preparing for research, research design and further searches.
•	Explain the Research terminologies and methodologies and interpret, analysis and presentation of the report.
•	Demonstrate a basic understanding of Research, Research Design, and Report Writing.

4	Detailed Syllabus	
	Research Methodology in Accounting and Finance	
Sr. No.	Modules / Units	No. of Lectures
1	Introduction to Research	08
	Introduction and meaning of research, Objectives of research, Features and Importance of research in Accounting and Finance, Objectives and Types of research - Basic, Applied, Descriptive, Analytical and Empirical Research. Formulation of the research problem: Meaning and Selection Review of Literature	
2	Research Design in Accounting and Finance	06
	Meaning of Introduction, Need, and Good research design. Hypothesis: Formulation, Sources, Importance and Types Different Research designs	
3	Data Collection and Processing	08
	Data Collection: Introduction and meaning, types of data Primary data: Observation, Experimentation, Interview, Schedules, Survey, Questionnaires, Limitations of Primary data Secondary data: Sources and Limitations Factors affecting the choice of method of data collection. Sampling: Significance, Methods, Factors determining sample size Data Presentation: Significance in Research, Stages in Data Processing: Editing, Coding, Classification, Tabulation, Graphic Presentation Use of computer and internet in data collection and processing	
4	Statistical Analysis	24
	Statistical Analysis: Tools and Techniques, Measures of Central Tendency, Measures of Dispersion, Correlation Analysis and Regression Analysis. Probability	
5	Testing of Hypothesis	08
	Different types of test for testing of hypothesis F Test, T Test, Z Test, Chi-Square	
6	Interpretation and Report Writing	06
	Meaning and techniques of interpretation, Research Report Writing: Importance, Essentials, Structure/ layout, Types	

5	Reference Books
•	 Research Methods in Accounting, Malcolm Smith Research Methods and Methodology in Finance and Accounting, by Viv Beattie and Bob Ryan

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester –III Syllabus

To be implemented from the Academic year 2020-2021

2B. Skill Enhancement Courses (SEC)

1. Foundation Course in Commerce (Financial Market Operations) - III

1	Preamble of the syllabus
	B.Com. in Accounting & Finance is an under graduation course of Department of B.Com. (Accounting & Finance), Changu Kana Thakur Arts, Commerce & Science College, New Panvel. Affiliated to University of Mumbai (MH). The course is designed to guide students of B.Com accounting and finance to give them an outline about the participants in the Financial Markets. It helps to make them aware of the primary and secondary markets. It also make the students aware about the share and debt markets. The performance of the learners shall be evaluated into two components i.e. internal and external. The learner's performance shall be assessed by Internal Assessment with 40 marks and external assessment with 60 marks.

2	Objectives of the Syllabus
•	To give them an outline about the participants in the Financial Markets.
•	To aware the students about share and debt markets and name their collective name
•	To aware the students about the instruments of the money & bond
•	To make them capable to distinguish between fixed-interest & interest-bearing markets
•	To make them aware of the primary and secondary markets

3	Course Outcome
•	Students will able to understand the Australian Banking system & describe the
	role of regulatory bodies in regulating how banks manage their capital
•	Students will able to apply different valuation techniques to determine share
	prices.
•	Students will able to describe the characteristic of different types of debt
	securities and be able to price them

4	Detailed Syllabus	
	Foundation Course in Commerce (Financial Market Operations) - III	
Sr. No.	Modules / Units	No. of Lectures
1	An Overview of the Financial System	05
	Saving and Investment Money, Inflation and Interest Banking and Non-Banking Financial Intermediaries	
2	Financial Markets	15
	Financial Markets: Introduction and meaning, Government Economic Philosophy and Financial Market, Structure of Financial Market in India Capital Market: Introduction and meaning, Concept, Role, Importance, Evolution in India, Primary Market System and Regulations in India, Secondary Market System Bond Market in India Debt Market in India	
3	Financial Instruments	10
	Meaning and types of Financial Instruments Characteristics of Financial Instruments: Liquidity, Maturity, Safety and Yield REPO, TBs, Equities, Bonds, Derivatives, others	
4	Financial Services	15
	Merchant Banking: Managing of Public Equity / Debenture Issues Mobilizing Fixed Deposits, Arranging Inter-corporate Loans, Raising term Finance and Loan Syndication. Other Financial Services: Consumer Finance, Credit Cards, Mutual Funds and Commercial Paper	

5	Reference Books
	 Social and Economic Problems in India, Naseem Azad, R Gupta Pub (2011) Indian Society and Culture, Vinita Padey, Rawat Pub (2016) Social Problems in India, Ram Ahuja, Rawat Pub (2014) Faces of Feminine in Ancient, medivial and Modern India, Mandakranta Bose Oxford University Press National Humana rights commission- disability Manual Rural, Urban Migration: Trends, challenges & Strategies, S Rajagopalan, ICFAI-
	 2012 Regional Inequilities in India Bhat L SSSRD- New Delhi Urbanisation in India: Challenges, Opportunities & the way forward, I J Ahluwalia, Ravi Kanbur, P K Mohanty, SAGE Pub (2014) The Constitution of India, P M Bakshi 2011
	 The Problems of Linguistic States in India, Krishna Kodesia Sterling Pub Politics in India: structure, Process and Policy Subrata Mitra, Rouutlege Pub Politics in India, Rajani Kothari, Orient Blackswan Problems of Communilism in india, Ravindra Kumar Mittal Pub Combating communalism in India: Key to National Integration, Kawal Kishor Bhardwai, Mittal Pub

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Syllabus

To be implemented from the Academic year 2020-2021

Semester IV

Sr.No.	Course Code	Course Title	Credits	L / Week
1	UAF4FA4	Financial Accounting (Special Accounting Areas) – IV	3	4
2	UAF4MAC	Management Accounting (Introduction to Management Accounting)	3	4
3	UAF4TX2	Taxation - III (Direct Taxes Paper- I)	3	4
4	UAF4IT2	Information Technology in Accountancy - II	3	4
5	UAF4BL3	Business Law (Business Regulatory Framework) – II	3	4
6	UAF4EC2	Business Economics- II (Macro Economics)	3	4
7	UAF4FCIV	 Any one course from the following list of the courses a. Foundation Course – IV b. Foundation Course in NSS – IV c. Foundation Course in NCC – IV d. Foundation Course in Physical Education – IV 	2	4

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester – IV Syllabus

To be implemented from the Academic year 2020-2021

1. Elective Courses (EC)

1. Financial Accounting (Special Accounting Areas) – IV

1	Preamble of the Syllabus	
	B.Com. in Accounting & Finance is an under graduation course of	
	Department of B.Com. (Accounting & Finance), Changu Kana Thakur Arts,	
	Commerce & Science College, New Panvel. Affiliated to University of	
	Mumbai (MH). The course is designed to guide students of B.Com accounting and finance with the pattern of the final account of the company.	
	It helps to provide the knowledge of redemption of preference shares and debentures. It also helps to understand the conversion of foreign currency	
	into reporting currency. The performance of the learners shall be evaluated into two components i.e. internal and external. The learner's performance shall be assessed by Internal Assessment with 40 marks and external	
	assessment with 60 marks.	

2	Objectives of the Syllabus
•	To describe the pattern of the final account of the company
•	It provides the knowledge of redemption of preference shares and debentures
•	To differentiate profit and loss prior to incorporation and post-incorporation
•	To understand the conversion of foreign currency into reporting currency

3	Course Outcomes
•	Learners understanding about final accounts of the companies
•	Learn about redemption provisions of preference shares and debentures
•	Work with profit prior to incorporation and post-incorporation profits

4	Detailed Syllabus	
	Financial Accounting (Special Accounting Areas) – IV	
Sr. No.	Modules / Units	No. of Lectures
1	Underwriting of shares & debentures	10
	Introduction, Underwriting, Underwriting Commission	
	Provision of Companies Act with respect to Payment of underwriting	
	commission Underwriters, Sub-Underwriters, Brokers and Manager to	
	issues, Types of underwriting, Abatement Clause Marked, Unmarked	
	and Firm-underwriting applications, Liability of the underwriters in	
	respect of underwriting contracts . Practical problems	
2	Redemption of Preference Shares	12
	Provision of the Companies Act for redemption of Preference Shares (Sec 55 of the Companies Act, 2013), Companies (Share and Debentures) Rules., Methods of Redemption of fully paid up Preference Shares as per Companies Act, 2013: The proceed of a fresh issue of shares, the capitalisation of undistributed profits and a combination of both, calculation of minimum fresh issue to provide the fund for redemption, (Question on entries and/or Balance Sheet) Note: Companies governed by Section 133 of the Companies Act, 2013 and comply with the accounting standards prescribed for them. Hence, the balance in security premium account not to be utilised for the premium payable on redemption of preference shares.	
3	Buy Back of Shares	10
	Company Law / Legal provisions (including related restrictions, power,	
	transfer to capital redemption reserve account and prohibitions).	
	Compliance of conditions including sources, maximum limits and	
	debt-equity ratio. Cancellation of Shares Bought back(Excluding Buy	
	Back of minority shareholding) - Practical problems	10
4	Redemption of Debentures	12
	Act, 2013, Creation and investment of DRR including The Companies (Share Capital and Debentures) Rules, 2014, the methods of writing- off discount/loss on issue of debentures; Terms of issue of debentures Methods of redemption of debentures: By payment in lumpsum and by payment in installments (excluding from by purchase in open market), Conversion. (Question on entries. ledgers and/or Balance Sheet and /or redemption of debentures)	
5	Preparation of Final Accounts of Companies	16
	Relevant provisions of Companies Act related to the preparation of Final Account (excluding cash flow statement) Preparation of financial statements as per Companies Act. AS 1 in relation to final accounts of companies (disclosure of accounting policies)	

5	Reference Books
•	 Introduction to Accountancy by T.S. Grewal, S. Chand and Company (P) Ltd., New Delhi Advance Accounts by Shukla and Grewal, S. Chand and Company (P) Ltd., New Delhi • Advanced Accountancy by R.L Gupta and M. Radhaswamy, S. Chand and Company (P) Ltd., New Delhi • Modern Accountancy by Mukherjee and Hanif, Tata Mc. Grow Hill and Co. Ltd., Mumbai • Financial Accounting by Lesile Chandwichk, Pentice Hall of India Adin Bakley (P) Ltd., New Delhi Financial Accounting for Management by Dr. Dinesh Harsalekar, Multi-Tech. Publishing Co. Ltd., Mumbai Financial Accounting by P.C. Tulsian, Pearson Publications, New Delhi Accounting by Monga, J.R. Ahuja, Girish Ahuja and Ashok Shehgal, Mayur Paper Back, Noida Financial Accounting by V. Rajasekaran, Pearson Publications, New Delhi Introduction to Financial Accounting by Horngren, Pearson Publications, New Delhi Financial Accounting by M. Mukherjee and M. Hanif, Tata McGraw Hill Education Pvt. Ltd., New Delhi Financial Accounting by M. Mukherjee and M. Hanif, Tata McGraw Hill Education Pvt. Ltd., New Delhi

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester – IV Syllabus

To be implemented from the Academic year 2020-2021

1. Elective Courses (EC)

2. Management Accounting (Introduction to Management Accounting)

Preamble of the Syllabus

B.Com. in Accounting & Finance is an under graduation course of Department of B.Com. (Accounting & Finance), Changu Kana Thakur Arts, Commerce & Science College, New Panvel. Affiliated to University of Mumbai (MH). The course is designed to guide students of B.Com accounting and finance to introduce the concept of management Accounting. It helps to analyse and interprets the financial statements. It also helps to manage and calculate the working capital requirement of the firm. The performance of the learners shall be evaluated into two components i.e. internal and external. The learner's performance shall be assessed by Internal Assessment with 40 marks and external assessment with 60 marks.

2	Objectives of the Syllabus
•	To introduce the concept of management Accounting.
•	How to analyse and interprets financial statement.
•	How to analysis cash flow of business
•	How to manage and calculate the working capital requirement of the firm.

3	Course Outcomes
•	Understand the concept of management accounting
٠	Analyses and interpret the financial statements.
٠	Calculate various ratios from the financial statements.
٠	Do cash flow analysis.
٠	Manage working capital requirement estimations of the firm.

4	Detailed Syllabus	
	Management Accounting (Introduction to Management Accounting)	
Sr. No.	Modules / Units	No. of Lectures
1	Introduction to Management Accounting	05
	Meaning, Features, Scope, Importance, Functions, role of Management Accounting, Management Accounting Framework, Tools, Management Accounting and Financial Accounting	
2	Analysis and Interpretation of Accounts	10
	 a)Vertical Forms of Balance Sheet and Profit and Loss Account suitable for analysis b) Trend Analysis. c) Comparative Statement. d) Common Size Statement. NOTE: Practical Problems based on the above (a) to (d) 	
3	Financial Statement analysis: Ratio analysis	15
	Meaning of financial Statement Analysis, steps, Objective and types of Analysis. Ratio analysis: Meaning, classification, Du Point Chart, advantages and Limitations. Balance Sheet Ratios Revenue Statement Ratios Combined Ratio Practical problems on the Calculation of ratio and write comments on it.	
4	Cash Flow Statement	12
	Preparation of Cash Flow Statement with reference to Accounting Standard .3. (Indirect method) and Direct Method	
5	Working Capital Management	08
	Concept, Nature of Working Capital, Planning of Working Capital Estimation / Projection of Working Capital Requirement in case of Trading and Manufacturing Organization Operating Cycle Practical Problems	
6	Cash Budget	10
	Meaning, Objectives, importance & Advantages of cash budget Types of cash budget Practical problems	

5	Reference Books
•	Cost Management by Saxena & Vashist
	• Cost & Management Accounting by Ravi N.Kishor, Publication Taxmonth
	• Essential of Management Accounting by P.N.Reddy, Himalaye
	Advanced Management Accounting by Robert S Kailar, Holl
	• Financial Of Management Accounting by S.R. Varshney, Wisdom
	• Introduction Of Management Accounting by Charbs T Horngram, PHI Learnng
	Management Accounting by I.m.Pandey, Vikas
	Cost & Management Accounting by D.K.Mattal, Galgotia
	Management Accounting by Khan & Jain, Tata Megaw
	Management Accounting by R.P.Resstogi

Choice Based Credit Grading and Semester System (CBCGS) S.Y.B.Com. Accounting & Finance Semester –IV Syllabus To be implemented from the Academic year 2020-2021

1. Elective Courses (EC)

3. Auditing- III

Preamble of the Syllabus

B.Com. in Accounting & Finance is an under graduation course of Department of B.Com. (Accounting & Finance), Changu Kana Thakur Arts, Commerce & Science College, New Panvel. Affiliated to University of Mumbai (MH). The the course is designed to guide students of B.Com accounting and finance with the knowledge of Auditing, where students will be getting to learn about various audit opinions that auditor is supposed to express, how effective computerised the environment can be for audit tools & also about the professional ethics that are to be followed by the auditor while carrying the investigation with due diligence. The performance of the learner's Performance shall be assessed by Internal Assessment with 40 marks and external assessment with 60 marks.

2	Objectives of the Syllabus
•	To introduce the concept of management Accounting.
•	How to analyse and interpret the financial statements.
•	How to analysis cash flow of business
•	How to manage and calculate the working capital requirement of the firm.

3	Course Outcomes
•	Understand the concept of management accounting
•	Analyses and interpret the financial statements.
•	Calculate various ratios from the financial statements.
•	Do cash flow analysis.
•	Manage working capital requirement estimations of the firm.

4	Detailed Syllabus	
	Auditing- III	
Sr. No.	Modules / Units	No. of Lectures
1	Audit Report	15
	Reporting requirement under the Companies Act Qualifications in the Audit Report, Disclaimers in Audit Report Adverse Opinion, Disclosures, Reports & Certificate	
2	Audit under Computerized Information System Environment	15
	Special aspects of CIS Audit Environment, Need for review of internal control especially procedure controls and facility controls Approach to audit in CIS environment Use of a computer for internal and management audit purposes Audit tools, test packs, computerized audit programes Special aspects in Audit of E-Commerce Transaction	
3	Professional Ethics	15
	Code of Ethics with special reference to the relevant provisions of The Chartered Accountant Act and the Regulations thereunder The Chartered Accountant Act Schedules Members who are deemed to be in Practice Significance of the Certificate of Practice Disabilities for the purpose of Membership Disciplinary Procedure Professional Misconduct	
4	Investigation and Due Diligence	15
	Introduction Auditing and Investigation Steps in Investigation Special aspects in connection with Business Investigation Types of Investigation (only introduction) Meaning of Due Diligence Purpose of Due Diligence	

Note: Relevant Law/statute/Rules in force in force on 1st April immediately preceding The commencement of Academic Year is applicable for ensuring examination after Relevant year.

Board of Studies-in-Accountancy, University of Mumbai

5	Reference Books		
	 Contemporary Auditing by Kamal Gupta, Tata Mc-Graw Hill, New Delhi A Hand-Book of Practical Auditing by B.N. Tandon, S. Chand and Company, New Delhi Fundamentals of Auditing by Kamal Gupta and Ashok Arora, Tata McGraw Hill, New Delhi Auditing: Principles and Practice by Ravinder Kumar, Virender Sharma, PHI Learning Pvt. Ltd., NewDelhi Auditing and Assurance for CA IPCC by Sanjib Kumar Basu, Pearson Education, New Delhi Contemporary Auditing by Kamal Gupta, McGrow Hill Education Pvt. Ltd., New Delhi Fundamentals of Auditing by Kamal Arora and Ashok Gupta, Tata McGraw Hill, New Delhi 		

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & FinanceSemester – IV Syllabus

To be implemented from the Academic year 2020-2021

1. Elective Courses (EC)

4. Taxation - II (Direct Taxes- II)

Preamble of the Syllabus

B.Com. in Accounting & Finance is an under graduation course of Department of B.Com. (Accounting & Finance), Changu Kana Thakur Arts, Commerce & Science College, New Panvel. Affiliated to University of Mumbai (MH). The course is designed to guide students of B.Com accounting and finance with the knowledge of Indian taxation law. It helps to provide a brief idea about the filing of the income tax returns. It also helps to acquaint knowledge of PAN, TDS and other different aspects of direct taxes. The performance of the learners shall be evaluated into two components i.e. internal and external. The learner's performance shall be assessed by Internal Assessment with 40 marks and external assessment with 60 marks.

2	Objectives of the Syllabus
•	To study Clubbing of Income from assets transferred to a person for the benefit of
	spouse, income from assets transferred to a person for the benefit of a spouse
	attracts the provisions on clubbing of income.
•	To learn various provisions under heads of income for enabling assessee to carry
	forward & set-off in the previous year as well as in the future. Learn limitations for
	a number of years, for which losses can be carried forward and set-off.
•	To learn with these objectives, an investor needs to generate income from his
	investments
•	To learn basic concept & objective of Tax Deducted at Source is to collect taxes at
	the very source of income.

3	Course Outcomes
•	By the end of the course students will able to understand the Indian Income tax
	system.
•	Understood fundamental Concepts of Indian Income tax act 1961
•	Apply Income tax laws and solves the problems.
•	Analyses and evaluates tax information and issues.
•	Communicate effectively and orally income tax act information to income tax
	issues.

4	Detailed Syllabus	
	Taxation – II (Direct Taxes – II)	
Sr. No.	Modules/ Units	No. of Lectures
1	Clubbing of Income - Section 60 to 65	8
2	Set Off & Carry Forward of Losses – Section 70 to 74)	8
3	Computation of Income of Partnership Firm in Relation to Sec: 40(b) & Tax Thereon With Applicable Rate of Tax	8
4	Return of Income & Self-Assessment	6
5	Tax Deduction at Source & Tax collected at Source	10
	Basic Aspects of Deduction of Taxes at Source Sec. 191 – Direct payment; Sec. 192 – TDS on Salary; Sec. 194A – TDS on Interest; Sec. 194C – TDS on Contractor; Sec. 194H – TDS on Commission; Sec. 194I – TDS on Rent; Sec. 194J – TDS on Professional Fees; Sec194N – TDS on cash withdrawal; Sec. 195 A – Income payable net of tax; Sec. 197Certificate of Tax at lower Rate; Sec. 197A Certificate of Tax at Nil Rate Sec. 200 – Duty of person deducting tax (Rule 30 & 31A) Sec. 201 – consequence of failure to deduct or pay Sec. 202 – deduction only one mode of recovery Sec. 203 – Certificate of tax deducted Sec. 203AA- Furnishing of statement of tax deducted Sec. 204 – Person responsible for paying TDS Sec206- Tax collected at Source	
6	Advance Tax (Section 207 to section 211 and 219)	6
7	Interest & Penalties	8
	Interest Payable - (Sec 234A, Sec. 234B, Sec. 234C, Sec. 234D, Sec. 234E & Sec. 234F) Penalty – (Sec. 270A, Sec. 271C, Sec. 271CA & Sec. 273)	
8	Practical Income-Tax	6
	PAN, TAN, Payment of Income tax & TDS Filing of Income-Tax return & TDS Return Form 12BA, Form No. 16 & Form No. 16A	

Note:

- 1. Relevant Law / Statute in force on 1st April immediately preceding commencement of Academic Year is applicable for ensuing examinations after relevant year.
- 2. The syllabus is restricted to study of particular section/s, specifically mentioned rules and notifications only.

5	Reference Books
•	 Direct Taxes Law & Practice by V.K. Singhania – Taxman Systematic Approach to Direct Tax by Ahuja & Gupta - Bharat Law House Income Tax Ready Recknoner by Dr .V.K. Singhania – Taxman Direct Tax Laws by T.N. Manoharan - Snow White Wealth Engine: Indian Financial Planning and Wealth Management Handbook by Sankaran S WEALTH MANAGEMENT by N/A Dun & Bradstreet

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester – IV Syllabus

To be implemented from the Academic year 2020-2021

1. Elective Courses (EC)

5. Wealth Management

1	Preamble of the syllabus
	B.Com. in Accounting & Finance is an under graduate course of Changu
	Kana Thakur Arts, Commerce & Science College, New Panvel affiliated to
	University of Mumbai. There is Choice Based Credit, Grading and Semester
	System to be implemented through this curriculum, developing learners
	towards basic fundamentals in the area of Wealth management. Learners
	who will pursue this course will be able to acquire the knowledge about
	various markets, Code of conduct relating to Portfolio construction, also an
	insight into dematerialization & re-materialization of securities, valuation of
	bonds & shares. The performance of the learners shall be evaluated into two
	components i.e. internal and external. The learner's performance shall be
	assessed by Internal Assessment with 40 marks and external assessment with
	60 marks.

2	Objectives of the course
•	To help students develop a strong foundation in investment concepts and
	products
•	To help students understand and devise goal-oriented planning of wealth
•	To help students assess market portfolio
•	To aid students in comprehending various theories related to wealth
	management

3	Course outcomes
٠	Students should be able to analyse the evolution of markets
•	Students should be able to evaluate the value of the securities i.e. shares &
	bonds
•	Students should be able to know the operational aspects of managing wealth
٠	Students should be able to analyse various financial products for investments

4	Detailed Syllabus	
	Wealth Management	
Sr. No.	Modules / Units	No. of Lectures
1	Introduction to Wealth Management	10
	Definition of wealth management & its evolution Wealth management process & phases Nature & structure of Primary & Secondary capital market Comparison between various options for investing & risk & return analysis Role of wealth manager: Obligations & responsibilities of wealth manager, Qualification, Capital requirement, certification to become investment advisor, Code of conduct & ethics in providing financial advice	
2	Important Numerical Concepts	20
	Simple Interest, Compound Interest, Discounted Cash flows & installment calculation Correlation, Standard deviation, Co-variance & Beta of portfolio Share Valuation Bond Valuation	
3	Wealth Management Process	15
	Developing a wealth management plan Essentials of a comprehensive wealth plan Analysis of different financial products for investments Risk profiling of the client Portfolio Construction Modern Portfolio & Theory of constructing a portfolio	
4	Operational aspects of wealth management	15
	Types of investors PAN & KYC Process Dematerialization & re-materialization of securities Power of Attorney Account opening Process of Non-resident Documentation of financial advisor	

5	Reference Books
	 Wealth engine: Indian Financial Planning & Wealth Management Handbook by Sankaran S WEALTH MANAGEMENT, by N/A Dun & Bradstreet

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester – IV Syllabus

To be implemented from the Academic year 2020-2021

2A. Ability Enhancement Courses (AEC)

1. Information Technology in Accountancy - II

Preamble of the Syllabus

B.Com. in Accounting & Finance is an under graduation course of Department of B.Com. (Accounting & Finance), Changu Kana Thakur Arts, Commerce & Science College, New Panvel. Affiliated to University of Mumbai (MH). The course is designed to guide students of B.Com accounting and finance to study computerised accounting system software like TALLY ERP. It helps to study business process management. It also helps to acquaint knowledge of Management Information System which helps organizations like HR, Marketing, and Finance etc.The performance of the learners shall be evaluated into two components i.e. internal and external. The learner's performance shall be assessed by Internal Assessment with 40 marks and external assessment with 60 marks.

2	Objectives of the Syllabus
•	To study business process management
•	To study automation of the business process
•	To study computerised accounting system software like TALLY ERP
•	To study Management Information System which helps organizations like
	HR, Marketing, Finance etc.
•	To study internal audits to evaluate the effectiveness of an operation's
	internal control

3	Course Outcomes
•	Learn need & importance of business process, business process
	management in IT, BPM life cycle
•	Learn practical knowledge of tally software
•	Learn importance & applications of information system in management, the
	role of computer in MIS
•	Learn different IT auditing techniques

4	Detailed Syllabus	
	Information Technology in Accountancy - II	
Sr. No.	Modules / Units	No. of Lectures
1	Business Process	10
	Introduction, Definition and Meaning of business process The flow of business process for accounting, purchase, sales and finance, Classification of business processes Introduction, Definition and Meaning of Business Process Management, Principles and Practices of Business Process Management, Business Process Management life cycle Theories of Business Management Process Implementation of Business process Management – need, key factors and importance Automation of Business Processes – benefits, risks, challenges Accounting systems automation IT and Business Process Management	
2	Computerized accounting system	20
	Introduction and meaning, Uses and Benefits, Role Need and requirements of the computerized accounting Basic requirements of computerized accounting system Limitations of computerized accounting system Understand the development and design of a computerized accounting system; determining how the accounting data will be processed, i.e. what accounts and books are needed and what is the desired output i.e. financial reports and other reports. Accounting Software: Introduction and meaning, Advantages of accounting software, Uses of Accounting software, Various accounting software Accounting software – creation of company, Ledgers, Groups, voucher entry, Accounting and reports	
3	Concept of MIS Reports in Computer Environment	10
	Introduction, Concept of MIS, Need for MIS, Characteristic of MIS, Outputs of MIS, Role of MIS, Guidelines for Developing MIS reports Functional Aspects of the MIS, Problems in MIS Knowledge required for studying MIS, MIS and Computer	
4	IT and Auditing	05
	Need and importance of IT in auditing Auditing in the IT environment	
5	Information systems	10
	Introduction, Information system, components of Information systems, Accounting Information System	
6	Other emerging technologies	05
	Business Analytics, Financial Analytics	

5	Reference Books
•	 Fundamentals of Computers – Rajaram V – Prentice Hall Computer today (3rd edition) – Sanders, Donald H – McGraw Hill Computers and Common sense – Hunt, Roger and Shelly John – Prentice Hall Computers – Subramaniam N – Wheeler • Introduction to Computers – Xavier C. – New Age
	 Computer in Business – Sanders D – McGraw Hill Computers and Information Management – S C Bhatnagar & V Ramant – Prentice Hall Internet for Business – Brummer, Lavrej – Cambridge
	 E-mail for Everyone – Leon Alexis & leon – Methews Basic Computer Programmes for Business – Sternberg C – New Jersey Hayden

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester – IV Syllabus

To be implemented from the Academic year 2020-2021

3. Core Courses (CC)

1. Business Law (Company Law) - III

Preamble of the Syllabus

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2	Objectives of the Syllabus
•	To cover the principles of company law.
•	To examine the various structures through which business may be run.
•	To examine the ways of financing and conducting the affairs of a company. To examine the duties and rights of directors, Shareholder rights, insolvency
•	To examine the method of establishing and running a company

3	Course Outcomes
•	Demonstrate comprehensive and accurate knowledge and understanding of those areas of company law.
•	Read and study primary and secondary sources of company law, with minimal staff guidance; critically analyse, interpret, evaluate and synthesise information from a variety of sources.
•	Critically analyse complex problems in relation to the regulation of companies, apply the legal principles studied to these problems, and evaluate competing arguments or solutions and present well-supported conclusions both orally and in writing.

S.Y.B.Com. A&F Syllabus 4 **Detailed Syllabus Business Law (Company Law) – III** Sr. No. Of **Modules / Units** Lectures No. 20 1 Company Law – I Definitions (section 2 of Company Act 2013) • Incorporation of companies (Section 3 to Section 22) • Prospectus & Allotment of Securities (Sections 23 to section 41) Private Placement (Section 42) Share Capital and Debentures (Sections 43 to section 72) • Acceptance of deposits by companies (section 73 to section 76) • 20 2 Company Law – II Registration of charge (section 77 to section 87) • Management & Administration (section 88 to section 122) • Declaration & payment of dividend (section 123 to 127) • Accounts of companies (section 128 to 138) Audit & Auditors (section 139 to 148) Appointment & qualification of Directors (section 149 to 172) Meeting of board & its powers (section 173 to 195) Winding up (Section 270) 15 Insolvency and Bankruptcy code, 2016. 3 Introduction -Historical perspectives of insolvency, bankruptcy and • the laws, Need, objects, applicability for the IBC 2016, Definition, Concepts of Insolvency and Bankruptcy, Debtors and Creditors. **Insolvency Resolution and Liquidation Process for Corporate Persons** • -Corporate insolvency resolution process, Liquidation process, Fast track insolvency resolution process. Insolvency Resolution and Bankruptcy for Individuals and Partnership Firms- Insolvency resolution process, Bankruptcy order for individuals and partnership firms, Administration and distribution of the estate of the bankrupt. Authorities under the Code- The Insolvency and Bankruptcy Board of India, Powers and functions of the Board, Insolvency professional agencies Information utilities, Inspection and investigation. Adjudicating Authorities under the Code - Adjudicating Authorities for Corporate Persons, Adjudicating Authorities for Individuals and Partnership Firms, Appeals. Offenses and Penalties for Contravention of the Provisions of the **Code-** By the debtor, By the creditor & By the bankrupt National Company Law Tribunal. 05 4 Constitution of National Company Law Tribunal, Appellate Tribunal Selection of members, terms of office, salary, Removal of members • Order of Tribunal, Powers of Tribunal, Appeal from orders of Tribunals

S.Y.B.Com. A&F Syllabus	
5	Reference Books
•	Companies Act 2013 by Ravi Puliani Bharat Publication
	 Companies Act 2013 by Taxmann

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester –III Syllabus

To be implemented from the Academic year 2020-2021

3. Core Courses (CC)

2. Business Economics - II – (Macro Economics)

1	Preamble of the Syllabus
	B.Com. in Accounting & Finance is an under graduation course of Department of B.Com. (Accounting & Finance), Changu Kana Thakur Arts, Commerce & Science College, New Panvel. Affiliated to University of Mumbai (MH). The course is designed to guide students of B.Com accounting and finance with the main macroeconomics theories. It helps to
	output, inflation, productivity. The performance of the learners shall be evaluated into two components i.e. internal and external. The learner's performance shall be assessed by Internal Assessment with 40 marks and external assessment with 60 marks.

2	Objectives of the Syllabus
•	Students will be able to describe the main macroeconomics theories
•	Students will be able to critically evaluate the consequences of basic macroeconomics policy option
•	To identify the determinants of various macroeconomics such as output, inflation, productivity

3	Course Outcomes
•	Understand the basic of national income accounting.
•	Understand the cause and consequence of the business cycle.
•	Understand the role of fiscal and monetary policy.

5.1.D.		
4	Detailed Syllabus	
	Economics – II – (Macro Economics)	
Sr. No.	Modules / Units	NO. Of Lectures
1	Introduction to Macroeconomic Data and Theory	15
	 Macroeconomics: Meaning, Scope and Importance. Circular the flow of aggregate income and expenditure: closed and open economy models The Measurement of national product: Meaning and Importance - conventional and Green GNP and NNP concepts Short run economic fluctuations: Features and Phases of Trade Cycles The Keynesian Principle of Effective Demand: Aggregate Demand and Aggregate Supply - Consumption Function - Investment function - effects of Investment Multiplier on Changes in Income and Output Introduction to The Great Depression and Euro Zone Crisis - Brexit 	
2	Money, Inflation and Monetary Policy	15
	 Money Supply: Determinants of Money Supply - Factors influencing Velocity of Circulation of Money Demand for Money: Classical and Keynesian approaches and Keynes' liquidity preference theory of interest Money and prices : The quantity theory of money - Fisher's equation of exchange - Cambridge cash balance approach Inflation: Demand-Pull Inflation and Cost-Push Inflation - Effects of Inflation-Nature of inflation in a developing economy. Monetary policy: Meaning, objectives and instruments, inflation targeting 	
3	Constituents of Fiscal Policy	15
	Role of a Government to provide Public goods- Principles of Sound and Functional Finance Policy: Meaning and Objectives Instruments of Fiscal policy: Canons of taxation - Factors influencing the incidence of taxation - Effects of taxation Significance of Public Expenditure - Social security contributions- Low-Income Support and Social Insurance Programmes - Public Debt - Types, Public Debt and Fiscal Solvency, Burden of debt finance; Union budget -Structure- Deficit concepts-Fiscal Responsibility and Budget Management Act.	45
4	Open Economy: Theory and Issues of International Trade	15
	 The basis of international trade: Ricardo's Theory of comparative cost advantage - The Heckscher – Ohlin theory of factor endowments- terms of trade - meaning and types Factors determining terms of trade - Gains from trade - Free trade versus protection Foreign Investment: Foreign Portfolio investment- Benefits of Portfolio capital flows-Foreign Direct Investment - Merits of Foreign Direct Investment - Role of Multinational corporations Balance of Payments: Structure -Types of Disequilibrium - Measures to correct disequilibrium in a BOP. Foreign Exchange and foreign exchange market: Spot and Forward rate of Exchange - Hedging, Speculation and Arbitrage -Fixed and Flexible exchange rates- Managed flexibility 	

5	Reference Books
•	• Ackley.G (1976), Macro Economic Theory and Policy, Macmillan Publishing Co. Ne York
	• Ahuja. H.L., Modern Economics — S.Chand Company Ltd. New Delhi.
	Blanchard Olivier (2000), Macro Economics, Englewood Elitt, Prentice Hall
	Bouman John, Principles of Macro Economics
	• Dornbush, Rudiger, Fisher Stanley and Startz, Richards Macroeconomics, Nineth edition 2004 TataMac Graw Hill, New Delhi
	• Dwivedi, D.N. (2001), Macro Economics: Theory and Policy, Tata-Mac Graw Hill, Ne Delhi
	• Friedman Hilton (1953) Essays in Positive Economics, University of Chicago Pres London.
	• Gregory .N. Mankiw, Macroeconomics, Fifth Edition (2002) New York: Worth Publishers
	• Jhingan, M.L., Principles of Economics — Vrinda Publications (P) Ltd.
	• Shapiro, E (1996), Macro-Economic Analysis, Galgotia Publication, New Delhi.
	• Vaish .M.C. (2010) Macro Economic Theory 14th edition. Vikas Publishing House(P)Ltd
	Ahuia H.L. : Modern Economics. 19th edition. 2015. S.Chand&co Pvt Ltd. New Delhi
	Bhatia H.L.: Public Finance, Vikas Publishing House Pvt. Ltd.
	• David N. Hyman : Public Finance A Contemporary Application of theory of polic Krishna Offset, Delhi
	• Hoiughton E.W.(1998) : Public Finance, Penguin, Baltimore
	• Haiela T.N: Public Finance – Ane Books Pvt.Ltd
	• Jha. R (1998) : Modern Public Economics. Route Ledge. London
	• Musgrave, R.A and P.B. Musgrave (1976) : Public Finance in Theory and Practice, Ta McGraw Hill, Kogakusha, Tokyo
	• Mithani, D.M (1998) : Modern Public Finance, Himalaya Publishing Hou
	MumbaiIntroduction to Accountancy by T.S. Grewal, S. Chand and Company (P) Ltd., No Delhi
	• Advance Accounts by Shukla and Grewal, S. Chand and Company (P) Ltd., New Delhi
	• Advanced Accountancy by R.L Gupta and M. Radhaswamy, S. Chand and Company (Ltd., New Delhi
	• Modern Accountancy by Mukherjee and Hanif, Tata Mc. Grow Hill and Co. Ltd., Mumba
	• Financial Accounting by Lesile Chandwichk, Pentice Hall of India Adin Bakley (P) Lt New Delhi
	• Financial Accounting for Management by Dr. Dinesh Harsalekar, Multi-Tech. Publishi Co. Ltd., Mumbai
	• Financial Accounting by P.C. Tulsian, Pearson Publications, New Delhi
	• Accounting Principles by R.N. Anthony and J.S. Reece, Richard Irwin, Inc
	• Financial Accounting by Monga, J.R. Ahuja, Girish Ahuja and Ashok Shehgal, May Paper Back, Noida
	• Financial Accounting by Williams, Tata Mc. Grow Hill and Co. Ltd., Mumbai
	• Financial Accounting by V. Rajasekaran, Pearson Publications, New Delhi
	• Introduction to Financial Accounting by Horngren, Pearson Publications, New Delhi
	• Financial Accounting by M. Mukherjee and M. Hanif, Tata McGraw Hill Education P Ltd., New Delhi
	• Financial Accounting a Managerial Perspective, Varadraj B. Bapat, Mehul Raithath Tata McGraw Hill Education Pyt Ltd New Delhi

Choice Based Credit Grading and Semester System (CBCGS)

S.Y.B.Com. Accounting & Finance Semester – IV Syllabus

To be implemented from the Academic year 2020-2021

2B. Skill Enhancement Courses (SEC)

1. Foundation Course in Management (Introduction to Management) - IV

1	Preamble of the Syllabus
	B.Com. in Accounting & Finance is an under graduation course of
	Department of B.Com. (Accounting & Finance), Changu Kana Thakur Arts,
	Commerce & Science College, New Panvel. Affiliated to University of
	Mumbai (MH). The course is designed to guide students of B.Com
	accounting and finance to understand staffing, directing and controlling. It
	helps to understand basic management concepts. The performance of the
	learners shall be evaluated into two components i.e. internal and external.
	The learner's performance shall be assessed by Internal Assessment with 40
	marks and external assessment with 60 marks.

2	Objectives of the Syllabus
•	Students will be able to understand basic management concepts
•	Students will be able to identify the term planning and organising
•	To understand staffing, directing and controlling

3	Course Outcomes
•	Understand the basic management concepts.
•	Understand the terms like planning and organising.
•	Understand staffing, directing and controlling.

4	Detailed Syllabus
	Foundation Course in Management (Introduction to Management) - IV
Sr. No.	Modules / Units
1	Introduction to Basic Management Concepts
	Introduction to Management, Definition of Management
	Objectives of Management
	Administration vs Management
	Levels of Management
2	
2	Planning
	Process of Planning
	Limitations of Planning
	Features of Sound Planning
	Features and process of decision making
3	Organising
	Definition, nature and significance
	Process of organisation Principles of organisation
	Formal and Informal organisation - features, advantages and disadvantages
	Centralisation and decentralisation – factors, merits and demerits
	Departmentation and Delegation
4	Staffing
	Meaning, Importance of Staffing
	Selection procedure
	Distinction between Recruitment and Selection
	Employment tests and types of Interview
5	Directing and Controlling
	Meaning and Importance of directing
	Principles of Directing
	Motivation – Importance and Factors
	Co-ordination – Meaning, features and Importance
	Meaning and steps in controlling
	Essentials of a good control system
S.Y.B.Com. A&F Syllabus

5	Reference Books
•	 Essentials of Management by Koontz H & W published by McGraw Hill Principles of Management by Ramaswamy published by Himalaya Management Concept and Practice by Hannagain T published by McMillan Basic Managerial Skills for All by McGrath E.H published by Prentice Hall of India Management – Text and Cases by VSP Rao published by Excel Books Essentials of Management by Massie Joseph published by Prentice Hall of India Management: Principles and Guidelines by Thomas Duening & John Ivancevich published by Biztantra Management Concepts and Strategies by J S Chandran published by Vikas Publishing House Principles of Management by Tripathy P C published by Tata McGraw Hill Principles of Management: Theory and Practice by Sarangi S K published by V M P Publishers

Choice Based Credit Grading and Semester System (CBCGS) S.Y.B.Com. Accounting & Finance Semester –III & IV To be implemented from the Academic year 2020-2021

Scheme of Evaluation

Scheme of examination for each semester

The performance of the learners shall be evaluated into two components. The learner's performance shall be assessed by Internal Assessment with 40% marks in the first component. External assessment with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular		Marks			
01	One periodical class test / online examination to be					
01	conducted in the given semester					
	One case study/project with presentation based on the curriculum to be					
	assessed by the teacher concerned					
02	Presentation	10 Marks				
	Written Document	05 Marks				
	Active participation in routine class instructional deli	veries and overall				
03	conduct as a responsible learner, mannerism and	articulation and	05 Marks			
	exhibit of leadership qualities in organizing related ac	ademic activities				
		Total Marks	40 Marks			

Internal Assessment- (Courses without Practical Courses)

Sr. No.	Particular	Marks			
	Practical Examination		20 Marks		
01	Journal	05 Marks			
01	Viva Voce	05 Marks			
	Laboratory Work	10 Marks			
02	One case study/project with presentation based on the curriculum to be assessed by the teacher concerned				
02	Presentation	10 Marks			
	Written Document	05 Marks			
03	Active participation in routine class instructional de conduct as a responsible learner, mannerism ar exhibit leadership qualities in organizing related action	liveries and Overall ad articulation and ademic activities	05 Marks		
		Total Marks	40 Marks		

Internal Assessment-(Courses with Practical)

Question Paper Pattern

(Periodical Class Test for the Courses at Under Graduate Programmes)

Maximum Marks: 20 Questions to be set: 02 Duration: 40 Minutes All Questions are Compulsory

Question No	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept-based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

B) Semester End Examination: 60 %

60 Marks

- i) Duration: The examination shall be of 2 Hours duration
- ii) Theory question paper pattern
 - There shall be four questions each of 15 marks.
 - All questions shall be compulsory with internal choice within the questions.
 - Question maybe subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the topic.

Question Paper Pattern (Practical Courses)

Maximum Marks: 60

Questions to be set: 04

Duration: 2 Hrs.

All Questions are Compulsory Carrying 15 Marks each.

Question No	Particular	Marks
Q-1	Full Length Practical Question	15 Marks
	OR	
Q-1	Full Length Practical Question	15 Marks
Q-2	Full Length Practical Question	15 Marks
	OR	
Q-2	Full Length Practical Question	15 Marks
Q-3	Full Length Practical Question	15 Marks
	OR	
Q-3	Full Length Practical Question	15 Marks
Q-4	Objective Questions	
	(*Multiple choice / True or False / Match the columns/Fill in the	15 Marks
	blanks/Short Questions.)	
Q-4	OR	
	Short Notes (Any three out of five)	15 Marks

Note:

The Practical question of 15 marks may be divided into two sub-questions of 7/8 and 10/5 Marks. If the topic demands, instead of practical questions, appropriate theory question maybe asked.

Question Paper Pattern (Theoretical Courses)

Maximum Marks: 60 Questions to be set: 04 Duration: 2 Hrs. All Questions are Compulsory Carrying 15 Marks each.

Question No	Particular	Marks
Q-1	Full Length Question	15 Marks
	OR	
Q-1	Full Length Question	15 Marks
Q-2	Full Length Question	15 Marks
	OR	
Q-2	Full Length Question	15 Marks
Q-3	Full Length Question	15 Marks
	OR	
Q-3	Full Length Question	15 Marks
Q-4	Objective Questions	
	(*Multiple choice / True or False / Match the columns/Fill in the	15 Marks
	blanks/Short Questions.)	
Q-4	OR	
	Short Notes (Any three out of five)	15 Marks

Note:

Theory question of 15 marks may be divided into two sub-questions of 7/8 and 10/5 Marks.

Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain a minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24Out of 60) separately, to pass the course and minimum of Grade E to pass a particular semester A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.





Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

Program: B. Sc.

Revised Syllabus of S.Y.B.Sc. Microbiology

Choice Based Credit, Grading and Semester System

w.e.f. Academic Year 2020-21

PREAMBLE OF THE SYLLABUS

With the introduction of Academic autonomy by the esteemed Changu Kana Thakur Arts ,Commerce and Science College, New Panvel from the academic year 2020-2021, the existing syllabus of S.Y.B.Sc. Microbiology is restructured according to the CBCS pattern for its implementation from 2020-2021. This syllabus is prepared to make students more knowledge oriented in Microbiology subject. The new and updated syllabus is based on interdisciplinary approach with vigour and depth taking care of the syllabus which is not heavy for the S.Y.B.Sc. learners. The contents have been drawn to accommodate the widening horizons of the Microbiology discipline. It reflects the changing needs of the learners, pertaining to the fields of Bio-Chemistry, Molecular Biology, Bio-Statistics, Medical Microbiology, Immunology, Fermentation technology, Bioinformatics, Research methodologies and presentation skills. The well-organized curricula including basic as well as advanced concepts in the Microbiology shall inspire the students for pursuing higher studies in Microbiology and for becoming an entrepreneur and also enable learners to get employed in the Microbiology subject based industries. भ.जि.प्र.मस्था

OBJECTIVES TO BE ACHIEVED:-

- To enrich learners' knowledge and train them in the pure microbial sciences.
- To introduce the concepts of application and research in Microbiology. •
- To inculcate sense of scientific responsibilities and social and environment awareness. •
- То help learners build-up progressive and successful a career.

S.Y.B.Sc Microbiology Syllabus (General Outline) Revised for Choice Based Credit System To be implemented from the Academic year 2020-21

	SEMESTER I	
Course Code	Title	Credits
USc3 Mi1	Estimation of Biomolecules and Introduction	2 Credits
Theory	Bioenergetics and Biostatistics	(45 lectures)
Unit-I	Extraction and analysis of Biomolecules	15 lectures.
Unit-II	Introduction to Bioenergetics, Thermodynamics and Biostatistics	15 lectures.
Unit-III	Preparation of solutions and Biochemical Calculations	15 lectures.
USc3 Mi2 Theory	Introduction to fermentation technology and Applied Microbiology	2 Credits (45 lectures)
Unit-I	Introduction to fermentation Technology	15 lectures.
Unit-II	Introduction to Food and Dairy Microbiology	15 lectures.
Unit-III	Fresh Water and Sewage Microbiology	15 lectures.
USc3 Mi 3	Introduction to Microbial Genetics and Molecular Biology	2 Credits
Theory		(45 lectures)
Unit-I	Nucleic acid chemistry, Electrophoresis and Sequencing	15 lectures.
Unit-II	Prokaryotic DNA replication, mutation and DNA repair mechanism	15 lectures.
Unit-III	Prokaryotic transcription and translation	15 lectures.
USc3 Mi P	PRACTICALS	3 Credits
	SECTION-1 Estimation of Biomolecules and Introduction Bioenergetics and Biostatistics (Practicals Based On Unit-I,II & III Of USC3 MI 1)	1 Credit (45 lectures)
	SECTION-2 Introduction to Fermentation Technology and Applied Microbiology (Practicals Based On Unit-I,II & III Of USC3 MI 2)	1 Credit (45 Lectures)
	SECTION-3 Introduction to Microbial Genetics and Molecular Biology (Practicals Based On Unit-I,II & III Of USC3 MI 3)	1 Credit (45 lectures)
	SEIVIESTEK II	
USc4 Mi-1 Theory	Introduction to Metabolism and Enzymology	2 Credits (45 Lectures)

Unit-I	Introduction to metabolism	15 lectures.
Unit-II	Enzyme Kinetics	15 lectures.
Unit-III	Membrane Transport	15 lectures.
USc4Mi-2 Theory	Introduction to Medical Microbiology and immunology	2 Credits (45 Lectures)
Unit-I	Common infectious diseases, Epidemiology and Public Health Awareness	15 lectures.
Unit-II	Host defence and public health (Epidemiology of infectious diseases)	15 lectures.
Unit-III	Introduction to Physiological sampling, Diagnostic techniques and Vaccines	15 lectures.
UcC4Mi-3 Theory	Advances Analytical Techniques, Soft Skills and Applications of Microbiology	2 Credits (45 Lectures)
Unit-I	Introduction to Bioinformatics, Nano biotechnology, Biofilm and Biosensor	15 lectures.
Unit-II	Analytical Techniques: Chromatography, Spectroscopy and Basic centrifugation	15 lectures.
Unit-III	Research Fundamentals, Hypothesis Writing, Study designs, Report writing and presentation	15 lectures.
USc2MiP	PRACTICALS	3 Credits
	SECTION-1 Introduction to Metabolism and Enzymology (Practicals Based On Unit-I,II & III Of USC4 MI 1)	1 Credit (45 Lectures)
	SECTION-2 Introduction to Medical Microbiology and immunology (Practicals Based On Unit-I,II & III Of USC4 MI 2)	1 Credit (45Lectures)
	SECTION-3 Advances Analytical Techniques, Soft Skills and Applications of Microbiology .(Practicals Based On Unit-I,II & III Of USC4 MI 3)	1 Credit (45 Lectures)

PRACTICAL EXAMINATION PATTERN

(A) External (Semester end practical examination) :- 50 Marks Per Section (Section-I based on course-1 & Section-II based on course-2)

Sr.No.	Particulars	Marks	Total
1.	Laboratory work (Section-I + Section-II+ Section III)	30 + 30+30	= 90
2.	Report / Quiz	05 + 05+05	= 15
3.	Viva	05 + 05+05	= 15
4.	Assignment/ /Case study/	05 + 05 + 05	= 15
	Journal	05 + 05+05	= 15

PRACTICAL BOOK/JOURNAL

Semester III:

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

The practical examination will be conducted in two days with 4.5 hrs of work each day.

Two examiners and one expert will be appointed from college for each batch by the principal / Head of the department.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-coordinator / Incharge of the department; failing which the student will not be allowed to appear for the practical examination.

Semester IV

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

The practical examination will be conducted in two days with 4.5 hrs of work each day.

Two examiners and one expert will be appointed for each batch by the principal / Head of the department.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-ordinator / Incharge of the department; failing which the student will not be allowed to appear for the practical examination.

	Section I /paper I		Section II/Paper			Section III/Paper						
	USc3Mi-1			II			III					
				USC3Mi-2			USc3Mi-3					
	Interna	Externa	Tota	Interna	Externa	Tota	Interna	Externa	Tota			
	1	1	1	1	1	1	1	1	1			
Theory	25	75	100	25	75	100	25	75	100			
Practical	00	50	50	00	50	50	00	50	50			
S												

Overall Examination and Marks Distribution Pattern Semester III

Semester IV

	Section I	/paper I	Section II/Paper			Section III/Paper			
	USc4Mi-1			II			III		
				USc4 Mi-2			USc4 Mi-3		
	Interna	Externa	Tota	Interna	Externa	Tota	Interna	Externa	Tota
	1	1	1	1	1	1	1	1	1
Theory	25	75	100	25	75	100	25	75	100

Practical	00	50	50	00	50	50	00	50	50
S									

C.K.Thakur ACS College, New Panvel (Autonomous)

S.Y.B.Sc. Microbiology

Sem III Theory

Paper/	Title	Lecture/	Total
Unit		Week	lectures
Paper	Estimation of Biomolecules and Introduction to Bioenergetics	03	45
Ι	and Biostatistics		
U1	a) Extraction and analysis of Biomolecules		15
	 b) Macromolecular composition of a microbial cell (Revision with Definition of atom, molecule, macromolecule, supramolecular, and biological application of each type of molecule. 		01
	 c) Methods of elemental analysis: i. Carbon: Manometer (Introduction) ii. Nitrogen: Micro Kjeldahl Method (Principle and Assembly) iii. Phosphorus: Fiske Subbarao Method (Principle and Procedure) 		03
	 d) Estimation of Proteins and amino acids i. Proteins by Biuret method ii. Protein estimation by Lowry's method iii. Amino acids by Ninhydrin method 		03
	 e) Estimation of Carbohydrates i. Total carbohydrates by Anthrone method ii. Total carbohydrates by Pheno-Sulphuric acid method iii. Reducing Sugars by DNSA method 		03
	f) Extraction of Lipids by Soxhlet method (Principle and Assembly)		01
	 g) General principles and extraction of nucleic acids i. RNA ii. DNA h) Estimation of Nucleic acids i. DNA by DPA method ii. RNA by Orcinol method 		04
U2	Introduction to Bioenergetics, Thermodynamics and Biostatistics		15
	2.1 Introduction to Bioenergetics and Thermodynamics		(10L)
	a) Biological Energy Transformations Obey the Laws of Thermodynamics		01
	b) Gibbs free energy, Enthalpy, Entropy		01

(c) The Standard Free-Energy Change Is Directly Related to the Equilibrium Constant	02
(a) Standard Free-Energy Changes Are Additive	01
6	e) Structure of ATP,	01
f) phosphoryl group transfer and ATP,	01
Ę	g) Types of energy–rich compounds,	01
ł	n) Assembly of Informational Macromolecules Requires Energy	02
Intr	oduction to Biostatistics	(05)
í	a) Definition of terms:	01
	Biostatistics, Sample and Population, Types of sampling techniques	
ł	b) Data presentation: Dot diagram, Bar diagram, Histogram, Frequency curve, pie diagram (Problems solving approach)	01
(c) Central Tendency: Definition, Notation, Formula and Problems: Mean, Median, Mode (Problems solving approach)	02
(Measures of Dispersion Definition, Notation and Formula of Variance, Standard Deviation and Standard Error (Problems solving approach) 	01
U3 Prep	paration of solutions and Biochemical Calculations	1
3.1 solutifract 3.2	Various units of expressing and inter-converting concentration of tions: molarity, moles, normality, osmolarity, molality, mole ion Bronsted Concept of conjugate acid –conjugate base pairs,	05
ioniz actic 3.3 acid	zation of solutions, pH, titration curves, buffers: preparation, on and their use in Biology Henderson-Hasselbalch equation, buffer capacity, polyproteic s, amphoteric salts, ionic strengths	05
(pro	blem solving under all heads)	05

Paper/ Unit	Title	Lecture/ Week	Total lectures
Paper II	Introduction to fermentation technology and Applied Microbiology	03	(45)
U1	Introduction to fermentation Technology		(15)
	A. Screening a. Primary screening- i. crowded plate technique ii. Auxanography iii. Enrichment culture techniques. iv. Use of indicator dye b. Secondary screening		03
	 b. Secondary screening. B. Fermentation media a. Characteristics of ideal fermentation medium. b. Types of fermentation media c. Raw material i. Carbon source ii. Nitrogenous material iii. Growth factors iv. Precursors v. Buffers vi. Antifoam d. Media sterilization and contamination e. Screening for production media 		04
	C. Preparation of inoculum		01
	D. Types of fermentation - Aerobic, anaerobic, surface submerged, solid substrate, Batch, continuous.		04
U2	 E. Fermenter design Factors involve in fermenter design Parts of fermenter Material used for fermenter Impeller, baffles, inoculum port, sparger, sampling point, pH control device, temperature control system, foam control device, bottom drainage system. Fermenter configuration Batch fermenter Continuous fermenter 		03
02			(15)
	 A. Important Microorganisms in Food Microbiology: General characteristics of the enlisted organisms to be studied wrt spoilage and transmission of infection/intoxication (no clinical features and structural details) a. Spoilage -causing microorganisms a. Yeast & Molds: Saccharomyces, Aspergillus & Penicillium 		04

	b. Bacteria: Bacillus, Clostridium, Flavobacterium, Pseudomonas		
	b. Food-borne Illness associated Microorganisms: Classification of		
	Food-borne diseases (Schematic).		
	Bacteria responsible for food -borne intoxication and infections-		
	overview/tabulation. Examples of non-bacterial food-borne		
	pathogens		
	Details of :		
	a) Staphylococcus food intoxication (organism, enterotoxin,		
	incidence, foods involved, prevention of outbreaks)		
	b) Salmonellosis (organism, source, incidence, foods involved,		
	outbreak-conditions & prevention		
-	B. General Principles of Food Preservation:		03
	a. Preservation using High temperature (including TDT, D, F, Z		
	values, 12D concept), principle of canning		
	b. Low temperature		
	c. Drying		
	d. Food preservatives (organic acids & their salts, Sugar & salt)		
	e. Ionizing radiations		
	C. Microbial flora of milk, normal and abnormal flora, their sources		02
	and changes induced them.		
	Milk borne pathogens.		
	D. Microbiological Quality of Milk & Milk Products: SPC, coliform		03
	count, LPC, thermophilic, psychrophilic counts and RPT (RRT,		
	MBRT, DMC)		
	E. Milk product-		03
	a) Butter,		
	b) Cheese (types and production of cheddar cheese and cottage		
	cheese),		
	c) Yogurt (Types and production).		
	d) Other milk products and names of organisms associated with them.		
U3	Fresh Water and Sewage Microbiology	1	(15)
	A. Fresh water environments and micro-organisms found in Springs,		2
	rivers and streams, Lakes, marshes and bogs		3
	B. Potable water: Definition, water purification ,water quality		2
	standards and pathogens transmitted through water		2
-	C. Microbiological analysis of water:		
	Indicator organisms and their detection in water- Total Coliforms,		2
	Fecal Coliforms and E. coli, Fecal Streptococci, Clostridium		L
	perfringens		
	D. Modern Waste Water treatment: Primary, Secondary and Tertiary		1
	Treatment		1
	E. The nature of wastewater and Monitoring of waste water treatment		2
	process(BOD,COD)		L
	F. Removal of Pathogens by Sewage treatment Processes.		1

	G. Oxidation Ponds and Septic tanks			1
	H. Sludge Processing			1
	I. Disposal of treated waste water and biosolids.			02
Paper/ Unit	Title	Credi ts	Lecture/ Week	Total lectures
Paper III	Introduction to Microbial Genetics and Molecular Biology	02		
U1	Nucleic acid chemistry, Electrophoresis and Sequencing		1	
	 A. Nucleic Acid Structure DNA stores genetic information DNA molecules have distinctive base composition DNA is a double helix DNA can occur in different 3D forms DNA sequences adopt unusual structures 			06
	Many RNAs have complex 3D structures B. Nucleic acid chemistry Denaturation of double helical DNA and RNA Nucleic acid from different species can form hybrids Nucleotides and nucleic acids undergo non enzymatic transformations, DNA methylation			06
	C. Separation of nucleic acids by Agarose gel electrophoresis			01
	D. DNA sequencing			02
U2	Prokaryotic DNA replication, mutation and DNA repair mechanism	~	1	
SHIFT	A. Historical perspective— conservative, dispersive, semi-			04
ED	conservative, Bidirectional and semi-discontinuous			
FROM USMB 501 UNIT 1	B. Prokaryotic DNA replication – Details of molecular mechanism Involved in Initiation, Elongation and Termination			04
SHIFT ED FROM USMB	C. Mutation-Terminology: alleles, homozygous, heterozygous, genotype, phenotype, Somatic mutation, Germline mutation, Gene mutation, Chromosome mutation, phenotypic lag, hotspots and mutator genes			01
501 UNIT 3	D. Types of mutations: Point mutation, frameshift mutation, base pair substitution, transition, transversion, missense mutation, nonsense mutation, silent mutation, neutral mutation			01
	E. DNA Repair 2.5.a. Mismatch repair, 2.5.b. Light repair			05

	2.5.c. Repair of alkylation damage			
	2.5.d. Base excision repair			
	2.5.e. Nucleotide excision repair			
	2.5.f. SOS repair			
U3	Prokaryotic transcription and translation		1	
SHIFT	Transcription, Translation			(7 L)
ED	A. RNA Synthesis			
FROM	a. RNA Metabolism:DNA dependent synthesis of RNA			
USMB	RNApolymerase,			
402	Promoters, Regulation of			
(2012-	transcription at various levels.			
13)	b. Specific sequences signal termination of RNA			
	synthesis.			
	c. RNA polymerases in Eukaryotic cells.			
	d. Protein factors required for RNA polymerase II.			
	e. Inhibition of DNA dependent RNA polymerase			
	f. RNA dependent synthesis of RNA			
	(65 ⁺ 0 ⁰ .			
	B. Protein synthesis			(8L)
	Stages of Protein synthesis:-			
	a. Activation of amino acids			
	b. Initiation			
	c. Elongation			
	d. Termination and release			
	e. Folding and post translational processing	>		
	A tree and the			
	. म. ाश. प्र. मर			

Paper 1

- 1. Methods In Microbiology, Vol.5B, Ed. Norris & Ribbon, Academic Press
- 2. Lehninger:Principles Of Biochemistry,4th Ed.,D.Nelson & M.Cox,W.H.Freeman & Co.,New York 2005.
- 3. Outlines Of Biochemistry, 5/E,Conn P.Stumpf,G.Bruening & R.Doi,John Wiley & Sons,New York 1995.
- 4. Enzymes:Biochemistry,Biotechnology & Clinical Chemistry,T.Palmer,East West Press Ltd.,New Delhi2004.
- 5. An Introduction to Practical Biochemistry, David Plummer, 3rd Edition (2003), Tata McGraw-Hill Publishing Co.Ltd.
- 6. Biochemical Methods, S.Sadasivam & A.Manickam, 2nd Edition (1996), New Age International (P) Ltd.
- 7. Laboratory Manual in Biochemistry, J. Jayraman.
- 8. Fundamental of biostatistics Khan and khanum ,ukaaz publications, Hydrabad.
- 9. Biochemical calculation: 2nd edition, Irwin H.Segel.

Paper2

- 1. Environmental Microbiology ,R. M. Maier,I.L.Pepper & C.P.Gerba (2010),Academic Press
- 2. A Textbook of Microbiology by RC Dubey and DK Maheshwari, Revised Edition(2013).
- 3. Introduction to Environmental Microbiology-By Barbara Kolawzan, Adamiak et al (2006)
- 4. Casida L. E., "Industrial Microbiology" 2009 Reprint, New Age International (P) Ltd, Publishers, New Delhi.
- 5. Stanbury P. F., Whitaker A. & Hall--S. J., 1997, "Principles of Fermentation, Technology", 2nd Edition, Aditya Books Pvt. Ltd, New Delhi.
- 6. Prescott and Dunn's 'Industrial Microbiology''.1982 4th Edition, McMillan Publishers
- 7. H. A. Modi, 2009. "Fermentation Technology" Vol 2, Pointer Publications, India
- 8. Industrial Microbiology. A.H.Patel. MacMillan. New Delhi. 1984.
- 9. Modern Food Microbiology. James Jay. 5th Ed,
- 10. Frazier and Westhoff, Food Microbiology, Tata McGraw Hill, 4th Edition
- 11. Microbiology By Prescott, Harley, Klein's 7th Edn
- 12. Outlines Of Dairy Technology, Sukumar De, Oxford University Press

Paper 3

- 1. Lehninger: Principles Of Biochemistry,4th Ed., D. Nelson & M. Cox, W.H.Freeman & Co.,(LPE).
- 2. Prescott's Microbiology, J.M. Willey, L.M. Sherwood, C.J. Woolverton, (2011) 8th edition, McGraw-Hill International edition.
- 3. Prescott, Harley and Klein's Microbiology, Willey, Sherwood, Woolverton (2008) 7th edition, McGraw-Hill International edition
- 4. Brock Biology of Microorganisms, Madigan, Martinko, Dunlap and Clark (2009) 12th edition, Pearson Education

Paper/Unit	S.N.	Title	Credits	Lecture/Week
Paper I		Estimation of Biomolecules and Introduction to Bioenergetics and Biostatistics	1	3
U1	1	Extraction of Lipids		
	2	Estimation of Proteins by Biuret method		
U2	3	Estimation of RNA		
	4	Estimation of Carbohydrates		
U3	5	Problems on thermodynamics		
	6	Use of Excel for determination of Mean, Standard Deviation, Standard error,		
Donon II		Plotting of error bar graph.	1	2
	7		1	3
UI	/	Screening of antibiotic producer		
	9	Basic design and operation features of the bioreactor (Demonstration from Vlab.co.in)		
U2	10	Selective isolation of food spoilage organisms; Proteolytic, Lipolytic, amylase producing and coliforms.		
	12 13 14	MIC of Sugar and Salt tolerance Dye reduction test: RRT, MBRT Microbial quality of Milk: SPC, LPC, Thermophilic count, Pshychrophilic		
U3	15	MPN		
	16	Routine Microbial analysis of water: SPC		
	17	Determination of BOD, COD Visit to Effluent treatment plant.		
PIII			1	3
U1	18	Extraction of Nucleic Acids		
	19	Estimation of DNA		
	20	Separation and visualization of nucleic acids by Agarose gel electrophoresis		
U2				
	21	UV mutagenesis		
	22	Assignment on Various types of DNA mutation and Repair		
U3	23	Extraction of RNA		
	24	Estimation of Proteins by Lowry's method		

Practicals based on Sem III

C.K.Thakur ACS College, New Panvel (Autonomous)

S.Y.B.Sc. Microbiology

Sem IV Theory

Paper/Unit SEM IV	Title	Lecture/ Week	Total lectures
Paper I	Introduction to Metabolism and Enzymology		
U1	Introduction to metabolism	1	
	1a Introduction to metabolism, Metabolic pathways		03
	1b EMP pathway and TCA cycle		03
	1c Experimental approaches to study metabolism		04
	1d Thermodynamics of Phosphate compounds1e Oxidation-reduction reactions1f Thermodynamics of life		05
U2	Enzyme Kinetics	1	
	 a. Introduction of Enzymes: General properties of enzymes How do enzymes accelerate reaction Rate law for a simple catalysed reaction, Michaelis- Menten equation and it's derivation Lineweaver Bruck plot Classification of enzymes 		6
	 b. Overview of Coenzyme: Coenzymes: Different types and reactions catalyzed by coenzymes (in tabular form) Nicotinic acid: structure, occurrence & biochemical function 		2
	 c. Enzyme Kinetics: Saturation kinetics Effect of temperature and pH Effect of Inhibitors- Reversible and irreversible, competitive, Non competitive and uncompetitive inhibitors Multisubstrate reactions- Ordered, Random and pingpong reactions Allosteric effects in enzyme catalysed reactions-Koshland-Nemethy and Filmer model & Monod, Wyman and Changeux model 		7
U3	Membrane Transport	1	
	 A. Composition and architecture of membrane Lipids and properties of phospholipid membranes Integral & peripheral proteins & interactions with lipids Permeability Aquaporins Mechanosensitive channels 		02

В	. Methods of studying solute transport	02
•	Use of whole cells	
•	Liposomes	
•	Proteoliposomes	
C	2. Solute transport across membrane	08
•	Passive transport and facilitated diffusion by membrane	
	proteins	
•	Co-transport across plasma membrane - (Uniport, Antiport,	
	Symport)	
•	Active transport & electrochemical gradient	
•	ATPases and transport (only Na-K ATPase)	
•	Shock sensitive system – Role of binding proteins	
•	Histidine uptake (Diagram and description)	
•	Phosphotransferase system	
•	Schematic representation of various membrane transport	
	systems in bacteria.	
D). Other exampl <mark>es of solute transp</mark> ort:	03
•	Iron transpo <mark>rt: A special problem</mark>	
•	Assembly of proteins into membranes and protein export	
•	Bacterial membrane fusion central to many biological	
	processes	
	9	

Paper/Unit	Title	Lecture/ Week	Total lectures
SEM IV Paper II	Introduction to Medical Microbiology and immunology	03	
U1	Common infectious diseases, Epidemiology and Public Health Awareness	01	(15)
	Part A: Common infectious diseases		(10)
FROM USMB 303 OPTION A	 a. Skin Infections: Study of structure and functions of skin Study of skin infections caused by <i>Pseudomonas</i>, Acne & Measles 		3
	 b. Infections of Nervous system Study of structure and functions of nervous system Study of Tetanus & Rabies 		2
	 c. Infections of Respiratory systems Study of structure and function of respiratory system Study of pharyngitis, laryngitis, Sinusitis (learn terms only), Diphtheria and common cold 		2
	d. Infections of Digestive system Study of structure and function of Digestive system		3

Study of Typhoid fever, E. coli gastroenteritis, Hepatitis A, Rotavirus and Amoebiasis Part B: Epidemiology and Public Health Awareness (5 Lectures) e. The Epidemiology of Infectious Diseases and Their Control Epidemiological terminology: Epidemiology, sporadic diseases, endemic diseases, Hyperendemic Diseases, Epidemic Diseases, Index Case, Pandemic Diseases, Outbreak f. The Spread of Infection: Reservoirs of infection - Human reservoir, Animal reservoir, non-living reservoir Transmission of Disease- Contact transmission, Vehicle Transmission and vectors g. Public Health Measures For Control Of Disease: Control directed against reservoir, Transmission of the	1
A, Rotavirus and AmoebiasisPart B: Epidemiology and Public Health Awareness (5 Lectures)e. The Epidemiology of Infectious Diseases and Their Control Epidemiological terminology: Epidemiology, sporadic diseases, endemic diseases, Hyperendemic Diseases, Epidemic Diseases, Index Case, Pandemic Disease, Outbreakf. The Spread of Infection: Reservoirs of infection - Human reservoir, Animal reservoir, non-living reservoir Transmission and vectorsg. Public Health Measures For Control Of Disease: Control directed against reservoir, Transmission of the	1
Part B: Epidemiology and Public Health Awareness (5 Lectures) e. The Epidemiology of Infectious Diseases and Their Control Epidemiological terminology: Epidemiology, sporadic diseases, endemic diseases, Hyperendemic Diseases, Epidemic Diseases, Index Case, Pandemic Disease, Outbreak f. The Spread of Infection: Reservoirs of infection - Human reservoir, Animal reservoir, non-living reservoir Transmission of Disease- Contact transmission, Vehicle Transmission and vectors g. Public Health Measures For Control Of Disease: Control directed against reservoir, Transmission of the	1
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Epidemiological terminology: Epidemiology, sporadic diseases, endemic diseases, Hyperendemic Diseases, Epidemic Diseases, Index Case, Pandemic Disease, Outbreakf. The Spread of Infection: Reservoirs of infection - Human reservoir, Animal reservoir, non-living reservoir Transmission of Disease- Contact transmission, Vehicle Transmission and vectorsg. Public Health Measures For Control Of Disease: Control directed against reservoir, Transmission of the	1
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Epidemic Diseases, Index Case, Pandemic Disease, Outbreakf. The Spread of Infection: Reservoirs of infection - Human reservoir, Animal reservoir, non-living reservoir Transmission of Disease- Contact transmission, Vehicle Transmission and vectorsg. Public Health Measures For Control Of Disease: Control directed against reservoir, Transmission of the	2
Outbreak f. The Spread of Infection: Reservoirs of infection - Human reservoir, Animal reservoir, non-living reservoir Transmission of Disease- Contact transmission, Vehicle Transmission and vectors g. Public Health Measures For Control Of Disease: Control directed against reservoir, Transmission of the	2
 f. The Spread of Infection: Reservoirs of infection - Human reservoir, Animal reservoir, non-living reservoir Transmission of Disease- Contact transmission, Vehicle Transmission and vectors g. Public Health Measures For Control Of Disease: Control directed against reservoir, Transmission of the 	2
Reservoirs of infection - Human reservoir, Animal reservoir, non-living reservoir Transmission of Disease- Contact transmission, Vehicle Transmission and vectors g. Public Health Measures For Control Of Disease: Control directed against reservoir, Transmission of the	2
reservoir, non-living reservoir Transmission of Disease- Contact transmission, Vehicle Transmission and vectors g. Public Health Measures For Control Of Disease: Control directed against reservoir, Transmission of the	2
Transmission of Disease- Contact transmission, Vehicle Transmission and vectorsg. Public Health Measures For Control Of Disease: Control directed against reservoir, Transmission of the	
Transmission and vectorsg. Public Health Measures For Control Of Disease: Control directed against reservoir, Transmission of the	
g. Public Health Measures For Control Of Disease: Control directed against reservoir, Transmission of the	
Control directed against reservoir, Transmission of the	
pathogens.	2
Immunisation, Quarantine, Surveillance and pathogen	
eradication	
Practicals	
U2 Host defence and public health (Epidemiology of infectious 1	(15)
diseases)	
SHIFTED	
FROM Innate immunity and immune system	(11)
USMB 402 Indication of immune system (innote immunity &	
UNIT 1 a. Classification of minute system (innate minuting &	2
b Physical barriers in non specific innets resistance	
revision Chemical barriers (Complement: principle &	
revision.Chemical barriers (Complement: principle & significance (no pathway) Cytokines: interferon	4
revision.Chemical barriers (Complement: principle & significance (no pathway), Cytokines: interferon, antimicrobialpeptides bacteriocins	4
 b. Physical barriers in hole specific inflate resistance revision. Chemical barriers (Complement: principle & significance (no pathway), Cytokines: interferon, antimicrobial peptides, bacteriocins c. Cells of immune sytem: Haematopoiesis lymphocyctes 	4
 b. Physical barriers in hole specific inflate resistance revision. Chemical barriers (Complement: principle & significance (no pathway), Cytokines: interferon, antimicrobial peptides, bacteriocins c. Cells of immune sytem: Haematopoiesis, lymphocyctes, monocytes & macrophages granulocytes mast cells. 	4
 b. Physical barriers in hole specific inflate resistance revision. Chemical barriers (Complement: principle & significance (no pathway), Cytokines: interferon, antimicrobialpeptides, bacteriocins c. Cells of immune sytem: Haematopoiesis, lymphocyctes, monocytes & macrophages, granulocytes, mast cells, dendritic cells & NK cells 	2
 b. Physical barriers in hole specific inflate resistance revision.Chemical barriers (Complement: principle & significance (no pathway), Cytokines: interferon, antimicrobialpeptides, bacteriocins c. Cells of immune sytem: Haematopoiesis,lymphocyctes, monocytes & macrophages, granulocytes, mast cells, dendritic cells & NK cells d.Phagocytosis & Inflammation 	4
 b. Physical barriers in hold specific inflate resistance revision. Chemical barriers (Complement: principle & significance (no pathway), Cytokines: interferon, antimicrobialpeptides, bacteriocins c. Cells of immune sytem: Haematopoiesis, lymphocyctes, monocytes & macrophages, granulocytes, mast cells, dendritic cells & NK cells d.Phagocytosis & Inflammation Epidemiology of infectious diseases 	4 2 3 (4)
 b. Physical barriers in hold specific inflate resistance revision. Chemical barriers (Complement: principle & significance (no pathway), Cytokines: interferon, antimicrobialpeptides, bacteriocins c. Cells of immune sytem: Haematopoiesis, lymphocyctes, monocytes & macrophages, granulocytes, mast cells, dendritic cells & NK cells d.Phagocytosis & Inflammation Epidemiology of infectious diseases e Tools of epidemiology, recognition of an infectious disease 	4 2 3 (4)
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 b. Physical barriers in hold specific inflate resistance revision. Chemical barriers (Complement: principle & significance (no pathway), Cytokines: interferon, antimicrobialpeptides, bacteriocins c. Cells of immune sytem: Haematopoiesis, lymphocyctes, monocytes & macrophages, granulocytes, mast cells, dendritic cells & NK cells d.Phagocytosis & Inflammation Epidemiology of infectious diseases e.Tools of epidemiology, recognition of an infectious disease in population f. Spread of infection: Reservoirs and transmissions. 	4 2 3 (4) 2
 b. Physical barriers in non specific inflate resistance revision. Chemical barriers (Complement: principle & significance (no pathway), Cytokines: interferon, antimicrobialpeptides, bacteriocins c. Cells of immune sytem: Haematopoiesis,lymphocyctes, monocytes & macrophages, granulocytes, mast cells, dendritic cells & NK cells d.Phagocytosis & Inflammation Epidemiology of infectious diseases e.Tools of epidemiology, recognition of an infectious disease in population f. Spread of infection: Reservoirs and transmissions. Nosocomial infections: Micro organism in hospital, 	4 2 3 (4) 2
 b. Fnysteal barriers in hone specific inflate resistance revision.Chemical barriers (Complement: principle & significance (no pathway), Cytokines: interferon, antimicrobialpeptides, bacteriocins c. Cells of immune sytem: Haematopoiesis,lymphocyctes, monocytes & macrophages, granulocytes, mast cells, dendritic cells & NK cells d.Phagocytosis & Inflammation Epidemiology of infectious diseases e.Tools of epidemiology, recognition of an infectious disease in population f. Spread of infection: Reservoirs and transmissions. Nosocomial infections: Micro organism in hospital, compromised host, chain of transmission, control of 	4 2 3 (4) 2 2 2
 b. Physical barriers in non specific inflate resistance revision. Chemical barriers (Complement: principle & significance (no pathway), Cytokines: interferon, antimicrobialpeptides, bacteriocins c. Cells of immune sytem: Haematopoiesis, lymphocyctes, monocytes & macrophages, granulocytes, mast cells, dendritic cells & NK cells d.Phagocytosis & Inflammation Epidemiology of infectious diseases e.Tools of epidemiology, recognition of an infectious disease in population f. Spread of infection: Reservoirs and transmissions. Nosocomial infections: Micro organism in hospital, compromised host, chain of transmission, control of nosocomial infection. 	4 2 3 (4) 2 2 2

U3	Introduction to Physiological sampling, Diagnostic 1	(15)
	techniques and Vaccines	
	A. Introduction to Physiological sampling	04
	• Types of specimens	
	Sample collection	
	Processing	
	Transportation and storage	
	B. Diagnostic techniques	08
	Microscopic and Culturing techniques	
	Biochemical Identification	
	• Molecular Biology Techniques (Western blotting,	
	ELISA, PCR)	
	• Immunological Tests (VDRL, Widal, SRID)	
	C. Vaccines	03
	Active and Passive immunity	
	Attenuated, Killed, Subunit vaccines	



Paper/ Unit	Title	Credits	Lecture/ Week	Total lectures
Paper	Advances Analytical Techniques. Soft Skills and	02	,, con	
III	Applications of Microbiology			
SEM				
IV				
U1	Introduction to Bioinformatics, Nano biotechnology, Biofilm and Biosensor		1	
	 A. Introduction to Bioinformatics Definition, aims, tasks and applications of Bioinformatics. Database, tools and their uses - Nucleic acid sequence databases- EMBL, DDBJ, GenBank, Protein sequence databases-PIR, SWISS-PROT, TrEMBL Different terminologies – Transcriptomics, Metabolomics, Pharmacogenomics, Phylogenetic tree, Annotation, Sequence alignment—(global, local), FASTA, BLAST. 			05
	Genomics, Proteomics			
	 B. Nano biotechnology Introduction of Nano biotechnology & application in drug and gene delivery Types of nanomatrials- nanoparticles, nanocapsules, nanotubes, liposomes, nanogels, Dendrimers, Gold nanoparticles.(Definition and applications) 			05
	 C. Biofilms and biosensors with applications: Biosensors: Introduction, design, working and applications of biosensors Biofilms: Introduction of biofilms, Types of biofilms, Mechanism of formation of biofilms and applications of biofilms. 			05
U2	Analytical Techniques: Chromatography, Spectroscopy		1	
	and Basic centrifugation			
	A.Chromatography			08
	• Introduction to chromatography,			
	 Types of chromatography Paper chromatography: Principle, circular, ascending and descending Paper Chromatography, Separation of amino acids by Paper Chromatography. 			

	\circ Thin layer chromatography: principle,		
	preparation of TLC plates, procedure for		
	TIC preparative TIC 2D TIC [one		
	neregraph UDTLC [1 negal Separation		
	paragraphi, HPTLC-[1 page], Separation		
	of sugars by TLC.		
	Column chromatography : Introduction &		
	principle		
	• Exclusion chromatography, gel chromatography		
	B. Spectroscopy		04
	Properties of light		01
	Beer's and I ambert's law		
	 UV visible spectroscopy 		
	• Ov-Visible specific scopy		
	\circ Construction		
	C Centrifugation		03
	Basic principles of sedimentation		05
	 Dask principles of sedimentation, types of rotors 		
	 Types of contribuce and its applications 		
	• Types of centrifuge and its applications.		
	• Care, maintainance and safety aspects of		
	centringes		
U3	Research Fundamentals, Hypothesis Writing, Study	1	
	designs, Report writing and presentation		
	A. Perception of Research		05
	Meaning of research		
	P M Cook's definition of Research		
	General characteristics of research		
	Functions of research		
	Specific characteristics of research		
	Objectives of research		
	Classification of research		
	Steps of action research		
	Characteristics of an investigator		
	Difference between action research and fundamental		
	research		
	B. Hypothesis Writing		02
	C. Scientific Writing		
	The research report		
	Need of research report		
	General format of research report		
	Mechanics of report writing		05
	Writing research abstract: Need of an Abstract		05
	Format of an abstract and Characteristics of a good		
	abstract		
		1	
	writing research papers: Format of a research paper,		
	Advantages of a research paper		
	Advantages of a research paper D. Presentation skills (Poster and Oral)		03

References:

Paper 1

- Lehninger: Principles Of Biochemistry,4th Ed., D. Nelson & M. Cox, W.H.Freeman & Co.,(LPE)
- 2. Principles of Biochemistry- G. Zubay, W.W. Parson, D.E. Vance. Wm.C.Brown Publishers.
- 3. Fundamentals of Biochemistry. D. Voet and J. Voet Publisher Wiley plus Edition 5th.
- 4. Gottschalk, G., (1985), Bacterial Metabolism, 2nd edition, Springer Verlag
- 5. White, D., (1995), The Physiology and Biochemistry of Prokaryotes, 3rd edition, Oxford, University Press.
- 6. Rose, A.H. (1976) Chemical Microbiology, 3rdednButterworth-Heinemann

Paper 2

- 1. Microbiology, An Introduction by Tortora, Funke & Case 9th and 10th edition, Pearson education.
- 2. Bailey and Scott's Diagnostic Microbiology, 11th edition Publ: Mosby
- 3. Anantnarayan & Paniker's Textbook of Mocrobiology, 8th Ed.
- 4. Mackie and McCartney Practical medical microbiology 14th edition. Publ: Churchill Livingstone
- 5. Brock biology of microorganism by Michael T Madigan. & John M Martinco. Pearson education.
- Presscot, Harley Klein. Mc Graw, Text Book of Microbiology, international edition, 7th Ed
- 7. Anantnarayan & Paniker's edtn 10th. University press
- 8. Kanai Mukherjee, Swarajit Ghosh 'Medical Laboratory Technology: Procedure manual for routine diagnostic tests, 3rd Edition.

Paper 3

- 1. Bionanotechnology Andrew and Waqar, One Central Press Ltd, UK., November, 2014.
- 2. Text book of Biotechnology by R C Dubey. 4th edition
- 3. Current Research, Technology & Education Topics in Applied Microbiology & Microbial Biotechnology. A Mendez Vilas Edition
- Periodicum Biologorum., Vol 109,, No 2, 2007. Characteristics and Significance of Microbial Biofilm Formation Biofilms Importance and Applications. Indian Journal of Biotechnology, Vol8, April 2009, pp159-169.
- 5. Research Methodology, Yogesh Kumar Singh, New age International Publisher
- 6. Instrumental Methods of chemical analysis, V.K. Ahluwalia, Ane Books Pvt.Ltd; 2015.
- Principles & techniques of Biochemistry & Mol biology 6th ed, Keith Wilson & John Walker, Cambridge University press, 2006
- 8. Laboratory manual in Biochemistry- J. Jayaraman
- 9. Research Methodology, Yogesh Kumar Singh, New age International Publisher

Practicals based on Sem IV

Paper/Unit	S.N.	Title	Credits	Lecture/Week
Paper I			1	3
U1	1	Problems on Bioenergetics		
U2	2	Extracellular Production of enzyme - Demo		
	3	Effect of [S] on enzyme activity		
	4	Determination of Km and Vmax (MM and LB plot)		
	5	Effect of pH on enzyme activity		
	6	Effect of temperature on enzyme activity		
U3	7	Extraction of lipid (Demo)		
	8	Preparation of liposomes (Demo)		
Paper II	9	Isolation of Pseudomonas, Escherichia	1	3
	10	Permanent slides of Entamoeba histolytica		
	11	Assignment on: i. Normal flora of - skin/ respiratory system/ nervous system / digestive system, ii. Immunization programmes in India (role of CDC,		
112	12	Differential staining: Blood staining		
	13	Pyocin typing		
	14	Phagocytosis (demonstration)	/	
U3	15	Acid fast staining		
	16	Metachromatic granules staining		
	17	VDRL and SRID		
	18	Isolation of pathogens on specific media XLD, SS agar, SIBA, Cetrimide agar		
	19	Biochemical tests IMViC, Sugar Fermentation, TSI, Oxidase, Catalase, Lysine decarboxylase, PPA, gelatinase		
PIII			1	3
U1	20	BLAST		
	21	Preparation of Silver Nano particles and study of its antimicrobial activity		
	22	Preparation and study of biofilm		
U2	23	Paper chromatography – amino acids separation		
	24	Thin layer chromatography –		

		carbohydrate separation	
	25	Column chromatography – separation of	
		plant pigments	
	26	Sizing of yeast	
U3	27	Writing of report on (any 1)	
		a. Isolation of spoilage causing	
		microbes	
		b. Isolation of pathogen from	
		patient's sample	
		c. Determination of efficiency of	
		waste water treatment.	
		2. Isolation of photosynthetic/ N-fixing/	
		Sulphate reducing bacteria	

Modality of Assessment

Internal assessment

a) Theory

25 Marks

Sr.No.	Evaluation type	Marks
1	One class test (multiple choice	20
	questions/objective and subjective /long	
	answers)	
2	Active participation in routine class	05
	instructional deliveries(case	
	studies/seminar/presentation)	

B) External examination-75%

Semester End Theory Assessment -75%

75 marks

Duration – These examinations shall be of two and half hours duration.

Theory question paper pattern:-

- 1. There shall be four questions. Three questions each of 20 marks and one question for 15 marks. On each unit there will be one questions & fourth one will be based on all the three units.
- 2. All question shall be compulsory with internal choice within the questions. Question number 1, 2 & 3 will be of 39 40 marks and question no. 4 will be 30 marks with internal options.
- 3. Questions may be subdivided into subquestions.
- 4. The allocation of marks depends on the weightage of the topic.

Practical Examination pattern

Semester III:

Course : USc3 Mi P	Total
Section -I	50 Marks
Section –II	50 Marks
Section -III	50 Marks

Semester IV:

Course : USc4 Mi P	Total
Section -I	50 Marks
Section –II	50 Marks
Section -III	50 Marks

SA.

Overall examination pattern

	Section I /paper I		100	Section II/Paper		11	Section III/Paper		
		1	1. 20	II			111		
	Interna	Externa	Tota	Interna	Externa	Tota	Interna	Externa	Tota
	1	1	1	1	1	1	1	1	1
Theory	25	75	100	25	75	100	25	75	100
Practical	00	50	50	00	50	50	00	50	50
S			1	1.	1	1.1			
Practical e	examinati	on -Seme	ster III	VEL	RAI	/	1		
USc3 Mi P)	- 7		1	//	-			
Section -I		8/ 3			50 Marks		17		
Section -II	[NA I	7 22	-	50 Marks		2/		
Section -II	Ι		14	IST	50 Marks	/			
Practical e	examinati	on –Seme	ster IV						
USc4 Mi P									
Section -I				4	50 Marks				
Section –II				4	50 Marks				
Section -III 50 Marks									

External examination pattern

Semester –III USc3 Mi P

Sr.no.	Section - I	Marks
1	Chemical assay (Estimation of Proteins /RNA /Carbohydrate)	20
2	Qualitative test	10
	Biostatics problem/ Problems on thermodynamics/Quiz	05
3	Assignment/Report	05

	Section- II	
1	Major techniques (Determination of TDT and TDT/MIC of Sugar	20
	and Salt tolerance/Microbial quality of Milk: SPC, LPC,	
	Thermophilic count, Psychrophilic count, coliform	
	count/MPN/Routine Microbial analysis of water: SPC.)	
2	Minor techniques (antibiotic producer/ organic acid	10
	producer/isolation of food spoilage organisms; Proteolytic,	
	Lipolytic, amylase producing and coliforms/ Dye reduction test:	
	RRT, MBRT/ Determination of BOD, COD)	
3	Assignment/Report	05
4	quiz	05



	Section- III	
1	Major techniques (Estimation of DNA / Estimation of Proteins by	20
	Lowry's method /Separation and visualization of nucleic acids by	
	Agarose gel electrophoresis)	
2	Minor techniques -(Extraction of Nucleic Acids/ / Extraction of	10
	RNA/UV mutagenesis)	
3	Assignment on Various types of DNA mutation and Repair	05
4	Quiz	05

Semester –IV USc4 Mi P

Sr.no.	Section - I	Marks
1	Major techniques (Effect of [S] on enzyme activity	30
	Determination of Km and Vmax (MM and LB plot)	
	Effect of pH on enzyme activity	
	Effect of temperature on enzyme activity)	
2	Problem/quiz	05
3	Assignment/Report	05
	Section II	
1	Major techniques (Biochemical tests IMViC, Sugar Fermentation,	20
	TSI, Oxidase, Catalase, Lysine decarboxylase, PPA, gelatinase/	
	Acid fast staining).	
2	Minor Techniques (Isolation of Pseudomonas, Escherichia coli	10
	and S. typhi / Differential staining: Blood staining/	
	Metachromatic granules staining/ Isolation of pathogens on	
	specific media XLD, SS agar, SIBA, Cetrimide agar/ Permanent	
	slides of Entamoeba histolytica/ VDRL and SRID.)	
3	Assignment on: i. Normal flora of - skin/ respiratory system/	05
	nervous system / digestive system, ii. Immunization programs in	
	India (role of CDC, WHO, ICMR, NICD, NAARI)	
4	Quiz/Report	05
	Section III	
1	Major techniques (Preparation of Silver Nano particles and study	20
	of its antimicrobial activity/ Thin layer chromatography –	
	carbohydrate separation/Column chromatography – separation of	
	plant pigments	
2	Minor techniques (Preparation and study of biofilm/ Paper	10
	chromatography – amino acids separation/ Sizing of yeast/	
	Isolation of photosynthetic/ N-fixing/ Sulphate reducing bacteria	
3	Report	05
4	Assignment/quiz	05

Class: S. Y. B. Sc. Microbiology

Syllabus Revision: 2019-20 2021

Syllabus Implementation: 2020-

Course Outcome

Semester III

Paper I:

Learners will

· Benefits in learning the estimation of biomolecules required for research purpose

 \cdot $\;$ Understand the concepts of bioenergetics, thermodynamics and basics of biostatistics

· Understand the biochemical calculations for the preparation of solutions

Paper II:

Learners will

 \cdot $\;$ Benefits in understanding the technology and microbiology involved in fermentation

· Understand the microbiology of food, milk, fresh water and sewage

Paper III:

Learners will

• Understand the nucleic acid chemistry, separation of nucleic acid using electrophoresis and its sequencing are the basic insights in molecular biology

 \cdot Understand the DNA replication in prokaryotes, mutations in genetic material and the repair mechanisms adapted by prokaryotes

• Understand the insights into the central dogma of life process namely transcription and translation

Semester IV

Paper I:

Learners will

- · Understand the concepts/basics under metabolism
- · Understand the kinetic studies of enzymes in metabolism process

 \cdot $\;$ Benefits in understanding the transport of molecules across the biological membranes

Paper II:

Learners will

 \cdot Benefits in understanding common infectious diseases, epidemiology and associated public health awareness in relation to diseases

· Understand the host defense mechanisms adapted by humans

 \cdot Understand the medical microbiology techniques like physiological sampling and the diagnosis of infectious diseases as well as the role of vaccines

Paper III:

Learners will

 \cdot $\;$ Understand the role of bioinformatics, nano biotechnology, biofilm and biosensors

 \cdot $\;$ Understand the analytical techniques used in education, industries and research institutes

· Benefits the learners in understanding the research fundamentals







Janardan Bhagat Shikshan Prasarak Sanstha's CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A⁺' Grade by NAAC 'College with Potential for Excellence' Status Awarded by UGC 'Best College Award' by University of Mumbai

Program: B.Sc.

Revised Syllabus of T.Y.B.Sc. (Applied Component

Biotechnology) Microbiology

Choice Based Credit, Grading and Semester System

w.e.f. Academic Year 2020-21

PREAMBLE OF THE SYLLABUS

With the introduction of Academic autonomy by the esteemed Changu Kana Thakur Arts, Commerce and Science College, New Panvel from the academic year 2019-2020, the existing syllabus of T.Y.B.Sc. (Applied Component Biotechnology) Microbiology is restructured according to the CBCS pattern for its implementation from 2019-2020. This syllabus is prepared to make students more skilled in the applied aspects of microbiology and biotechnology. The new and updated syllabus is based on interdisciplinary approach with vigour and depth. The contents have been drawn to accommodate the widening horizons of the microbial techniques. It reflects the changing needs of the students, pertaining to the fields of Plant biotechnology, Bioremediation, Animal Biotechnology, Industrial biotechnology, Marine Biotechnology, Bioenergy, Healthcare biotechnology and Molecular Techniques. The wellorganized curricula including basic as well as advanced concepts in the Microbiology shall inspire the students for pursuing higher studies in Microbiology and for becoming an entrepreneur and also enable students to get employed in the Microbiology subject based industries.

OBJECTIVES TO BE ACHIEVED:-

- To enrich students' knowledge and train them in the microbial sciences.
- To introduce the concepts of application and research in Microbiology.
- To inculcate sense of scientific responsibilities and social and environment awareness.
- To enhance the employability of learners.
- To help students build-up a progressive and successful care

T. Y. B. Sc. Choice Based credit system Biotechnology (Applied Component) Syllabus for B. Sc degree in Microbiology (To be implemented from the academic year 2020-2021) Semester V

Introduction to Biotechnology						
		Semester V				
Course code	Unit	Торіс	Credits	Lectures/ Week		
USc5Mi5	Ι	Basic Techniques in biotechnology	2	4		
	II	Bioremediation in Biotechnology				
	III	Animal Biotechnology				
	IV	Industrial and Marine				
		Biotechnology				
USc5Mi PAC		Practical Based on USc5Mi5	2	4		

SEMESTER VI

Applied Biotechnology						
		Semester VI	1			
Course code	Unit	Торіс	Credits	Lectures/ Week		
USc6Mi5	Ι	Role of Biotechnology in Society	2	4		
	II	Bioenergy and Biofuels				
	III	Plant Biotechnology				
	IV	Healthcare Biotechnology				
USc6 Mi PAC		Practical based on USc6Mi5	2	4		

N.B.

I. Each theory period shall be of 48 minutes duration. Theory component shall have 60 instructional periods plus 60 notional periods per semester which is equal to 96 learning hours. For theory component the value of one credit is equal to 48 learning hours.

II. Each practical period shall be of 48 minutes duration. Practical component shall have 60 instructional periods plus 15 notional periods per semester which is equal to 60 learning hours. For Practical component the value of one credit is equal to 30 learning hours.

LEARNING OBJECTIVES:

Topics included in this semester aim:

- To revise and impart to the students, knowledge of the basic techniques of biotechnology with respect to gene cloning and cloning vectors.
- To give the students an overview of bioremediation of soil, water and the different methods of using genetically engineered microbes and plants.
- To provide a basic insight into the methods of generating transgenic animals and study their applications.
- To give an insight into the role of microorganisms in industrial and marine biotechnology.

Learning outcome:

- Students will become competent by gaining knowledge of bioremediation, industrial production and animal biotechnology which will enhance their chances for employment and for further education.
- The students will acquire knowledge to carry out techniques in biotechnology and will understand the applications of transgenic animals and the methods used for obtaining transgenic animals.


	Introduction to Biotechnology		
	Course code : USc5Mi5 (2 Credits)		
	Semester V		
Unit	Tonic	Lec/	Lecture/
ome	Topic	topic	Sem
Ι	Basic Techniques in Biotechnology		15L
	Biophysical techniques	05	
	A. Principle and application of		
	1. Electrophoretic techniques: Agarose Gel Electrophoresis,		
	Polyacrylamide Gel Electrophoresis, 2-D, PFGE		
	2. Spectrophotometric Techniques (Principle, Ray diagram, Applications):	06	
	B Molecular Techniques:		
	a. DNA sequencing methods		
	b. Microarray		
	c. GISH and FISH	04	
II	Bioremediation in Biotechnology :		15L
	2.1 Introduction and Types of reaction in Bioremediation.	02	
	2.2 Biodegradation of pesticides and herbicide	03	
	2.3Bioremediation of contaminated soil and waste water.	02	
	2.4Bioremediation using genetically engineered interobes(GEM)	$\begin{vmatrix} 02\\ 02 \end{vmatrix}$	
	2.5 Transgenic plants for phytoremediation	02	
	2.7 Bioremediation market	02	
III	Animal Biotechnology :	02	151
	3.1 Transgenic Mice :	07	152
	Methodology: The retroviral Vector method,		
	The DNA microinjection method,		
	The engineering embryonic stem cell method,		
	Genetic modification with the Cre-lox P recombination system, RNA		
	interference, , Transgenesis with high capacity vectors.		
	3.2 Transgenic mice applications:	08	
	Transgenic disease models: Alzneimer disease, Using Transgenic		
	Conditional control of cell death		
IV	Industrial and Marine Biotochnology:		151
1 V	4 1 Industrial Riotechnology	7 L	102
	 Synthesis of Novel Antibiotics – Engineering polykatid antibiotics 		
	peptide antibiotics		
	 Production of SCP – Yeast, Spirulina, Mushroom 		
	• Production of Biopolymers – Biogums, Biopolysaccharides.		
	Bioplastic.		
	4.2 4.2 Marine Biotechnology:	8L	
	Bio-prospecting, Marine Microbial Habitats and Their		
	Biotechnologically relevant Microorganisms		
	• Methods for Microbial Bio-prospecting in Marine Environments.		
	Biotechnological Potential of Marine Microbes		
	Bioactive compounds from other Marine Organisms: fungi,		
	Microalgae, Seaweeds, Actinomycetes, sponges		
	Marine Bio-resources, Marine Secondary Metabolites,		
	Marine Proteins, Marine Lipids, Cosmetics from Marine		
	Sources, Marine Drugs, Marine Microbial Enzymes, Marine		
	Drugs as Pharmaceuticals.		5

References:

- Banwell, C.N. and McCash, E.M., 2012, *Fundamentals of Molecular Spectroscopy*, 4th Ed., New Delhi, Tata McGraw Hill Education Pvt. Ltd.
- Upadhyay, Upadhyay and Nath, 2012, *Biophysical Chemistry: Principles and Techniques*, Mumbai, Himalaya Publishing House
- Analytical Chemistry by Open Learning Series, 2008, New York, John Wiley and Sons.
- Braun R., Introduction to Instrumental Analysis, New York, McGarw Hill Book Company
- Skoog, Holler and Nieman, Principles of Instrumental Analysis, 5th Ed. Australia, Thomson Brock/Cole
- Elements of Biotechnology: 2009 PK Gupta, Rastogi Publications Edition 2nd ,
- Bernard R Glick and Jack J Pasternak. Molecular Biotechnology: Principles and Applications of recombinant DNA. 4th Edition.
- Primrose and others. Principles of Gene manipulations. 7th edition. 2004 Blackwell Science.
- Peter J. Russell 2006, "Genetics-A molecular approach", 3rd edition.
- R. C. Bubey. A Texy book of Biotechnology. 2006 S. Chand and Company Ltd.
- B. D. Singh. Biotechnology. Kalyani Publishers.
- Prescott and Dunn's ""Industrial Microbiology""1982 4th Edition, McMillan Publishers
- Marine biotechnology in the twenty-first century-Problems, promise, and products, National academy press •

PRACTICALS BASED ON USc5Mi PAC

- 1. Gel electrophoresis of DNA
- 2. Isolation of genomic DNA (bacterial / yeast or onion)
- 3. Enrichment and isolation of Sulphate reducing bacteria
- 4. Isolation and identification of *Bacillus thuringenesis*
- 5. Determination of COD and BOD of sewage sample /Industrial Effluent
- 6. Production of Biopesticide
- 7. Production of Microbial polysaccharide and determination of yield.
- 8. Cultivation of Edible mushroom
- 9. Isolation of marine microbial flora

SEMESTER VI LEARNING OBJECTIVES:

- > Aims at imparting knowledge on recent trends in plant and healthcare biotechnology.
- > Aims at highlighting the significance of bioenergy and biofuel
- Create awareness of the importance of Biotechnology in society

LEARNING OUTCOME:

- Students will be trained to address issues of Bioenergy and Bio fuels
- They will be skilled to respond to issues related to genetic engineering in plant biotechnology.
- The learner will be able to comprehend details of the role of biotechnology in society

	Applied Biotechnology Course code : USc6Mi5		
	Credits 02		
	Semester VI		
Unit	Торіс	Lec/ topic	Lecture /sem
Ι	Role of Biotechnology in Society	15	15L
	1.1 Benefits of Biotechnology.		
	1.2 ELSI of Biotechnology		
	1.3 Recombinant therapeutic product for human healthcare		
	1.4 Genetic modification and food consumption		
	1.5Recombinant food and religious beliefs		
	1.6 Are Genetically Modified Food is safe?		
	1.7 Release of genetically engineered organisms		
	1.8Application of Human genetic r-DNA research		
	1.9Human embryonic stem cell research	-	
	1.10 Organ cloning	1	
	1.11 Biotechnology and the developing countries	_	
	1.12 Patenting Biotechnology Invention	1	
II	Bioenergy and Biofuel	· · · ·	15L
	2.1Bioenergy	07L	
	a) Energy consumption Worldwide		
	b) Energy consumption in India		
	c) Solid biomass resources and dedicated energy crops		
	d) Greenhouse gases and Kyoto protocol		
	e) Bioenergy for Sustainable Development		
	2.2Biofuel	07L	
	a) Liquid biofuels: Bio-diesel, Bio-ethanol, Bio-oils		
	b) Gaseous Biofuels: Biogas, Bio hydrogen		
	c) Fossil fuels: The nonrenewable sources of energy		
	d) Renewable and C-Neutral bioenergy		
	e) Biomass production and its utilization for bioenergy		
	2.3 Benefits and problems	011	
	a) - in production and use of biofuels	UIL	

III	Plant Biotechnology		15L
	3.1 Genetic engineering of Plants	06L	
	a) Plant transformation with Ti plasmids of		
	A.tumefaciens,		
	b) Ti plasmid derived vector systems,		
	c) physical methods of transferring genes to plants.	09L	
	3.2Uses of genetically engineered plants:		
	a) To overcome Biotic and abiotic stress:		
	b) Insect resistance: Increasing expression of the		
	B.thuringiensis protoxin, other strategies for protecting		
	plants against insects,		
	c) preventing the development of <i>Bacillus thuringeinsis</i>		
	resistant insects,		
	d) Herbicide resistant plants		
	e) Oxidative stress,		
	f) Salt and drought stress,		
	g) Modification of plant nutritional content: Vitamin A		
IV	Healthcare Biotechnology		15L
	a) Branches within healthcare biotechnology	03	
	b) Animal and human health care	04	
	c) Genetic Counseling	04	
	d) Forensic medicine	04	

References:

- Bernard R Glick and Jack J Pasternak. Molecular Biotechnology: Principles and Applications of recombinant DNA. 4th Edition.
- Bioenergy and biofuels: Ozcan Konur, CRC Press, Edition 1st 2018
- Elements of Biotechnology, 2009 P K Gupta, Second Revised Edition , Rastogi Publications .
- Vault Career guide to Biotechnology (E-Book)
- Biotechnology 2004 U. Satyanarayana, Books and Allied (P) Ltd.

PRACTICALS BASED ON USc6Mi PAC

- 1. Test for reducing sugars.
- 2. Bioethanol production from biomass.
- 3. Isolation of Cellulase producing microorganisms and determination of Cellulase activity
- 4. Plant tissue culture Callus formation.
- 5. Immobilization of Sacchromyces cerevisiae using alginate and invertase assay
- 6. Visit to PTC and ATC Facility
- 7. Case Studies

XXXXX

Modality of Assessment

Internal assessment

a) Theory

25 Marks

75 marks

No.	Evaluation type	Marks
1	One class test (multiple choice	20
	questions/objective and subjective /long	
	answers)	
2	Active participation in routine class	05
	instructional deliveries(case	
	studies/seminar/presentation)	

B) External examination-75%

Semester End Theory Assessment -75%

Duration – These examinations shall be of two and half hours duration.

Theory question paper pattern:-

- 1. There shall be five questions of 15 marks each.
- 2. On each unit there will be one questions & fifth question will be based on all the four units.
- 3. All questions shall be compulsory with internal choice within the questions.
- 4. All questions will be of 30 marks with internal options.
- 5. Questions 1, 2, 3, and 4 will be subdivided into a) Subjective question (2 out of 4) for 10 marks and b) Objective questions (5 out of 10) for 5 Marks.
- 6. Question no. 5 will be subjective (3 out of 6) for 15 marks.
- 7. The allocation of marks depends on the weightage of the topic.

Practical Examination pattern

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

The practical examination will be conducted in one day with 6 hrs of work or in two days with 3 hrs of work each day.

One examiner and one expert will be appointed from college for each batch by the principal / Head of the department.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Cocoordinator / Incharge of the department; failing which the student will not be allowed to appear for the practical examination.

Semester V:

Course : USc5 Mi PAC	Marks Assigned
Lab work	50
Major practical (30 Marks)	
Minor Practical (20 Marks)	
Assignment on Bio-pesticide production	10
Case study on Mushroom cultivation	10
Quiz	10
Viva-voce	10
Journal	10
Total Marks	100

Semester VI:

Course : USc6 Mi PAC	Marks Assigned
Lab work	50
Major practical (30 Marks)	
Minor Practical (20 Marks)	
Visit Report	10
Case study Report	10
Quiz	10
Viva-voce	10
Journal	10
Total Marks	100







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Program: M. Sc.

Revised Syllabus of M.Sc. (Part II) Microbiology

Choice Based Credit, Grading and Semester System

w.e.f. Academic Year 2020-21

PREAMBLE OF THE SYLLABUS

With the introduction of Academic autonomy by the esteemed Changu Kana Thakur Arts, Commerce and Science College, New Panvel from the academic year 2019-2020, the existing syllabus of M.Sc. Microbiology is restructured according to the CBCS pattern for its implementation from 2019-2020. This syllabus is prepared to make students more knowledge oriented in Microbiology subject. The new and updated syllabus is based on interdisciplinary approach with vigour and depth. The contents have been drawn to accommodate the widening horizons of the Microbiology discipline. It reflects the changing needs of the students, pertaining to the fields of Bio-Chemistry, Molecular Biology, Bio-Statistics and Research methodology, Environment protection, emerging techniques and pharmaceutical microbiology. The well-organized curricula including basic as well as advanced concepts in the Microbiology shall inspire the students for pursuing higher studies in Microbiology and for becoming an entrepreneur and also enable students to get employed in the Microbiology subject based industries.

OBJECTIVES TO BE ACHIEVED:-

- मित्रम म गर To enrich students' knowledge and train them in the microbial sciences.
- To introduce the concepts of application and research in Microbiology.
- To inculcate sense of scientific responsibilities and social and environment awareness.
- To enhance the employability of learners.
- To help build-up progressive students a and successful career.

M.Sc. Microbiology Syllabus (General outline) Revised for Choice Based Credit System To be implemented from the Academic year 2020-21

	SEMESTER III	
Course Code	Title	Credits
PSC3 Mi 1 Theory	Tools and Techniques : Research Methodology	04 Credits (60 L)
Unit-I	Research Fundamentals and Terminology	15 L
Unit-II	Defining Research Problem and Data Collection	15 L
Unit-III	Sampling and Sampling Distributions	15 L
Unit-IV	Data Analysis and Report Writing	15 L
PSC3 Mi 2 Theory	Food Microbiology	04 Credits (60 L)
Unit-I	Microbes in Food	15 L
Unit-II	Uses of Microbes in Food	15 L
Unit-III	Control of Microbes in Food	15 L
Unit-IV	Microbial Detection and Food Safety	15 L
PSC3 Mi 3	Advances In Microbial Technology	04 Credits (60 L)
Unit-I	Agricultural Microbiology	15 L
Unit-II	Animal <mark>Biotechnology</mark>	15 L
Unit-III	Nano Biotechnology	15 L
Unit-IV	Medical Biotechnology	15 L
PSC3 Mi 4	Applied and Environmental Microbiology	04 Credits (60 L)
Unit-I	Microbial Diversity	15 L
Unit-II	Techniques in Microbial Ecology	15 L
Unit-III	Soil, Marine and Agricultural Microbiology	15 L
Unit-IV	Advanced Food and Water Microbiology	15 L
PSC3 Mi P	PRACTICALS	02 Credits (60 L)
SECTION-1	Literature Survey and Research Project Proposal	15 L
SECTION-2	Food Microbiology	15 L
SECTION-3	Advances in Biotechnology	15 L
SECTION-4	Applied and Environmental Microbiology	15 L ³

	SEMESTER IV	
Course Code	Title	Credits
PSC4 Mi 1 Theory	Tools and Techniques: Biomolecular Analysis	04 Credits (60 L)
Unit-I	Spectroscopic Techniques	15 L
Unit-II	Chromatographic Techniques	15 L
Unit-III	Molecular Biology Techniques	15 L
Unit-IV	Nanotechnology Techniques	15 L
PSC4 Mi 2 Theory	Pharmaceutical Microbiology	04 Credits (60 L)
Unit-I	Principles and Applications of GMP in Pharmaceuticals and Cosmetics	15 L
Unit-II	Quality Management and Regulatory Aspects	15 L
Unit-III	Analytical Aspects for Pharmaceutical and Cosmetic Products	15 L
Unit-IV	Drug Discovery	15 L
PSC4 Mi 3	Advances in Biotechnology	04 Credits (60 L)
Unit-I	Pharmaceutical Biotechnology	15 L
Unit-II	IPR and Ethics in Biotechnology	15 L
Unit-III	Marine Biotechnology	15 L
Unit-IV	Advances in Molecular Biotechnology	15 L
PSC4 Mi 4	Applied and Environmental Monitoring & Management	04 Credits (60 L)
Unit-I	Bioremediation, Biodegradation & Waste disposal	15 L
Unit-II	Biofilm Management	15 L
Unit-III	Environmental Pollution & Monitoring	15 L
Unit-IV	Environmental & Natural Resources Management and Safety Standards	15 L
PSC4 Mi P	PRACTICALS	02 Credits (60 L)
SECTION-1	Dissertation based on Research Project and Poster Presentation.	15 L
SECTION-2	Pharmaceutical Microbiology	15 L
SECTION-3	Advances in Biotechnology	15 L
SECTION-4	Applied and Environmental Monitoring & Management	15 L

M. Sc. II Microbiology Syllabus Revision Academic Year 2020-2021

Semester III

Paper/Unit	Title	Lecture/ Week	Total lectures
PSc3Mi 1	Tools and Techniques : Research Methodology	1	(60)
Unit I	Research Fundamentals and Terminology		(15)
	1.1 Meaning and Objective of research, features of a good research study, scientific method		(05L)
	1.2 Study designs and variations: basic, applied, historical, exploratory, experimental, ex-post-facto, case study, diagnostic research, crossover design, case control design, cohort study design, multifactorial design		(10L)
Unit II	Defining Research problem and data Collection		(15L)
	2.1 Hypothesis, theory and scientific law: development, structure, conditions, sources, formulation, explanation of hypothesis; structure, identification, elements, classification, functions of theory; scientific laws and principles		(05L)
	2.2 Methods and techniques of data collection: types of data, methods of primary data collection(observation/ experimentation/ questionnaire/ interviewing/ case/ pilot study , methods), methods of secondary data collection(internal/ external), schedule method		(10L)
Unit III	Sampling and sampling distributions (15L)		
	3.1 Sampling frame, importance of probability sampling, simple random sampling, systematic sampling, stratified random sampling, cluster sampling, problems due to unintended sampling, ecological and statistical population in the laboratory		05L
	3.2 Variables: nominal, ordinal, discontinuous, continuous, derived		05
	3.3 Dispersion, Correlation, regression, test of statistical significance		05
Unit IV	Data analysis and report writing		(15L)
	4.1 Experimental data collection and data processing: Processing operations, problems in processing, elements of analysis in data processing, software for data processing,		05L
	4.2 Report writing and presentation: types of research reports, guidelines for writing a report, report format, appendices, Miscellaneous information, poster and oral presentations		06L
	Analysis of Variance		04

References: PSMB301 (Semester III)

- Kothari, C.R., 1985, *Research Methodology- Methods and Techniques*, New Delhi, Wiley Eastern Limited.
- 2. Das, S.K., 1986, An Introduction to Research, Kolkata, Mukherjee and Company Pvt. Ltd.
- 3. Misra R.P., 1989, Research Methodology: A Handbook, New Delhi, Concept Publishing Company
- 4. Kumar, R., 2005, *Research Methodology-A Step-by-Step Guide for* for beginners,(2nd.ed.),Singapore, Pearson Education.
- 5. Bhattachraya, D.K., 2006, Research Methodology, (2nd.ed.), New Delhi, Excel Books.
- 6. Panneerselvam R., 2012, Research Methodology, New Delhi, PHI Learning Pvt. Ltd.
- 7. Khan, Irfan Ali, 2008, Fundamentals of Biostatistics, Ukaaz Publications
- 8. Rosner B.A., 2011, Fundamentals of Biostatistics, Cengage Learning
- 9. Katz J.M., 2009, Form Research to Manuscript: A guide to scientific writing, USA, Springer Science
- 10. Saravanavel, P. 1990. Research methodology. Allahabad, Kitab Mahal



Paper/Unit	Title	Lecture /Week	Total lectures
PSc3Mi 2	Food Microbiology	1	(60)
Unit I	Microbes in foods		(15)
	1.1 Importance of microbes in food		
	1.2 Sources of microbes in food		
	1.3 Normal microbiological quality of food		
	1.4 Factors influencing microbial growth in food		
Unit II	Uses of microbes in food		(15L)
	2.1 Microbial stress response in food		03
	2.2 Starter cultures		02
	2.3 Microbiology of fermented foods General method of		10L
	production		
	2.3.a. Cheese – Swiss and Blue cheese		
	2.3.b.Fermented meat product – Sausage		
	2.3.c.Fermented vegetable products – Pickles, soy product,		
	Sauerkraut		
	2.3.d.Bread and Idli		
Unit III	Control of microbes in food		(15L)
	3.1 Control of access		01
	3.2 Control by physical removal, heat, low temperature, reduced		10
	aw, low pH and organic acids, modified atmosphere,		
	antimicrobial preservatives, irradiation		
	WVE PALOT		
	3.3 Novel emerging techniques of food preservation		03
	3.4 Control by combination of methods (Hurdle concept)		01
Unit IV	Microbial Detection and Food Safety		(15L)
	4.1 Conventional Methods.		07
	4.1.a. Methods used, Sampling for microbial analysis		
	4.1.b.Quantitative microbial enumeration in food		
	4.1.c.Qualitative methods of microbial detection		
	4.1.d.Bacterial Toxins		
	4.1.e.Rapid methods		
	4.1.f.Biosensors		
	4.2 Controlling the Microbiological Quality of food.		08
	4.2.a. Quality and Criteria		
	4.2.b.Sampling Schemes		
	4.2.c.QC using microbiological control		
	4.2.d.Control at source		
	4.2.e. Codes of GMP		
	4.2.1. IAULY 4.2 g Laboratory Accreditation		_
			7

References: Unit I

1. Bibek Ray and Arun Bhunia (2008) Fundamental Food Microbiology 4th Ed. CRC Press.

2. Srilakshami B (2010) Food Science. 5th Ed. New Age International Publishers.

3. James Jay, M Loessner and D Golden (2005) Modern Food Microbiology 7th Ed.

4. Adams M R and Moss M O (2008) Food Microbiology 3rd Ed. RSC Publishing.

5. J Maud Kordylas (1991) Processing and Preservation of tropical and subtropical foods. ELBS Macmillan.

References: Unit II

1. Bibek Ray and Arun Bhunia (2008) Fundamental Food Microbiology 4th Ed. CRC Press.

2. Gerald Reed (2004) Prescott and Dunn's Industrial Microbiology 4th Ed. CBS Publishers.

3. J Maud Kordylas (1991) Processing and Preservation of tropical and subtropical foods. ELBS Macmillan.

References: Unit III

1. Bibek Ray and Arun Bhunia (2008) Fundamental Food Microbiology 4th Ed. CRC Press.

2. N Shakuntala Manay and Shadaksharaswamy M (1985) Foods Facts and Principles. New Age International

References: Unit IV

1. Bibek Ray and Arun Bhunia (2008) Fundamental Food Microbiology 4th Ed. CRC Press.

2. Adams M R and Moss M O (2008) Food Microbiology 3rd Ed. RSC Publishing.

3. N Shakuntala Manay and Shadaksharaswamy M (1985) Foods Facts and Principles. New Age International.

4. Harrigan W F and McCance M F (1976) Laboratory methods in food and dairy microbiology. Academic Press.

5. Aylward F (2001) Food Technology Processing and Laboratory Control. Agrobios (India)

Paper/Unit	Title	Lecture/	Total
		Week	lectures
PSc3Mi 3	Advances In Microbial Technology	1	(60)
Unit I	Agricultural Microbiology		(15)
	1.1 Plant Tissue Culture for crop improvementInitiation and		
	maintenance of Callus and Suspension culture, Direct and Indirect		
	Organogenesis, Micropropagation, Artificial seeds, Anther culture and		
	dihaploids, Protoplast isolation culture and fusion, Production of		
	haploids, Somaclonal variations, Germplasm conservation, Somatic hybrids, Cybrids.		
	1.2 Production of secondary metabolites from plant cell cultures,		
	Technology of plant cell culture for production of chemicals, Bioreactor		
	systems and models for mass cultivation of plant cells.		
	1.3 Plant Transformation Technology – Agrobacterium mediated gene		
	transfer, Agrobacterium based vectors, viral vectors, Direct gene		
	narticle hombardment		
	Molecular breeding plant selectable markers, Reporter genes, Positive		
	selection, Selectable marker elimination, Trangene silencing, Strategies		
	to avoid transgene silencing.		
	1.4 Plant Genetic Engineering for Productivity and Performance—		
	a) Biotic Stress Tolerance- Herbicide resistance, Glyphosate, Insect		
	Resistance, Bt toxin, Disease Resistance, Virus resistance		
	b) By manipulation of—Photosynthesis, Nitrogen fixation, Nutrient uptake efficiency		
	c) For Quality Improvement-Protein, Lipids, carbohydrates,		
	vitamins and minerals.		
	d) Biosafety concerns of transgenic plants		
	1.5 Plants as bioreactors		
	1.6 Soil Microbes interaction, Biofertilizer, Biopesticide		
Unit II	Animal Biotechnology		(15L)
	2.1 Animal Tissue Culture: Primary culture, Organ culture, Embryo		
	Culture, Established Cell lines		
	2.2 Scale up, Cryopreservation, Culture Collections		
	2.3 Risks and Safety, Bioethics.		
	2.4 Stem Cell Technology, Cloning techniques Applications.		
	2.5 Transgenics and knockouts: Transgenic cattle, Transgenic birds, Transgenic fish	g)

	2.6 Applications: Transgenic mice: i) Retroviral method ii) DNA	
	microinjection method iii) Engineered Embryonic Stem cell method	
Unit III	Nanobiotechnology	(15L)
	3.1 Nanoscale systems, nanoparticles, nanowires, thin films and	
	multilayers; Properties of nanomaterials	
	3.2 Synthesis of nanostuctures - physical, chemical and biological,	
	microbiological methods -	
	a. Biomolecules as nanostructures.	
	b. Nanoparticular carrier systems, Micro and Nanofluidics	
	c. Applications: Biosensors, drug and gene delivery systems, chip	
	technologies, nano imaging, Nanomedicine and Cancer diagnostics	
	and treatment.	
Unit IV	Medical Biotechnology	(15L)
	4.1 Genetic Testing of diseases and disorders, Cancer genetics,	07
	Immunogenetics; prenatal diagnosis-chorionic villus sampling,	
	amniocentesis, Pre-implantation diagnosis, Genetic counselling.	
	4.2 Gene therapy-concept, yectors, gene targeting and tissue-specific	
	expression, Antisense Technology	
	expression, Antisense Technology 4.3 Introduction to pharmacogenomics, Pharmacogenetics and	
	expression, Antisense Technology 4.3 Introduction to pharmacogenomics, Pharmacogenetics and toxicogenomics	
	expression, Antisense Technology 4.3 Introduction to pharmacogenomics, Pharmacogenetics and toxicogenomics 4.4 Social- genetic discrimination: insurance and employment, human	
	 expression, Antisense Technology 4.3 Introduction to pharmacogenomics, Pharmacogenetics and toxicogenomics 4.4 Social- genetic discrimination: insurance and employment, human cloning, foeticide, Sex determination 	
	 expression, Antisense Technology 4.3 Introduction to pharmacogenomics, Pharmacogenetics and toxicogenomics 4.4 Social- genetic discrimination: insurance and employment, human cloning, foeticide, Sex determination 4.5 Tissue Engineering, Methods of Synthesis, Biomolecular 	
	 expression, Antisense Technology 4.3 Introduction to pharmacogenomics, Pharmacogenetics and toxicogenomics 4.4 Social- genetic discrimination: insurance and employment, human cloning, foeticide, Sex determination 4.5 Tissue Engineering, Methods of Synthesis, Biomolecular Engineering 	

References: PSc3Mi 3 References: Unit I :PSMB303 (Semester III) 1. Plant Biotechnology: The genetic manipulation of plants, 2005, A.Slater, N.Scott & M.Fowler, Oxford Univ Press, Oxford. 2. Introduction to Plant Biotechnology(3rd Edtn), H.S. Chawla 3. Roberta Smith, Plant Tissue Culture: Techniques and Experiments, 2nd Edn, Academic Press, 2000 4. H.K.Das(ed), Textbook of Biotechnology, Wiley India, 2004 5. J.H.Hammond, P. Mcgarvey, and V.Yusibov(eds), Plant Biotechnolgy, Springer Verlag, Heidelberg, 2000 6. B.B.Buchanan, W.Gruissen and R.L.Jones(eds), Biochemistry and Molecular Biology of Plants, American Society of Plant Biology, Rockville, USA, 2000. 7. Plant Biotechnology and Agriculture: Prospects for the 21st Century, Arie altman, Paul Michael Hasegawa, 8. Plant Biotechnology and Genetics: Principles, Techniques & Applications, Stewart, C.Neal, June 2008, John Wiley & Sons **References: Unit II** 1. Animal Cell Culture by Ian Freshney 2. Basic Cell Culture. Ed.J.M.Davis 2nd.Ed 2007. Oxford press EL R 3. Animal Cell Culture Sudha Gangal 4. Principles of biotechnology and applications-Glick and Pasternack **References: Unit III** 1. Nanobiotechnology by David Goodsell. John Wiley 2. Handbook of Nanostructured biomaterials and their applications in nanobiotechnology by Nalwa HS 2005. American scientific publishers 3. Nanobiotechnology by Niemeyer CM & Mirkin CA 2005 .Wiley Interscience **References: Unit IV** 1. Jogdand S. N., Medical Biotechnology, Himalaya Publishing House, Mumbai, (2008) 2. Judit Pongracz, Mary Keen, Medical Biotechnology, Churchill Livingstone, Elsevier (2009) 3. Pratibha Nallari & V. Venugopal Rao, Medical Biotechnology, Oxford University Press, India (2010)

Paper/Unit	Title	Lecture /Week	Total lectures
PSc3Mi 4	Applied And Environmental Microbiology (4 Credits)	1	(60)
Unit I	Microbial Diversity		(15)
	1.1 Microbial ecology: concepts, niche, habitat, ecosystem		
	1.2 Introduction to microbial diversity: Types of microorganisms- bacteria, Archaebacteria, Eucarya interactions between microorganisms, ecological succession		
	1.3 Extremophiles: Habitat, effect of extreme conditions on cellular components membrane structure, nucleic acids and proteins, adaptation mechanism in microorganisms in diverse environments		
	1.4 Study of Thermophiles, Psychrophiles, halophiles, Piezophiles, Acidophiles, Alkaliphiles, Xerophiles, Radiation resistant organisms, Methanogens.		
	1.5 Biotechnological Applications of extreme proteins from the above groups		
	1.6 Geo-microbiology: Biofouling, bio-corrosion, bioleaching.		
Unit II	Techniques in Microbial Ecology		(15L)
	2.1 Environmental sample collection and processing.: Soils and Sediment Water Air Detection of Microorganisms on families		
	2.2 Cultural Methods: Cultural methods for isolation & enumeration of Bacteria		
	2.3 Physiological Methods: Measuring microbial activity in pure culture; Carbon respiration, Stable isotope probing, Use of radioisotopes as tracers Adenylate energy charge, Enzyme assays		
	2.4 Functional genomics & proteomics based approach		
	2.5 Immunological methods: Immunoassays		
	2.6 Nucleic acid based methods of analysis: Obtaining Nucleic acids from Environment, Use of Gene probes, PCR,		
	2.7 Recombinant DNA Techniques, RFLP, Denaturing /Temperature gradient, Plasmid analysis, Reporter genes. Rep PCR fingerprinting and microbial diversity		
	2.8 Molecular Techniques to Assess Microbial Community Structure, Function, and Dynamics in the Environment: culturable and unculturable bacterial analysis		
Unit III	Soil, Marine & Agricultural Microbiology		(15L)
	3.1 Soil Microbiology: The litho ecosphere: Soil formation, Properties (physical and chemical) Soil communities. Link to microbial interactions. Soil sampling for surface, subsurface soils .Processing and storage of samples.		
	3.2 Marine microbiology: Marine and estuarine habitats. Characterization and stratification of the oceans Vertical and horizontal zones of marine habitats Marine microbes		12

	characteristics, distribution, composition & activity.	
	3.3 Agricultural microbiology: Factors affecting microbial load of soils. Relationship between plants and microbes rhizosphere, phyllosphere. Beneficial uses of microorganisms for plant growth and development, Interactions with aerial plant structures	
	3.4 Microbial contribution to animal nutrition Special reference to Rumen flora	
	3.5 Biogeochemical cycles for Carbon Nitrogen and Oxygen. Degradation of recalcitrant polymers and xenobiotics eg cellulose, lignin, lignocellulose. Combating Greenhouse effect using microbes. Concept of Carbon credits	
Unit IV	Advanced Food & Water Microbiology	(15L)
	4.1Sampling, sample processing approaches for analysis of foods implicated in outbreaks with measurement of uncertainty for mycotoxic fungi ,pathogenic bacteria(Enteropathogenic <i>E. coli</i> , <i>Vibrio ,Salmonellae</i>) and viruses (Hepatitis A, Norwalk) in meat/fish products as per BIS/ISO/APHA standards	07
	4.2 Use of biosensors and enzymatic/ thermal techniques for food analysis	
	4.3 Food additives and ingredients: Food additives-definitions, classification and functions, (Preservatives, antioxidants, colors, emulsifiers, sequesterants, natural and microbial flavors)	
	4.4 Toxicological evaluation of food additives	
	4.5 Applications of fibres from food sources, microbial fructooligosaccharides	
	 4.6 Nutraceuticals and health foods: Introduction to nutraceuticals: definitions, basis of claims for a compound as a nutraceuticals, regulatory issues for nutraceuticals Microbes and production of nutraceuticals like lycopene, isoflavonoids, prebiotics and probiotics, glucosamine, phytosterols. Formulation of functional foods containing nutraceuticals-stability and analytical issues, labelling issues 	
	 4.7 Drinking water risk assessment & its safety: Bottled water-legislation: a) Types of bottled water. BIS Regulations regarding the production of bottled waters wrt final quality of the product. b) Potential chemical and microbiological hazards in the bottles depending on the type of water, the type of bottle and the bottling procedure. The application of HACCP in the bottling plants: Water Quality attained from point of use water purifier units c) Types of water purifiers: Microbiological specifications and methods used certify water purifiers International standards regulating quality of water purifiers 	

Unit - I Microbial Diversity

1. Brock Biology of microorganisms12th ed Madigan, Martinko, Dunlap, Clara, Pearson Intl Ed

2. R. M. Atlas and R. Bartha - 1998 - Microbial Ecology - Fundamentals and Applications.

3. AddisonWesley Longman, Inc.

4. Microbial Diversity- Current Perspective and Potential Application--Johri and Satyanarayana

5. Methods in Microbiology Vol 35- Extremophiles (2006) Edited by Fred Rainey, Aharon Oren (Academic press)

UNIT - II Techniques in Microbial Ecology

1. R. M. Atlas and R. Bartha - 1998 - Microbial Ecology - Fundamentals and applications. AddisonWesley Longman, Inc.

2. R.MMaier, I.L.Pepper and C.P.Gerba 2010, Environmental Microbiology Academic Press

3. Rastogi & Sani, Microbes and Microbial Technology, 2011, pp 29-57, Molecular Techniques to Assess Microbial Community Structure, Function, and Dynamics in the Environment 4. A K Bej and M H Mahbubani, Applications of the polymerase chain reaction in environmental .Microbiology.*Genome Res.* 1992 1: 151-159

5. The Metagenomics of soil by Rolf Daniel, 470/June2005/vol3, ww.nature.com/reviews

6. Metagenomics: DNA sequencing of environmental samples, Susannah Green Tringe and Edward M. Rubin, 806/November2005/Volume6

7. www.nature.com/reviews/genetics

Unit - III : Soil, Marine & Ag<mark>ricultural Microbiology</mark>

1. Marine Microbiology: Ecology and Applications. Colin Munn. Garland publishing. ISBN: 0815365179

2. Environmental Microbiology. Alan H. Varnam. Manson Publishing. 2000.

3. Agricultural Microbiology. G. Rangaswami, D. J. Bagyaraj, D.G. Bagyaraj. PHI Learning Pvt. Ltd., 2004

4. Microbes and Microbial Technology: Agricultural and Environmental Applications. Iqbal Ahmad, Farah Ahmad, John Pichtel. Springer, 2011.

UNIT -IV: Advanced Food & Water Microbiology

1. AOAC International. 2003. Official methods of analysis of AOAC International. 17th Ed. Gaithersburg, MD, USA, Association of Analytical Communities.

2. Kirk RS & Sawyer R. 1991. Pearson's Chemical Analysis of Foods. 9th Ed. Longman Scientific & Technical.

3. Leo ML. 2004. Handbook of Food Analysis. 2nd Ed. Vols. I-III.

4. Linden G. 1996. Analytical Techniques for Foods and Agricultural Products. VCH.

5. Macleod AJ. 1973. Instrumental Methods of Food Analysis. Elek Sci.Marcel Dekker

6. Nielsen S. (Eds.). 1994. Introduction to Chemical Analysis of Foods. Jones & Bartlett.

Practicals PSc3Mi 1

	Tools and Techniques: Research Methodology (60L)	
	Unit I : Literature survey (15L)	
PSc3Mi 1	Unit II : Literature survey (15L)	02
	Unit III : Writing Research Project Proposal (15L)	
	Unit IV : Writing Research Project Proposal (15L)	

Practicals PSc3Mi 2

	Food Microbiology (60L)	
PSc3Mi 2	 Microbiological study of fermented foods (Idli batter and sauerkraut) Microbiological load in carrot and apple juice, salad, mayonese Quality Assessment and Analysis of food Milk (Raw, Packed) Ice-cream Yoghurt Report to be written in journal on Novel detection methods for food borne pathogens/ toxins 	02

Practicals PSc3Mi 3

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	Advances in Biotechnology	
	1. Terminology, Laboratory design of Animal tissue culture laboratory	
	2. Preparation of complete medium, Sterilization and sterility checking	
	3. Chick embryo fibroblast culture, viable staining	
	4. Lymphocyte culture, viable staining and heamocytometer count	
	5. Preparation of Nanosilver By Wet reduction Method(Chemical), using	
PSc3Mi 3	Neem Extact(plants) & Bacteria(Microbiological)	02
	6. Characterisation of Nanosilver by UV spectrometry and microscopic	
	methods	
	7. Antimicrobial effect of Ionic silver and Nanosilver prepared by above	
	methods	
	8. Study of Nanosilver coated Gauze/textiles for antimicrobial effect on	
	different bacteria	

	1. Enrichment & isolation of thermophiles from hotsprings/compost heaps
	& extraction of thermophillic enzymes & determination of its specific
	activity.
	2. Estimation of anti-oxidants and anti-nutritional factors (tannin/phytic
	acid) by spectrometric method
	3. Microbiological analysis of fish samples wrt sample processing for
	recovery and detection of Enteropathogenic Ecoli, Vibrio, Salmonellae
PSc3Mi 4	as per BIS/ISO/APHA standards and computation of measure of 02
	uncertainty
	4. Assessment of point of use water purifiers (Zero B) for removal of
	bacteria
	5. Soil analysis- nitrogen, phosphorus, chloride, organic matter, & calcium
	carbonate content
	6. Enrichment and isolation of cellulose, lignin & xylanase degraders from
	mangrove soil

Practicals PSc3Mi 4



Semester IV

Paper/Unit	Title	Lecture/	Total
		Week	lectures
PSc4Mi 1	Tools and Techniques : Biomolecular Analysis	1	(60)
Unit I	Unit I Spectroscopic Techniques		(15)
	1.1 UV-visible spectroscopy: Beer- Lambert's Law, Instrumentation, operation, calibration, accuracy and applications		05
	1.2 IR: Principles, Instrumentation, operation, calibration, accuracy and applications		05
	1.3 Atomic Absorption Spectroscopy: Principles, Instrumentation, operation, calibration, accuracy and applications		05
Unit II	Chromatographic Techniques		(15L)
	2.1 Gas Chromatography: Principles, Instrumentation, operation, calibration, accuracy and applications		05
	2.2 High Performance Liquid Chromatography: Principles, Instrumentation, operation, calibration, accuracy and applications		05
	2.3 Supercritical Liquid Chromatography: Properties of SFE/SFC, Instrumentation, operation, advantages and applications		05
Unit III	Molecular Biology Techniques		(15L)
	3.1 Variations/ Modifications of PCR: Hot- Start PCR, Multiplex PCR, Nested PCR, RT-PCR, Broad Range PCR, arbitrarily primed PCR, Quantitative PCR, Real time PCR		05
	3.2 Hybridization array technology: applications of microarrays in microbiology, Microarray platform technologies (oligonucleotide microarrays, cDNA microarrays)		05
	3.3 FISH with other techniques: (confocal laser scanning microscopy, microautoradiography, flow cytometry, immunofluorescence, microsensors, peptide, nucleic acids)		05
Unit IV	Nanotechnology Techniques		(15L)
	 4.1 Microscopy: i. Scanning Probe Microscopes - scanning tunnelling microscope(STM), atomic force microscope (AFM), magnetic force microscope(MFM), scanning near field microscope(SNOM) ii. Electron Microscopy: SEM, TEM 		10
	4.2 Diffraction Techniques: X-ray diffraction (XRD)		02
	4.3 Photoluminescence Spectroscopy: X-ray and UV photoelectron spectroscopies(XPS)/Auger electron spectroscopy		0317

- 1. Persing, H.D. et al. 2004, *Molecular Microbiology: Diagnostic principles and practice*, Washington D.C., ASM press.
- 2. Chandler D.E. and Roberson R.W. 2009, *Bioimaging: current concepts in light and electron microscopy*, Singapore, Jones and Bartlett Publishers
- 3. Muralidharan V.S. and Subramania A. 2010, *Nanoscience and Technology*, New Delhi Ane Books Pvt Ltd.
- 4. Viswanathan B. 2010, NanoMaterials, New Delhi, Narosa Publishing House.
- 5. Pattabhi V. and Gantham N. 2002, *Biophysics* (2nd Ed.) Springer.
- 6. Narayana P. 2008, Essentials of Biophysics, New Age International Pvt Ltd Publishers

7. Sharon, Madhuri and Maheshwar, 2012, Bio-Nanotechnology: concepts and applications. New Delhi, Ane books Pvt Ltd.

8. Scott R. P.W. 2012, *Principles and Practice of Chromatography (Chrom-Ed Book Series)*, Reese-Scott Partnership

9. McNair H. M. and Miller J. M., 2009, Basic Gas Chromatography, Wiley International

10. Kulkarni Sulabha, 2011, *Nantotechnology: Principles and Practices*, New Delhi, Capital Publishing Company.

11. Chattopadhyay K.K. and Banerjee A.N., 2012, *Introduction to Nanoscience and Nanotechnology*, New Delhi, PHI Learning Pvt. Ltd.

12. Miller J. M., 2009, *Chromatography: Concepts and Contrasts*, USA, John Wiley and Sons, Inc.

13. Banwell, C.N. and McCash, E.M., 2012, *Fundamentals of Molecular Spectroscopy*, 4th Ed., New Delhi, Tata McGraw Hill Education Pvt. Ltd.

14. Upadhyay, Upadhyay and Nath, 2012, *Biophysical Chemistry: Principles and Techniques*, Mumbai, Himalaya Publishing House

15. Braithwaite A. and Smith F.J., 2001, *Chromatographic Methods*, 5th Ed., London, Kluwer Academic Publishers

16. Analytical Chemistry by Open Learning Series, 2008, New York, John Wiley and Sons.

17. Braun R., Introduction to Instrumental Analysis, New York, McGarw Hill Book Company

18.Skoog, Holler and Nieman, Principles of Instrumental Analysis, 5th Ed. Australia, Thomson Brock/Cole

Paper/Unit	Title	Lecture/	Total
DS-4M: 2	Dhowmoooutical Microbiology	Week	lectures
P5041011 2	Pharmaceutical Microbiology	1	(00)
Unit I	Principles and applications of GMP in pharmaceuticals and cosmetics		(15)
	1.1 Principles – Applications and Definitions		
	1.2 The concept of Quality		
	1.3 The regulatory factors		
	1.4 QC, QA and GMP		
	1.5 Quality assurance beyond GMP		
	1.6 ISO		
	1.7 Sanitary practices in cosmetic manufacturing		
Unit II	Quality management and regulatory aspects		(15L)
	2.1 Premises and contamination control, location, design, structure, layout, services and cleaning		
	2.2 Personnel management, training, Hygiene and health		
	2.3 Documentation		
	2.4 Quality control and GCLP		
	2.5 Sterile and other products		
	2.6 Global regulatory and toxicological aspects of cosmetic preservation		
Unit III	Analytical aspects for pharmaceutical and cosmetic Products		(15L)
	3.1 Quality control and GCLP		
	3.2 Sterile and other products.		
	3.3 Validation		
	 3.4 Cosmetics microbiology- testing methods and preservation 3.4.a Antimicrobial preservation efficacy and microbial content testing 3.4.b Validation method for cosmetics 3.4.c Preservation strategy 3.4.d Evaluation of antimicrobial mechanism 		
Unit IV	Drug Discovery		(15L)
	4.1 Modern Methods of Drug Discovery		
	4.2 Proteomics		
	4.3 Bioinformatics		19

4.4 High throughput screening technology	
4.5 Natural products for lead identification	
4.6 The role of protein 3D structures in the drug discovery process.	

Unit I

1. Sharp John (2000) Quality in the manufacture of medicines and other healthcare products. Pharmaceutical Press.

2. Iyer S. (2003) Guidelines on cGMP and quality of Pharmaceutical products. D K Publishers Mumbai.

3. Philip A, Taylor and Francis (2006) Cosmetic Microbiology a practical approach.2nd Ed.

Unit II

1. Denyer S p, Hodges N A and Gorman S P (2005) Hugo and Russell's Pharmaceutical Microbiology.

Blackwell Publishing.

2. Bibek Ray and Arun Bhunia (2008) Fundamental Food Microbiology. 4th Ed. CRC Press.

3. Sharp John (2000) Quality in the manufacture of medicines and other healthcare products. Pharmaceutical Press.

4. Bhatia R and Ichhapujani R L (1995) Quality Assurance in Microbiology. CBS publishers and distributors.

Unit :III

1. Sharp John (2000) Quality in the manufacture of medicines and other healthcare products. Pharmaceutical Press.

2. Philip A, Taylor and Francis (2006) Cosmetic Microbiology a practical approach.2nd Ed.

Unit IV

1. Hillisch A and Hilgenfeld R (2009) Modern Methods of drug discovery. Springer International Edition.

2. Kadam s s, Mahadik K R and Bothara K G (2009). Principles of medicinal Chemistry. Vol II Nirali Prakashan Pune.

3. Lemke T L and Williams D A (2008) Foye's Principles of Medicinal Chemistry. 6th Ed. Wolter Luwer, Lippincott Williams and Wilkins. N Delhi.

Paper/Unit	Title	Lecture/	Total
		Week	lectures
PSc4Mi 3	Advances in Biotechnology	1	(60)
Unit I	Pharmaceutical Biotechnology		(15)
	1.1 Biologics, Biopharmaceuticals		
	 1.2 Protein structure stability, folding, structure prediction, Post translation modifications, Protein Therapeutics – Upstream and Downstream processing, Cytokines, Interferon production, Interleukins production, Therpeutic hormones – Insulin, Human Growth Hormone, Recombinant blood products, Therapeutic Enzymes 1.3 Newer Vaccines, Vaccine Designing Approaches 		
	1.4 Drug Discovery Tools, Combinatorial Chemistry, High Throughput Screening, Chemiinformatics, In silico Modelling, Molecular Modeling, Structure Prediction, Rational Drug Designing, Drug Development, Concept of Pharmacognosy, Pharmacokinetics and Pharmacodynamics		
Unit II	IPR and Ethics in Biotechnology		(15L)
	 2.1 Biotechnology and Intellectual Property Rights (9 L) lectures 2.1a. Intellectual Property Rights (IPR) and Protection (IPP) 2.1 b. Biotechnology and IPR-Rationale of Patent in Research and Scientific Innovations, Biotechnological Patents 2.1c. Requirements for Patentability- Patentable subject matter, Novelty, Invention in Biotechnological Research, Industrial Applicability, Enablement Requirement. 2.1d. Patent Specifications and Basic Component of License Agreement, In IP System 2.1e. Categories of Biotechnological Patents-Patenting in New Era of Genomics, Proteomics and Microbiology, Examples of Patents granted by USPTO, Concerns over Biotechnology Patents. 2.1fPatenting in Biotechnology-European Scenario, US Scenario, Australia Scenario, Indian Scenario, Non Patentable IP and Patentable IP in Indian Patent Act 		09
	 2.2 Biotechnology and Bioethics 2.2.a) Biotechnology and Bioethics 2.2.b) Bioethics and cross-cultural bioethics Autonomy, Rights, Beneficience, Do No Harm, Justice, Confidentiality, Animal Rights, Environmental ethics, Decision-Making 2.2.c) Perceptions of Ethical Biotechnology'Moral' is not the same as Ethical, Mixed Perception of Benefit & Risk, Reasoning behind Acceptance or Rejection of Genetic Manipulation,Concerns about Consuming products of GMOs. 		06
	2.2.d) Past and Present 'Bioethical Conflicts' in Biotechnology- Interference with Nature , Fear of Unknown,		21

	Regulatory Concerns, Human Misuse		
	2.2.a) Futura 'Pioathical Conflicts' in Piotochnology		
	Changing percention of Neture Human Constin Engineering		
	2.2.6 Disothics vs Dusingset A Conflict? JDD Clobal Issues of		
	2.2.1) Bioetnics vs Business: A Conflict ?- IPP, Global Issues of		
	Technology Transfer, Safety vs Costs, Is New Technology		
	Better		
	2.2.g) Resolution of Conflicts- Who can be trusted?, Public		
	Education, Sufficient Regulations		
	2.2.h) Ethical limits of BiotechnologyAbsolute or Relative,		
	Timeless or Transient		
	2.2.i)Criteria to Assess whether Biotech Research is Ethical.		
Unit III	Marine Biotechnology		(15L)
	3.1 Extreme environmental conditions. Marine life forms.		
	Biomimetic materials new class of pharmaceuticals industrial		
	products and processes vaccines diagnostics		
	and analytical reagants. Environmental research in marine		
	and analytical leagents, Environmental research in marine		
	environment, Methods in Marine Microbiology – Detection of		
	microorganisms and microbial activity, Metabolic diversity,		
	Extreme Environment conditions, Marine bacteria, marine archaea,		
	Biofouling and biodetrioration, Degradation of pollutants,		
	Bioremediation, Role of microorganisms in ocean processes,		
	Marine Genomics and Proteomics.		
	3.2 Marine bioprospecting – Isolation of Marine Natural Products		
	3.3 Diversity of marine derived compounds - Alkaloid Terpenoids		
	and steroides nucleoside aminoacids pentides depsinentide		
	ndu steroides, indereoside, animodeids, peptides, depsipeptide,		
	polyketide, Macionde, Marine Enzymes- protease, npase, cintinase,		
	giucanase; Marine diominerais;		
	Biominerelized structures; Biocomposites; Biopolymers -		
	polysaccharides, chitin, marine collagens		
	3.4 Bioactive Compounds And Biomaterials From Marine		
	Environment.		
Unit IV	Advances in Molecular Biotechnology		(15L)
	4.1 Chemical synthesis and sequencing of DNA: Phosphoramidite		
	method, Uses of synthesized oligonucleotides, Dideoxynucleotide		
	method for sequencing of DNA, Automated DNA sequencing,		
	Using Phage M13 as a sequencing vector		
	4.2 Manipulation of Gene Expression in Procarvotes: Gene		
	expression from strong and regulatable promoters. Fusion proteins.		
	unidirectional tandem gene arrays Increasing protein stability		
	protein folding DNA integration into host		
	chromosome		
	4.3 Heterologous protein production in aukarvotic calle: Expression		
	watama lika Saaaharamyaaa aarayisiga Dishig rastaria		
	systems like Saccharomyces cerevisiae, Pichia pastoris,		
	Baculovirus-Insect cell, mammalian cell		
	4.4 Directed Mutagenesis: Oligonucleotide directed mutagenesis		
	with M13, Oligonucleotide directed mutagenesis with plasmid		22
	DNA, PCR amplified oligonucleotide directed mutagenesis,		
	Random mutagenesis with degenerate oligonucleotide primer,		

Random mutagenesis with nucleotide analogues, Error-prone PCR, DNA shuffling, Mutant proteins with unusual amino acids	
4.5 Protein Engineering: Adding disulfide bonds, Changing aspargine to other amino acids, Reducing the number of free sulfhydryl residues, Increasing enzymatic activity, Modifying metal cofactor requirement, Decreasing protease sensitivity, Modifying protein specificity, Increasing enzyme stability and specificity, altering multiple properties	
4.6 Synthetic Biology: Introduction, types, mechanisms, applications in industry	

Unit I :

1. Gary Walsh, Pharmaceutical Biotechnology – Concepts and Applications (EBook), John Wiley & Sons Ltd. (2007)

- 2. Jogdand S. N., Biopharmaceuticals, Himalaya Publishing House, Mumbai (2006)
- 3. K. Sambamurthi, Pharmaceutical Biotechnology, New Age International (2006)

4. Daan J. A. Crommelin, Robert D. Sindelar and Bernd Meibohm Pharmaceutical Biotechnology:

Fundamentals and Applications, informa healthcare, (Oct 30, 2007)

References: Unit II: 2.1:

1. Biodiversity, Biotechnology & Traditional Knowledge- Understanding Intellectual Property Rights, Aravind Kumar, Govind Das, Narosa

2. A textbook of Biotechnology, R.C.Dubey, S.Chand.

References: Unit II: 2.2:

1. Biotechnology, Second Completely Revised Edition-Volume 12-Legal, Economic and Ethical

Dimensions.Volume Editor-D.Brauer(A multi- Volume Comprehensive Treatise),H.J.Rehm and G.Reed, A.Puhler ,P Stadler

2. Ethics in Biotechnology-An Executive Guide, Chris MacDonald & Rahul.K. Dhanda

3. www.BiotechEthics.ca

References:Unit: III :

- 1. RSK Barners & R.N Huges : Introduction to Marine Ecology, Blackwell
- 2. David H.Attway & Oskar R.Zabosky: Marine Biotechnology: Volume 1, 2, 3, Plenum Press, (1993).

3. P.J.Scheuer: Marine. Natural Products, Volume 1 & 2 (1978). Volume (1980-81)

Academic Press.

- 4. O.Kinne: Marine Ecology, Vol.V.Ocean Management 3&4, John Wiley & Sons, (1984).
- 5. Rita Colwell (Ed.): Biotechnology in Marine Sciences, Academic Press, (1981).
- 6. R.R.Colwell (ed), Biotechnology of Marine Science, (1982).
- 7. R.R.Colwell et. al (eds) Biotechnology of Marine polysaccharides, (1985).

David H.Attway & Oskar R.Zabosky: Marine Biotechnology, Volume 1, 2, 3, plenum press (1993).

8. P.J.Scheuer: Marine Natural Products, Volume 1&2 (1978) Volume (1980, 81), Academic Press

References: Unit IV

1. Molecular Biotechnology: Principles and Applications of Recombinant DNA Bernard R. Glick, Jack J. Pasternak, 4/e (2010), ASM Press

2. An Introduction to Molecular Biotechnology: Molecular Fundamentals, Methods and Applications in Modern Biotechnology edited by Michael Wink, (2006)Wiley VCH

3. Molecular biotechnology: principles and practices Channarayappa, (2006), Universities Press 23

4. Synthetic Biology

Paper/	Title	Lecture/	Total
Unit		Week	lectures
PSc4Mi 4	Applied and Environmental Monitoring & Management	1	(60)
Unit I	Bioremediation, biodegradation &Waste disposal		(15)
	1.1 Engineering and bioremediation process its needs and limitations		
	1.2 Bioremediation in Soil of BTEX hydrocarbons		
	1.3 Petroleum contamination, Polycyclic aromatic compounds		
	1.4 Nitroaromatic compounds, PCB, Chlorinated Phenols, Chlorinated aliphatic compounds. Molecular technique in Bioremediation		
	1.5 Sewage & Sludge treatment and disposal methods.		
Unit II	Biofilm management		(15L)
	2.1 Structure and properties of biofilms		
	2.2 Formation of biofilm, Regulation of Initial Attachment, Biofilm Formation Proceeds via Multiple Convergent Genetic Pathways, Early Attachment Events, Maturation of the Biofilm, Detachment and Return to the Planktonic Growth Mode		
	2.3 Study of Quorum Sensing: Cell- Cell Communication amongst bacteria, and its similarity with <i>M. xanthus</i> Fruiting Body Development.		
	2.4 Multispecies biofilms: Clinical Relevance		
	2.5 Biofilms in plant-associated habitats: In the Phyllosphere (impact on survival and bacterial interactions, interaction of plants with epiphytic biofilms,), In the Rhizosphere (ubiquity and importance for rhizosphere bacteria, impact of rhizosphere biofilms on plant biology,)		
	2.6 Biofilm erradication: Methods and commonly used biocides such as surfactants, enzymes, triclosan, chlorhexidine, quarternary ammonium compounds		
	2.7 Use of other biofilm management methods such as probiotic organisms and prebiotics to restore disrupted beneficial biofilms to a "normal state". Correction of environmental conditions for enhanced bioremediation of biofilms (eg dental plaque)		
	2.8 Disadvantages of biofilm management strategies-development of resistant strains-cross resistance induction		
	2.9 Biofilms from different environments, Impact of environment on biofilm development and its composition and implications of each on biofilms in water bodies, biofouling associated microbial biofilms prosthetics associated biofilms, human associated biofilms eg. Gut		
Unit III	Pollution control and monitoring		(15L)
	3.1Introduction to Pollution, Pollution Control and Monitoring, Natural and anthropogenic pollution. Role of government and public in		£7

	pollution control	
	3.2 Air pollution: Sources - Organic and inorganic pollutants, particulate matter, photochemical smog, acid rain, ozone depletion, greenhouse effect, global warming, and role of microorganisms in cause and mitigation of global warming, climate change. Control measures of air pollution - dust control equipment, control measures for specific gaseous pollutants Effects of air pollution, assessment & monitoring. (Indoor air pollution, vehicular pollution and control, odour control)	
	3.3 Water pollution: Sources of water and their contamination, types of pollutants, Effects of water pollution on plants, animals and human beings. Indicator microorganisms. Eutrophication – causes, effects and control measures	
	3.4 Wastewater treatment – aerobic and anaerobic. CETP, Water quality criteria and standards for discharge. Assessment & monitoring of water pollution.	
	3.5 Marine pollution: Sources, effects and coastal management	
	3.6 Therman politicity. Sources, effects and control	
	3.7 Soil Pollution: Chemical composition and classification (hazardous and non-hazardous) of soil, sources of soil pollution, effects on plants, animals and human beings, biomagnification, control measures, assessment and monitoring	
	3.8 Noise pollution: Sources, impact, measurement and indices, control and abatement	
	3.9 Radioactive pollution: Sources, effects, prevention and control measures	
Unit IV	Environmental & natural resources management and safety standards	(15L)
	4.1Natural resources: Renewable/ non-renewable. Land, water, forest, minerals, energy, food. Associated problems and management practices. Environmental Impact Assessment and Sustainable Development	
	4.2 Solid waste management: Biodegradable waste from kitchen, abattoirs and agricultural fields and their recycling by aerobic composting or biomethanation. Non biodegradable waste like plastics, glass metal scrap and building materials and plastic recycling, metal recycling.	
	4.3Hazardous waste management: Hazardous waste from paint, pesticides and chemical industries and their composition, Probable means to reduce these waste through Common Effluent Treatment Plants	
	4.4 Biomedical and electronic waste management, recovery of precious metals from electronic waste resources.	
	4.5Biohazards: Introduction, levels of biohazards, Risk assessment, proper cleaning procedures	25

4.6Biosafety: Historical background and introduction, need of	
biosafety levels, biosafety guidelines for GMOs and LMOs. Role of	
Institutional biosafety committee. RCGM, GEAC, etc. for GMO	
applications in food and agriculture. Environmental release of GMOs.	
Overview of national regulations and relevant international	
agreements. Ecolabelling, IS 22000, Generally Recognized as Safe	
(GRAS)	

UNIT- I: Bioremediation, biodegradation & Waste disposal

- 1. Principles and Applications by Ronald L
- 2. Crawford and Don L Crawford
- 3. Biotechnology: B.D.Singh
- 4. A textbook of Biotechnology: R.C.Dubey
- 5. Environmental Biotechnology by Allan Scragg, 2nd Edn

UNIT- II: Biofilm management

1. Davies DG, Parsek MR, Pearson JP, Iglewski BH, Costerton JW, Greenberg EP. 1998. The

involvement of cell-to cell signals in the development of a bacterial biofilm. *Science* 280 (5361):295–98
2. O'Toole GA, Kolter R. 1998. The initiation of biofilm formation in *Pseudomonas aeruginosa* WCS365 proceeds via multiple, convergent signaling pathways: a genetic analysis. *Mol. Microbiol.* 28:449–61
3. Morris, C. E. and Monier, J. M. 2003. The ecological significance of biofilm formation by plant-associated bacteria. Annu. Rev. Phytopathol. 41:429–53

4. O'Toole, G., Kaplan, H. B. and Kolter, R., 2000. Biofilm formation as microbial development. Annu. Rev. Microbiol. 2000. 54:49–79

5. Bacterial biofilms: from the Natural environment to infectious diseases. Nature Reviews Microbiology 2, 95-108 (February 2004)

UNIT - III Pollution control and monitoring

1. Environmental microbiology. P. D. Sharma. Alpha Science International 2005 ed.

2. Wastewater engineering: Treatment and reuse. Metcalf and Eddy, Tata McGraw Hill Publishing Co. Ltd. 4th Ed.

- 3. A textbook of environmental pollution and control. S S. Dara
- 4. Environmental chemistry A. K. De
- 5. Environmental pollution control engineering. C. S. Rao. New Age International Publishers.
- 6. APHA 1998. Standard Methods for the examination of water and wastewater, 20th Ed.
- 7. Biotechnology of Odour and Air pollution Control. Springer

8. Water and Wastewater analysis Volume 1. Handbook of methods in environmental studies. S. K. Maiti. ABD Publishers 2004

9. Soil analysis Volume 2. Handbook of methods in environmental studies. S. K. Maiti. ABD Publishers 2004

10. Environmental chemistry B. K. Sharma

UNIT - IV Environmental & natural resources management and safety standards

1. Resource ecology. S. K. Agarwal

- 2. Environmental management. H. V. Jadhav, Vipul Prakashan, 2002
- 3. Environmental management. R.K. Jain and others
- 4. Modern trends in ecology and environment. R. S. Ambasht
- 5. Industrial hygiene and safety. M. H. Fulekar

Practicals PSc4Mi 1

	Tools and Techniques: Biomolecular Analysis	
	Unit I: Research project experimental work	
PSc4Mi 1	Unit II: Research project experimental work	02
	Unit III: Research project experimental work	02
	Unit IV: Research project experimental work	

Practicals PSc4Mi 2

	Pharmaceutical Microbiology	
	1. Sterility testing and reporting (as per Pharmacopeia)	
PSc4Mi 2	2. Microbial load in cosmetic product	
	3. Efficacy testing of preservatives like parabens	02
	4. Efficacy of preservation and shelf life study.	
	5. Preparation of cosmetic product and its preservation study	
	6. Report on LAL and other tests for QC	

Practicals PSc4Mi 3

	Advances in Biotechnology	
PSc4Mi 3	 Assignments on IPR-Case studies on different patents granted Report on International Bioethics survey on specific concerned issues Research Project experimental work 	02

Practicals PSc4Mi 4

	Applied and Environmental Monitoring & Management	
	1. Biofilm visualization by staining of a slide immersed in different	
	environments such as soil, water, saliva (to emphasize compositional	
	and structural variations in biofilms from different environment).s	
	2. Determination of MIC of disinfectant/antimicrobials with sessile and	
	planktonic bacteria (to show higher resistance of biofilms to	
	antimicrobials as compared to planktonic cells) quantified using crystal violet assay	
	3. Analysis of sludge: sewage and industrial for the following parameters:	
	Sludge volume index (SVI), Mixed liquor suspended solids (MLSS),	
	Mixed liquor volatile suspended solids (MLVSS), F/M ratio.	
	4. Demonstration of Analysis of SOx, NOx, heavy metal (As/Cr)	
PSc4Mi 4	pollutants using volumetric/ spectrophotometric methods.	02
	5. Study tour/ academic visit to any large scale industry (environmental	
	health and safety aspects) Food/ Pharma/chemical, environmental	
	consultancy, research centres	
	OR	
	Study tour/ academic visit to Sewage treatment plant/ ETP of any	
	industry /water purification unit/ Pollution Control Board Lab, CETP,	
	landfill, etc.	
	6. Preparation/ drafting of an EIA report.	
	7. Case studies: sustainable agricultural practices, coastal zone 2 management,	7
	8. MEOR, management of monuments, air pollution episodes, oil spills.	

Modality of Assessment

I] Theory Examination pattern

A. Internal examination 40%

Sr. No.	Internal Examination pattern	Marks
1.	Internal Class Test	20
2.	 One seminar based on curriculum to be assessed by the teacher of the institution teaching P. G. learners. Selection of the topic, Introduction, write up, references & Presentation with the use of ICT. 	15
3.	 Active participation in routine class instructional deliveries. Overall conduct as a responsible learner 	05

B. External examination - 60 %

Semester End Theory Assessment -

60 marks

- i. Duration These examinations shall be of two and half hours duration.
- ii. Theory question paper pattern :-
 - There shall be **five** questions each of **12** marks. On each unit there will be one question & fifth one will be based on all the four units.
 - 2. All questions shall be compulsory with internal choice within the questions. Each question will be of **24** marks with options.
 - Questions may be sub divided into sub questions a, b, c & d only, each carrying six marks OR a, b, c, d, e & f only each carrying four marks and the allocation of marks depends on the weightage of the topic.

II] Practical Examination Pattern

(A) Internal Examination:- There will not be any internal examination/ evaluation for practicals.

(B) External (Semester end practical examination) Per course :-

Sr. No.	Particulars	Marks
1	Laboratory work	40
2	Journal	05
3	Viva	05

28

Semester III:

Practical examination will be held at the college at the end of the semester. One external examiner and one internal examiner will be appointed by the Principal/ Chairman, Board of studies in Microbiology of the college. The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination. In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head of the Department/ Co-coordinator of the department; failing which the student will not be allowed to appear for the practical examination.

Research proposal: Candidates are required to present two copies of duly certified research proposal (Spiral bound) as per the format of University Grants Commission with relevant references (minimum 25) and make the power point presentation of the same for the evaluation by the examiner.

Assignments: Candidates are required to present duly certified assignments (Spiral bound) as per the format provided by the institution and make the oral presentation of the same for the evaluation by the examiner.

Semester IV:

Practical examination will be held at the college at the end of the semester. One external examiner and one internal examiner will be appointed by the Principal/ Chairman, Board of studies in Microbiology of the college. The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination. In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head of the Department/ Co-coordinator of the department; failing which the student will not be allowed to appear for the practical examination

Research project work: Candidates are required to present duly certified dissertation report based on the topic of research along with the laboratory notebook containing raw data and make the poster presentation of the research work for evaluation by the examiner.

Assignments: Candidates are required to present duly certified assignments (Spiral bound) as per the format provided by the institution and make the oral presentation of the same for the evaluation by the examiner.

Semester III

Course	PSc3	Mi 1	Total	PSc3	Mi 2	Total	PSc3	Mi 3	Total	PSc3Mi 4		Total	Grand total
	Internal	External		Internal	External		Internal	External		Internal	External		
Theory	40	60	100	40	60	100	40	60	100	40	60	100	400
Practical		50	50		50	50		50	50		50	50	200
S. SANO													

Course	PSc4	Mi 1	Total	PSc4	Mi 2	Total	PSc4	Mi 3	Total	PSc4Mi 4		Total	Grand total
	Internal	External	5	Internal	External	VEL.	Internal	External	$\sum_{i=1}^{n}$	Internal	External		
Theory	40	60	100	40	60	100	40	60	100	40	60	100	400
Practical		50	50		50	50		50	50		50	50	200
Department	:Microbiology	Class	: <u>M. Sc. II</u>										
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Course Name & No.	: Research Methodology	Course Code	: PSC3 Mi 1										

Course Objective

- To introduce students with the basic concepts of research designs
- To introduce students with hypothesis, theory and scientific laws
- To make the learner aware about methods of data collection.
- To enrich learners' knowledge about data analysis and report writing

Course Outcome

Learners will be able to

- Define a research problem
- write research hypothesis
- design method of data collection
- wright scientific report

Department	:	Microbiology	Class	: <u>M. Sc. II</u>
Course Name & No.	:	Food Microbiology	Course Code	: PSC3 Mi 2

Course Objective

- To provide general principles of food microbiology
- To learn importance of microorganisms in food microbiology
- To learn the techniques used to control the microorganisms in food.
- Use of different techniques for analysis of microorganisms and food safety programmes

Course Outcome

Learners will be able to understand

- Interactions between microorganisms and food environment, factors influencing on their growth and survival.
- Significance and activities of microorganisms in food.
- The beneficial role of microorganisms in fermented food and food processing.
- Imoprtance of microbiological quality control programmes in food production.
- The rationale for the use of standard and procedures for the microbiological analysis of food.
- Identify the different methods used to detect microorganisms and /or their products in food.

Department	:	Microbiology	Class	: <u>M. Sc. II</u>
Course Name & No.	:	Advances in Biotechnology	Course Code	: PSC3 Mi 3
Course Objective				

- To inculcate the skills of animal and agricultural biotechnology for enhancing employability in concerned fields
- To impart the knowledge of emerging trends in nanobiotechnology
- To emphasise the applications of biotechnology in medical field

Course Outcome

Learners will be able to understand

- The gene transfer techniques involved in recombinant DNA technology and its application in plant and animal sciences
- The use of various polymers in synthesizing nanomaterials and its applications in various fields
- The modern techniques in medical fields such as gene therapy, tissue engineering, pharmacogenomics etc
- And apply the skills for advancement in biotechnology in plant, animal and medical fields

Department	: <u>Microbiology</u>	Class	: <u>M. Sc. II</u>
Course Name & No.	: Applied &Environment Microbiology	Course Code	: PSC3 Mi 4

Course Objective

- To provide the learners with concept of the microbial diversity in extreme conditions
- To make the learners understand beneficial role of organisms in food, nutritive status of food and skills related to diagnosis of food borne pathogens.
- To acquaint the learners with knowledge of microbial ecology and techniques for identification and detection of microorganisms.
- To make the learners understand microbial diversity of soil and water.

Course Outcome

- The learners will gain knowledge of microbial diversity in extreme environment
- The learners will gain knowledge of significance and importance of organisms in food, food pathogens and develop skills to detect microbial food pathogens.
- The learners will understand the diversity of microbial ecology and the techniques used for detection of microorganism.
- The learners will understand the diversity of microorganisms in soil and water

Course Name & No.: Tools and Techniques : Biomolecular Analysis Course Code: PSC4 Mi 1

Course Objective

- To enrich learner with the theory of spectrophotometric technique •
- To enrich learner with the theory of chromatographic technique •
- To enrich learner with the theory of molecular biology techniques
- To enrich learner with the theory nanotechnology Techniques

Course Outcome

The learners will gain indepth knowledge about theory of

- spectrophotometric technique
- chromatographic technique
- molecular biology techniques •
- nanotechnology Techniques •

Learners will be able to apply this knowledge during application of these techniques for solveing diverse problems.

Department : Microbiology Course Name & No.: Pharmaceutical Microbiology

Class : M. Sc. II Course Code: PSC4 Mi 2

Course Objective

- Learners will be introduced with principles and application of GMP in industry ٠
- Learners will be introduced with quality management and regulatory aspects
- Learners will be introduced with analytical aspects of industrial products •
- Learners will be introduced with various methods of drug discovery

Course Outcome

The learners will

- gain indepth knowledge about GMP, quality management and regulatory aspects.
- understand analytical aspects of industrial products •
- gain knowledge about various methods used for drug discovery. •
- be able to use this knowledg to enhance his employability. •

: M. Sc. II

Class

Department : <u>Microbiology</u>

Course Name: Advances in Biotechnology

Course Code: PSC4 Mi 3

Course Objective

- To understand the aspects of pharmaceutical biotechnology
- To make the learners aware about the intellectual property rights and bioethics
- To explore the insights of marine environment and its applications
- To enhance the knowledge of molecular biology techniques

Course Outcome

After completion of this course the learner will understand

- Biopharmaceuticals with respect to structure large scale production and its application
- The details of intellectual property rights, its need and forms as well as bioethical issues
- Extreme environmental condition in ocean and microbial diversity as well as marine bioprospecting
- Methods of synthesis, manipulation and expression of genes
- Protein engineering and synthetic biology



Department: MicrobiologyClass : M. Sc. IICourse Name: Applied & Environment Monitoring & ManagementCourse Code: PSC4 Mi 4

Course Objective

- To provide the learners with process and mechanism of bioremediation, biodegradation and waste disposal.
- To acquaint the learners with the concept of biofilms formation and mechanism to control biofilm.
- To provide the learners with mechanism of pollution control and monitoring
- To make the learners understand the concept of biosafety of GMOs, biomedical, e waste, solid management.

Course Outcome

- The learners will be able to understand the process of bioremediation, biodegradation and waste management which a need of today's society.
- The learners will acquire the knowledge of biofilm formation and its control.
- The leaners will understand the cause of pollution and develop skills to detect various pollutants.
- The learners will understand the concept of biosafety and solid waste management.





Janardan Bhagat Shikshan Prasarak Sanstha's



CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC 'College with Potential for Excellence' Status Awarded by UGC 'Best College Award' by University of Mumbai

Affiliated to University of Mumbai with an autonomous Status

Revised Syllabus of

Program: M.Sc. Biotechnology

M.Sc. Part-II (Semester III & IV) Choice Based Credit & Grading System (60:40)

(To be implemented from Academic Year 2020-2021)

Preamble:

Master of Science (M.Sc.) Programme in Biotechnology is a P.G. Programme of Department of Biotechnology, Changu Kana Thakur Arts, Commerce & Science College, New Panvel, affiliated to University of Mumbai with an Autonomous status. Biotechnology is technology based on biology. Biotechnology harnesses cellular and bio-molecular processes to develop technologies and products that help to improve our lives and the health. Modern biotechnology provides breakthrough products and technologies to combat debilitating and rare diseases, reduce our environmental footprint, feed the hungry, cleaner energy, and have safer, cleaner, and more efficient industrial manufacturing processes.

The Choice Based Credit and Grading System (CBCGS) to be implemented through this curriculum would allow students to develop a strong footing in the fundamentals and specialize in the disciplines of his/her liking and abilities. The proposed credit-based curriculum and grading system will even add much more to the existing interdisciplinary nature of biotechnology.

Under the 'autonomy' we have made an attempt to design Master's in Biotechnology course syllabus to cater to the needs of credit based- semester and grading system. The changing scenario of higher education in India and abroad is taken into consideration to make this syllabus more oriented towards current need of modern research and industrial sectors.

The present M.Sc. Biotechnology Second Year (Semester III and IV) syllabus is based on the remodeled M.Sc. Biotechnology Curriculum, May 2017, Department of Biotechnology, Ministry of Science and Technology, Government of India and revised syllabus of University of Mumbai. Syllabus is robust and well-designed to enable students to pursue high quality research or increase employability of the students. Online course component has been introduced in the curriculum in keeping with the digital initiatives of MHRD to provide good quality self-learning content through MOOCs under SWAYAM and allied platforms. It is hoped that the revised syllabus shall serve its objective of promoting outcome-based learning to meet the changing needs of the biotechnology sector.

M.Sc. Biotechnology Course Structure

Course code PSBT	Title	Theory /Practical	Marks	Credits	Nos of Lectures / week
PBT3AVM	Applied Virology and Microbiology	Theory	100	4	4
PBT3EBT	Environmental Biotechnology	Theory	100	4	4
PBT3BRA	Biologics and Regulatory Affairs	Theory	100	4	4
PBT3MET	Molecular Enzymology and Enzyme Technology	Theory	100	4	4
PBT3PR1	Practical- I (Paper-I &IV)	Practical	100	4	8
PBT3PR2	Practical –II (Paper-II &III)	Practical	100	4	8
		TOTAL	600	24	32

Semester III

Semester IV

Course code PSBT	Title	Theory /Practical	Marks	Credits	Nos of Lectures
					/ week
PBT4NBT	Nanobiotechnology	Theory	100	4	4
PBT40SB	OMICS & Systems Biology	Theory	100	4	4
PBT4DDC	Drug Discovery & Clinical Study	Theory	100	4	4
PBT4SWF	Scientific Writing & Food Biotechnology	Theory	100	4	4
PBT4PR1	Practical- I (Paper-I &II)	Practical	100	4	8
PBT4PR2	Practical –II (Paper-III &IV)	Practical	100	4	8
		TOTAL	600	24	32

Teaching pattern: One (01) Credit would be of thirty-forty (30-40) learning hours; of this, more than fifty per cent of the time will be spent on classroom instructions including practical as prescribed by the University. Rest of the time would be invested for assignments, projects, journal writing, case studies, library work, industrial visits, attending seminars/workshops, preparations for examinations etc. would be considered as notional hours. The present syllabus considers (60L as classroom teaching and 15 lectures as Notional hours/ paper). Each lecture duration would be for 60 min. The names of the reference books provided in the syllabus are for guidance purpose only. Students and faculty are encouraged to explore additional reference books, online lectures, videos, science journals for latest/ additional information.

Eligibility: As per University of Mumbai Rules

Scheme of Examinations: (a) Internal assessment of 40 marks per course per semester should be conducted. (b) External assessment of 60 marks per course per semester at the end of every semester (c) Practical examination of 200 marks should be conducted at the end of every semester.

40	Marks
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Sr. No.	Particular		Marks
01	One periodical class test / online examination to be		
01	conducted in the given semes	ter	20 Marks
	One case study (clinical case/	rial study report for paper III)	
	/review / project with presentation based on curriculum to		15 Marks
02	be assessed by the teacher concerned		
	Presentation	10 Marks	
	Written Document	05 Marks	
	Active participation in routine class instructional deliveries		
03	and overall conduct as a responsible learner, mannerism		05 Marks
	and articulation and exhibit of leadership qualities in		
	organizing related academic a	ictivities	

A) Internal Assessment: 40 %

Semester -IV	
a. FOR PAPER 4: The internal assessment will comprise of the following: Online course: The student is expected to complete at least one online course relevant for the subject from any of the appropriate reputed online platforms. A proof of successful completion of the online course must be provided for the award of marks. /TEST	20 Marks
b. Research Proposal: The student is expected to submit a research proposal relevant to the subject	20 Marks

Question Paper Pattern (Periodical Class Test for the Courses at Under Graduate Programs)

Duration: 40 Minutes

Maximum Marks: 20 Questions to be set: 02 All Questions are Compulsory

Question No.	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice	10 Marks
	Questions/ Answer in One or Two Lines (Concept	
	based Questions) (1 Marks / 2 Marks each)	
Q-2	Answer in Brief (Attempt any Two of the Three)	10 Marks
	(5 Marks each)	

B) Semester End Examination: 60 % 60 Marks Duration: $2\frac{1}{2}$ hours Question Paper Pattern

Theory question paper pattern		
1. There shall be five questions each of 12 marks.		
2. All questions shall be compulsory with internal options.		
3. Question may be subdivided into sub-questions a, b, c and the allocation of		
marks depends on the weightage of the unit.		

Passing Standard:

The learners shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of grade D in each project wherever applicable to pass a particular

SL. No.	Questions	MARKS	
1.	Practical Question 1	25	
2.	Practical Question 2	15	
3.	Journal	05	
4.	Viva Voce	05	
OR			
1.	Practical Question	40	
2.	Journal	05	
3.	Viva Voce	05	
Semester IV- Project Dissertation100			
• For semester IV it is mandatory for students to undergo Hands-on Project			
training in an established research laboratory or college laboratory for 4-6			

Practical Examination Evaluation scheme (50 marks per paper)

- months; This should involve one or more relevant instrumentation technique.
 Thesis on the same to be evaluated by the guide alternatively by an internal examiner for 50M based on the student's performance, written matter and experimentation.
- A certificate must be appended with the thesis. The external examiner will assess for 50M as a Presentation during practical exams. Marks allotted by Internal examiner would be scaled down if required as per university guidelines

The practical examinations at a center would be evaluated by one external examiner assigned by the University and one internal examiner assigned by the college/department.

Semester-III

M.Sc. Biotechnology Semester –III Paper-I Applied Virology & Microbiology (PBT3AVM)

	 Students will be exposed to pandemic diseases, significance of epidemiology in studying various diseases and societal & economic issues related to such diseases. Students will also learn details about emerging viral, bacterial, parasitic pathogens. Students will learn advanced, automated methods for determining antimicrobial susceptibility, drug resistance and various aspects of biofilms 		
Course Outcomes:	 Students will understand epidemiological principles in prevention, control and management of pandemic disease. They will acquire understanding of antimicrobial resistance for management of drug resistance in population. Students will understand the different aspects of biofilm and their management. They will also get insights into latest development of diagnostics & therapeutics for such diseases. 		
Units	Topics	Credit	Lectures
Unit-I	• Introduction to Pandemic diseases and	4	15
Pandemic Diseases,	causative agent like H1N1, MERS, SARS, Swine		
Pathogenesis,	flu, COVID-19, Nipah virus, Ebola virus.		
Diagnosis and	• Structure of these virus-coat and envelope		
Treatment	protein, genome composition.		

Unit- II	Concept of Host, Reservoir, Source of infection,	15
Epidemiology of	Carrier, Epidemic, Endemic, Pandemic,	
Infectious Diseases	Outbreak	
	• History, Definition scope, importance of	
	epidemiology	
	• Epidemiology, Health & Public Health	
	• Epidemiological principles in prevention &	
	control of disease	
	• Measures of disease frequency – Concept of	
	incidence, prevalence, Incidence rate,	
	cumulative incidence, case fatality	
	• Epidemiological studies Organizations in	
	disease control & Research – WHO, CDC,	
	UNICEF, NACO, ICMR, NARI, NIV & NGOs	
	Emerging Pathogens / Infections: Diseases	15
Unit- III	caused by Bacteria / parasites/ viruses- Name	
Medical	of causative agent, Name of disease caused,	
Microbiology	History, Antigenic structure, virulence factors,	
	source of infection, Transmission, Pathogenesis,	
	Clinical manifestations, Laboratory diagnosis,	
	Treatment, Prophylaxis, vaccines, Current	
	research and developments	
	• Bacteria as emerging pathogens / Diseases	
	caused by bacteria: MOTT, Legionella,	
	Conditions caused by <i>Helicobacter pylori</i>	
	• Viruses as emerging pathogens / Diseases	
	caused by viruses: HIV (AIDS), Chikungunya,	
	Dengue,	
	• Parasites as emerging pathogens / Diseases	
	caused by parasites: Malaria, Entamoeba	
	histolytica (Amoebic dysentery)	
Unit- IV	• Structure of Biofilm – Extracellular polymeric	15
Biofilms	substances, Biofilm architecture.	
&	Stages in formation of Biofilm.	
Antimicrobial	• Microbial interactions in Biofilms (Quorum	
Activity	sensing) Need for formation of Biofilms by	
	microorganisms.	
	Microorganisms commonly associated with	
	biofilms on indwelling medical devices	

Response of biofilms to host defense	
mechanisms & antimicrobial agents	
• Recent advances in biofilm management.	
• Conventional methods of drug susceptibility	
testing (Kirby-Bauer disc diffusion, Stoke's	
method, E test)	
Advanced methods- Macro & Micro broth	
dilution methods, Time kill curves, serum	
killing curves and checker-board assays.	
• Detection of drug resistance in Staphylococci,	
Streptococci, Enterococci. Automated methods	
of sensitivity testing. Concept of CLSI standards.	

1.	Microbiology An introduction 10th edition Gerald Tortora. Burdell Funke.
	Christine Case, Pearson Education Inc. Publication 2010.
2.	Basic Epidemiology R. Bonita, Bealglehole, T. Kiellstrom, 2nd Edition, 2006,
	WHO.
3.	Principles of Epidemiology in Public Health Practice, Third edition, US
	Department of Health & Human Services, CDC, 2012.
4.	Martin Rusnák, Viera Rusnáková, Georges Kamtoh,: Relations Between
	Epidemiology and Public Health, 2018
	https://www.researchgate.net/publication/323964710
5.	Evaluation and use of Epidemiological evidence for environmental health risk
	assessment guideline document World Health Organization 2000
	eur/00/5020369
6.	Ananthanarayan and Paniker's Textbook of Microbiology, by Reba Kanungo,
	10thedUniversities Press; Tenth edition, 2017
7.	Koneman's Colour Atlas & Textbook of Diagnostic microbiology, 7th edition,
	2017, Lippincott, Williams & Wilkins.
8.	Mackie & McCartney Medical Microbiology, J. G. Collee, J. P.Duguid, A. G. Fraser,
	B. P. Marmion, Thirteenth edition, Churchill Liviingston
9.	Bailey and Scotts Diagnostic Microbiology Forbes, Sahem et al 12th ed, Moshby

M.Sc. Biotechnology

Semester –III

Paper-II - Environmental Biotechnology (PBT3EBT)

Course Objectives	 This course aims to introduce learners to environmental biotechnology, various typ monitoring, latest mitigation strategies and r same. Health hazards of pollution and w management, biodiversity concepts and data environmental monitoring. 	latest co es of j nanageme vaste, so manage	oncepts in pollutions, ent of the lid waste ment and
Course Outcomes	• At the end of the course, students will be able to concepts of environmental biotechnology, latest area and use of microbiological, molecular and a environmental biotechnology.	understa developn nalytical r	nd various nent in the nethods in
Units	Topics	Credit	Lectures
Unit -I Air pollution and Management	 Air pollution & air Quality Monitoring, Sampling, and Source Apportionment. Air Pollution Management in Urban Settlement & Rural Areas, Integrated Air Pollution Management, Green Belt. Bio scrubber. Catalytic Systems. Green Technology. Ozone Layer Depletion Atmospheric Brown Cloud Impact on Flora and Fauna Impact on Crop Yield, concept of carbon credit, footprint. 	4	15
Unit -II Soil pollution And Solid waste Management	 Causes of soil salinity; Chemical and metallic pollution of agricultural soil; Mining and soil pollution. Bioleaching of metals, bioaugmentation & biomagnification for soil remediation. Phytostabilization - Contaminant removal, Soil cover, Rhizosphere modification, Geotextile capping solid waste; Industrial solid waste; Domestic solid waste; Agricultural solid waste; Municipal solid waste; Major sources of solid wastes; Effects of solid waste generation on quality of air, water and public health; 		15

 Solid waste management, Disposal of organic and medical waste: Recovery and recycling of 		
metallic waste; Disposal of plastic waste and		
hazardous wastes.		
Biofilms in treatment of waste water; Biofilm development and biofilm Kinetics; Aerobic		15
Biofilms.		
 Marine pollution-major pollutants (heavy metal, pesticide, oil, thermal, radioactive, plastics, litter and microbial, microplastics); Biological indicators (Marine microbes, algae and crustaceans) and accumulators: Biotechnological application of hazardous waste management of water; Use of microbial systems, Phytoremediation strategies in constructed wetlands, Designing constructed wetlands, Substrate, Hydraulic loading rate, Hydraulic retention time, The selection of plant species, Surface area of wetland, Mechanisms to remove pollutants from constructed wetlands 		
 Introducing biodiversity informatics, Global patterns of distribution of biodiversity, biomes, Composition and distribution of biodiversity in India, Taxonomic Database Working Group (TDWG) standards, compatibility and interoperatability, taxonomically intelligent systems, Global biodiversity information system-Overview of the UNEP/GEF biodiversity data management project (BDM) Biosensors in Environmental Monitoring – Working & its application for monitoring environment pollutants, Application of protein biomarkers; Biosensors and biochips. IOT for water quality monitoring – General working, Application, water Parameters. 		15
	 Solid waste management, Disposal of organic and medical waste; Recovery and recycling of metallic waste; Disposal of plastic waste and hazardous wastes. Biofilms in treatment of waste water; Biofilm development and biofilm Kinetics; Aerobic Biofilms. Marine pollution-major pollutants (heavy metal, pesticide, oil, thermal, radioactive, plastics, litter and microbial, microplastics); Biological indicators (Marine microbes, algae and crustaceans) and accumulators: Biotechnological application of hazardous waste management of water; Use of microbial systems, Phytoremediation strategies in constructed wetlands, Designing constructed wetlands, Substrate, Hydraulic loading rate, Hydraulic retention time, The selection of plant species, Surface area of wetland, Mechanisms to remove pollutants from constructed wetlands Introducing biodiversity informatics, Global patterns of distribution of biodiversity, biomes, Composition and distribution of biodiversity in India, Taxonomic Database Working Group (TDWG) standards, compatibility and interoperatability, taxonomically intelligent systems, Global biodiversity information system-Overview of the UNEP/GEF biodiversity data management project (BDM) Biosensors in Environmental Monitoring – Working & its application of protein biomarkers; Biosensors and biochips. IOT for water quality monitoring – General working, Application, water Parameters. 	 Solid waste management, Disposal of organic and medical waste; Recovery and recycling of metallic waste; Disposal of plastic waste and hazardous wastes. Biofilms in treatment of waste water; Biofilm development and biofilm Kinetics; Aerobic Biofilms. Marine pollution-major pollutants (heavy metal, pesticide, oil, thermal, radioactive, plastics, litter and microbial, microplastics); Biological indicators (Marine microbes, algae and crustaceans) and accumulators: Biotechnological application of hazardous waste management of water; Use of microbial systems, Phytoremediation strategies in constructed wetlands, Designing constructed wetlands, Substrate, Hydraulic loading rate, Hydraulic retention time, The selection of plant species, Surface area of wetland, Mechanisms to remove pollutants from constructed wetlands Introducing biodiversity informatics, Global patterns of distribution of biodiversity in India, Taxonomic Database Working Group (TDWG) standards, compatibility and interoperatability, taxonomically intelligent systems, Global biodiversity information system-Overview of the UNEP/GEF biodiversity data management project (BDM) Biosensors in Environmental Monitoring – Working & its application for monitoring environment pollutants, Application of protein biomarkers; Biosensors and biochips. IOT for water quality monitoring – General working, Application, water Parameters.

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3.	Singh, R. L. (Ed.). (2017). Principles and applications of environmental
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4.	Enger, E. D., Smith, B. F., & Bockarie, A. T. (2000). <i>Environmental science: A study</i>
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5.	Rittmann, B. E., & McCarty, P. L. (2012). <i>Environmental biotechnology: principles</i>
	and applications. Tata McGraw-Hill Education.
6.	Wainwright, M. (2012). An introduction to environmental biotechnology.
	Springer Science & Business Media.
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	Phytostabilization: a green approach to contaminant containment. In <i>Advances</i>
	in agronomy (Vol. 112, pp. 145-204). Academic Press.
8.	Pradhan, A. K., & Pradhan, N. (2015). Microbial biosurfactant for hydrocarbons
	and Revised Syllabus for M.Sc. (Biotechnology) Semester III and IV Page 14 of
	35 heavy metals bioremediation. In <i>Environmental Microbial Biotechnology</i> (pp.
	91-104). Springer.
9.	Rittmann, B. E., & McCarty, P. L. (2012). <i>Environmental biotechnology: principles</i>
	and applications. Tata McGraw-Hill Education.
10.	Foin, T. C. (1976). <i>Ecological systems and the environment</i> . Houghton Mifflin.
11.	Wise, D. L. (1988). Biotreatment systems: Volume II, Springer.
12.	Sheng, Y., Qu, Y., Ding, C., Sun, Q., & Mortimer, R. J. (2013). A combined
	application of different engineering and biological techniques to remediate a
	heavily polluted river. <i>Ecological engineering</i> , 57, 1-7.
13.	Maier, R. M., Pepper, I. L., & Gerba, C. P. (2009). <i>Environmental microbiology</i>
	(Vol. 397). Academic press.
14.	Olguni, E.J. et al. (2000) Environmental Biotechnology and Cleaner Bioprocess,
	Taylor & Francis.
15.	Gareth M. Evams et al., (2003) Environmental Biotechnology: Therory &
	Applications, Wiley.
16.	Milton fingerman et al. (1999) Recent Advances in Marine Biotechnology
	Volume 3, AbeBooks Inc
17.	Upadhyay, L. S., & Verma, N. (2015). Role of Biosensors in Environmental

18.	Geetha, S., & Gouthami, S. (2016). Internet of things enabled real time water
	quality monitoring system. Smart
19.	Gibas, C., Jambeck, P., & Fenton, J. M. (2001). Developing bioinformatics computer
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20.	Attwood, T.K. & Parry-Smith D.J. (2003). Introduction to Bioinformatics.
	Pearson Education.
21.	Rastogi, S. C., Rastogi, S. C., Mendriratta, N., & Rastogi, P. (2006). Bioinformatics:
	Concepts, Skills & Applications. CBS Publishers & Distributors Pvt. Limited.
22.	Sensen, C. W. (2005). Handbook of genome research: genomics, proteomics,
	metabolomics, bioinformatics, ethics and legal issues; Vol. 1 und 2. Wiley-VCH
	Verlag GmbH & Co. KGaA.

M.Sc. Biotechnology Semester –III Paper-III- Biologics and Regulatory Affairs (PBT3BRA)

Course Objectives:	 To introduce learner to the basic concept of Biolo its therapeutic uses To expose learner to the methodologies/steps invo Biologics/Biosimilars. To educate learner with the nuances of characterizemphasis on Reference Biologic. To familiarize learner with the regulatory as Biologic/Biosimilar. 	gics and Bios olved in the p zation of Bios pects of app	imilars, and roduction of imilars with proval of a
Course Outcomes	 At the end of the course, the learner will be: Familiar with the basic concepts and significance of addition to having knowledge about its the Knowledgeable in the steps involved in Biologics/Biosimilars Aware of the protocols/techniques required for Biosimilars relative to the Reference Biologic Acquainted with the regulatory aspects of approval 	of Biologics/H herapeutic the pro- characteriza l of a Biosimi	Biosimilar in applications duction of ation of the lars.
Unit	Topics	Credits	Lectures
Unit- I Introduction to Biologics and Biosimilars	 Definition: Drugs, Small molecules, Large molecules/Biologics; Categories of Biologics: protein-based hormones, enzymes, monoclonal antibodies, vaccines, blood products, and gene/cellular therapies. Similarities and Differences: Small molecules versus generics, Biologics versus Biosimilars. USFDA Approved Small Molecules and USFDA Approved Generics USFDA Approved Biologics and USFDA Approved Biosimilars. Indian Regulatory Scenario in relation to Small Molecules and Biologics. Therapeutic uses of some of the Biologics/Biosimilars Acceptable quality differences between approved Biosimilar and innovator's product. 	4	15

Unit- II Production of Biologics and Biosimilar s Unit- III Characteriza tion of Biologics and Biosimilars	 Reference Biologic and its significance, Choice of expression system/s and stability of cell lines Development of upstream and downstream processes and scale up to manufacturing. Major factors contributing to the maintenance of product quality: raw materials and manufacturing conditions, virus filtration, mycoplasma removal, ultrafiltration. Example: Production of Monoclonal antibody, downstream processing of Mab Introduction to the concept of Biobetters vs Biosimilars. Appearance, particulates, pH, osmolality, particle size Molecular Weight, Protein Sequence and/or amino acid composition Glycosylation, Sialylation, Phosphorylation, Acetylation, and Myristoylation, if any Sulfhydryl groups(s) and di-sulphide bridges. Size and Purity on HPLC/ MALDI Isoform pattern, Gel electrophoresis (IEF, SDS PAGE and Native PAGE), Western blot Fluorescence spectrum FTIR spectrum and NMR spectrum Bioassays, characterization using Monoclonal Antibody as an example. 	15
Unit- IV Quality Assurance & Regulatory Affairs of Biologics and Biosimilars	 Introduction to Regulatory Affairs and approvals of Biosimilars, Products approved under the FD&C. PHS/BCPI Act 2009: Innovator Biologics Approval, Biosimilar Pathway, Totality of Evidence, Information required to demonstrate biosimilarity, Inter changeability, Product Switching, Product Naming Global regulatory framework. 	15

1.	Biosimilars: Regulatory, Clinical and Biopharmaceutical Development, Editors:
	Hiten J. Gutka, Harry Yang, Shefali Kakar, AAPS Advances in the Pharmaceutical,
	Sciences Series, Volume 34.
2.	https://www.fda.gov/drugs/drug-approvals-and-databases/approved-drug- products-therapeutic-equivalence- evaluations-orange-book.
3.	https://www.fda.gov/drugs/therapeutic-biologics-applications-bla/purple- book-lists-licensed-biological- products-reference-product-exclusivity-and- biosimilarity.
4.	http://nib.gov.in/ NIB-DBT2016.pdf.
5.	Biosimilars of Monoclonal Antibodies, A Practical Guide to Manufacturing, Preclinical, and Clinical Development. <i>Edited by Cheng Liu, Ph.D.,K. John Morrow,</i> <i>Jr., Ph.D.,</i> Copyright c 2017 by John Wiley & Sons, Inc. All rights reserved. Published by John Wiley & Sons, Inc., Hoboken, New Jersey.
6.	Introduction to Biologic and Biosimilar Product Development and Analysis, Karen M. Nagel, AAPS Introductions in the Pharmaceutical Sciences, Editor-in- Chief: Robin M. Zavod, Midwestern University, Downers Grove, IL, USA
7.	International Journal of Drug Regulatory Affairs; 2017, 5(1), 20-24.
8.	Introduction to Biosimilars and Regulatory Requirements. Fact Sheet 3. International Federation of Pharmaceutical Manufacturers & Association (Geneva) & International Alliance of Patients Organization (UK).

M.Sc. Biotechnology Semester –III

Paper-IV-Molecular Enzymology and Enzyme Technology (PBT3MET)

Course	 To get familiarity with the basic concepts of enzymes 	like enzy	yme kinetics,
Objectives	catalytic power of enzymes, active site and transition	n sate, re	gulatory and
	allosteric enzymes, on protein enzymes.		
	• Techniques of enzyme purification and its importance. Need for enzyme		
	engineering and its benefits and applications.		
	Role of enzymes as a diagnostic tool and for industri	al applica	ations. Use of
	enzymes as Biosensors.		
Course	 Enzyme deficiencies and use of enzymes as therapeu 	tics. At t	he end of the
Outcomes	course the student will be aware of the enzyme l	kinetics,	the catalytic
	power of an enzyme, changes in the active site, and t	the impo	rtance of the
	transition state. The importance of obtaining enzym	es in the	ir pure form
	and the ways it can be achieved. The need for and	methods	for enzyme
	engineering to enhance its activity or half-life.		
	• The significance of enzymes as diagnostic tools, i	n therap	y, industrial
	application and as biosensors; and the outcome of er	izyme de	ficiencies.
Unit	Topics	Credits	Lectures
IInit-I	Brief history and introduction: chemical nature and	4	15
Basic	nronerties of enzymes:	-	15
concents of	• how enzymes work-mechanism of action:		
Enzymology	catalytic nower and specificity of enzymes: types of		
Linzymology	catalysis: active site: transition state and evidence		
	for enzyme transition state complementarity:		
	enzyme kinetics – factors affecting enzyme		
	activity : enzyme inhibition: enzyme specificity:		
	• Regulatory enzymes . regulation of enzyme		
	activity; allosteric enzymes and their kinetic		
	properties; units of enzymes; non protein enzymes.		
Unit-II	Purification and Characterization:		15
Techniques	• Based on molecular size (Dialysis/ ultrafiltration,		
of Enzyme			
5	density gradient centrifugation, size exclusion		
Purification	density gradient centrifugation, size exclusion chromatography);		
Purification and Studies	density gradient centrifugation, size exclusion chromatography);based on solubility of proteins (Isoelectric		
Purification and Studies /Enzyme	 density gradient centrifugation, size exclusion chromatography); based on solubility of proteins (Isoelectric precipitation, salting out); Based on electric charge 		

	 (Ion exchange chromatography, Electrophoresis- capillary electrophoresis, 2D electrophoresis); Based on adsorption properties (Adsorption and Affinity chromatography). Other techniques: Immobilized metal ion affinity chromatography, Hydrophobic interaction chromatography, Reversed-phase chromate- graphy and Chromato-focusing. Enzyme engineering – Introduction, Objectives, Principles, Examples and Steps involved in enzymes engineering. Random mutagenesis and molecular breeding of DNA. Recent advances in rational approaches for Enzyme engineering. Applications of 	
	enzyme engineering.	
Unit-III Industrial & Medical Application Of Enzymes	 Textile Industry, Detergent Industry, Pulp and Paper Industry, Animal Feed Industry: Enzyme Technology for Detoxification of Mycotoxins in Animal Feed, Phytases for Feed Applications and Leather Industry. Enzyme Applications for Human and Animal Nutrition. Biosensors – Introduction, instrumentation, Types and examples. Enzymes based sensors as diagnostic tools- Biosensors for Blood Glucose, Biosensors for Urea in Blood and Urine, Biosensors for Uric Acid, Biosensors for Arginine, Biosensors for Asparagine, Biosensors for Creatinine, Biosensors for Cholesterol, Allosteric enzyme-based biosensors. 	15
Unit-IV	• Disorders of amino acid metabolism-	15
Enzyme	Phenylketonuria, Alkaptonuria, Homocystinuria.	
Deficiencies/	• Disorders of carbohydrate metabolism –	
Diagnostic	Galactosemia, Hereditary fructose intolerance,	
Enzymes/	hereditary lactose intolerance.	
Inerapeutics	• Disorder of lipid metabolism - Gaucher disease,	
	 Enzymes in diagnosis of diseases- Liver disorders. 	
	Cancer, Cardiac disorders.	
	Role of Other enzymes- Lysozyme, Butyryl choline	
	esterase and Lipases.	

Therapeutic uses of enzymes - enzymes in
replacement therapy enzymes in cancer treatment,
enzymes for fibrinolysis, enzymes used for various
treatments and enzyme gene therapy.
 Iso-enzymes; enzyme pattern in diseases.

1.	Lehninger Principles of Biochemistry (4th Ed. Nelson, D., and Cox, M.; W.H. Freeman
	and Company, New York, 2005
2.	Satyanarayan and Chakrapani, Biochemistry. New Delhi, Elsevier Health Sciences
	APAC, 2013.
3.	Berg JM, Tymoczko JL, Stryer L (2002): Biochemistry, 5th ed., Freeman WH and Co.,
	New York.
4.	https://shodhganga.inflibnet.ac.in/bitstream/10603/100595/7/07_chapter%201.pdf
	General Introduction to enzymes
5.	https://iopscience.iop.org/ book/978-0-7503-1302-5/chapter/bk978-0-7503-1302-
	5ch1 Introduction to enzymes and their applications.
6.	Biochemistry by Lehninger, 2nd Ed, Kalyani publication 2008.
7.	Understanding enzymes (3rd edition). Edited by Trevor Palmer, Ellis Horwood,
	Chichester, 1991.
8.	Protein purification principles, High Resolution Methods, and Applications, 3rd
	Edition, Jan-Christer Janson, John Wiley & Sons, Inc., Hoboken, New Jersey.
9.	https://www.biotecharticles.com/ Applications-Article/Methods-of-Purification-of
	Enzymes-583.html
10.	https://www.creative-enzymes.com/service/enzyme-purification 307.html Enzyme
	Purification
11.	http://web.sungshin.ac.kr/~spark/class/enzchem/EnzChem_ch02pdf_Chapter_2
	purification of enzymes
12.	https://www.labome.com/method/Protein-Purification.html
13.	http://www1.lsbu.ac.uk/water/enztech/index.html Chapter 6 Enzyme preparation
	and use Revised Syllabus for M.Sc. (Biotechnology) Semester III and IV Page 21 of 35
14.	https://docplayer.net/20937505- Protein-purification-nison-sattayasai-khon-kaen-
	universitythailand-1-introduction-2-extraction-of-protein.html
15.	http://www.processdevelopmentforum.com/ppts/posters/
	Protein_purification_methods _overview,_29155460.pdf
16.	https://www.researchgate.net/publication/281102215_How_to_purify_proteins.
17.	Fundamentals of Enzyme Engineering, Young Je Yoo, Yan Feng, Yong-Hwan Kim,
	Camila Flor J. Yagonia, : Springer Netherlands 2017

M.Sc. Biotechnology Semester –III PRACTICAL- I (PBT3PR1)

4 Credits

Paper-I

1.	Viral Titering – Plaque Assay, Tissue Culture Infectious Dose (TCID), Chicken				
	Embryo Infectious Dose (CEID)				
2.	Immunoassays: For detection of the virus antigens by ELISA / RIA				
3.	Detection techniques for COVID like RT- PCR and various RAPID tests				
4.	Diagnosis of dengue (kit method).				
5.	Diagnosis of Chikungunya (kit method)				
6.	Antibiotics susceptibility testing by broth Macro dilution method & Micro broth				
	dilution method				
7.	Study of microbial biofilm formation on various surfaces & Biofilm visualization				
	by staining				
8.	Demonstration of minimum biofilm inhibition concentration of				
	antibiotics/disinfectants				

Paper-II

1.	Soil and water quality assessment (temp, pH, salinity, water holding capacity of
	soil etc.
2.	Study of metal tolerance of microorganisms isolated from soil/water.
3.	Soil ecosystem analysis/ analysis of microorganisms of soil.
4.	Analysis of compost.
5.	Detection of heavy metals concentration in soil/ water.
6.	Study and comparison of different air samplers.
7.	Growth curve of metal tolerant organism isolated from soil/ water.

M.Sc. Biotechnology Semester –III PRACTICAL- I (PBT3PR2)

4 Credits

Paper-III

1.	Electrophoresis {PAGE (native, SDS, reducing, non-reducing)} to characterize the		
	protein with regard to its molecular weight, structure/subunits/SS bonds etc., or		
	for detection of impurities in the product.		
2.	Concentration of protein with Folin Lowry		
3.	Western blot/dot blot for purity of product demonstration/ dummy sandwich		
	preparation of semi-dry or wet western blot sandwich.		
4.	HPLC /FTIR/NMR spectrum based theory questions may be asked for		
	interpretation		
5.	Visit to a facility manufacturing Biosimilar		

Paper-IV

1.	Microbial Enzyme production: a. Partial purification using ammonium sulphate precipitation. b. Dialysis of the salt-precipitated protein. c. Assessing the enzyme activity and the protein content.
2.	Effect of inhibitors/ chemicals on enzyme activity.
3.	Extraction of enzymes from any plant sources.
4.	Measurement of Enzymatic Activity by Using a Colorimetric Assay.
5.	Purification of Acid Phosphatase from Wheat Germ.
6.	Enzyme Immunoassays. a. Methods for Enzyme Immunoassays. b. Non- competitive Solid-phase Enzyme Immunoassay. c. Competitive, Solid-phase Enzyme Immunoassay.
7.	Determining of Alkaline Phosphatase (ALP) Concentration in Blood Plasma.
8.	Measuring Lactase Enzymatic Activity.
9.	Screening of new microbial strains for production of enzymes and perform its
	activity staining (zymogram).
10.	To determine Specific activity of α Amylase from different sources.

Semester-IV

M.Sc. Biotechnology Semester –IV Nanobiotechnology (PBT4NBT)

Course Objectives Course Outcomes	 The course aims at providing a general and broad introduction to multi- disciplinary field of nanotechnology. It will familiarize students with the synthesis and applications of nanomaterials in the field of medicine. The course will also give an insight into complete systems where nanotechnology can be used to improve our everyday life. Students should be able to understand the basic science behind the properties of nanomaterials and the principles behind advanced experimental techniques for studying nanomaterials. Also understand the different aspects and applications of nanomaterials. 		
Unit	Торіс	Credits	Lectures
Unit -I Introduction to Nanotechnology and Nanomaterials Unit -II Synthesis of Nanomaterials	 Introduction: Nanotechnology, Nature's biological pathway, Examples of nanomaterials and nanostructures found in nature. Nanometer-scale materials: Nanometer-Scale Metals Nano Metal Oxides, Nanopolymers, Quantum Dots, Carbon nanostructures. Nanorobotiocs devices of nature ATP synthase, the kinesin, myosin, dynein, flagella modulated motion. Synthesis of nanometer-scale materials- Top down and Bottom up approaches. Self-Assembly of nanoparticles and its mechanism. Bio-directed synthesis and assembly of nanomaterials Synthesis and Assembly of Nanoparticles and Nanostructures Using Bio-Derived Templates 	4	15
Unit -III Nanotechnology in Drug Delivery	 Biological Barriers to Nanocarrier- Mediated Delivery of Therapeutic and Imaging Agents, Nano-Sized Carriers for Drug Delivery, nano enabled drug delivery system, nanorobotics in medicine, Nanomedicine: biopharmaceutics, implantable materials, implantable chemicals, surgical aids. 		

Unit –IV	Applications of Nanomaterials.	
Applications of	Nanotoxicology: Unique Properties, Toxicity of	
nanotechnology	Nanomaterials, Factors Responsible for the	
and	Nanomaterial Toxicity, Routes of Exposure,	
Nanataviaology	Mechanisms of Nanoparticle Toxicity,	
Nanotoxicology	• In Vitro Testing Methods for Nanomaterials,	
	Ecotoxicity Analyses of Nanomaterials	

1.	Poinern, Gerrard Eddy Jai. A laboratory course in nanoscience and			
	nanotechnology. CRC Press, 2014.			
2.	Guozhong, Cao. Nanostructures and nanomaterials: synthesis, properties and			
	applications. World scientific, 2004.			
3.	Sulabha K. Kulkarni (auth.) - Nanotechnology_ Principles and Practices-			
	Springer International Publishing (2015)			
4.	Crookes-Goodson, W. J., Slocik, J. M., & Naik, R. R. (2008). Bio-directed			
	synthesis and assembly of nanomaterials. Chemical Society Reviews, 37(11),			
	2403-2412			
5.	Chad A. Mirkin, Christof M. Niemeyer - Nanobiotechnology II_ More Concepts			
	and Applications-Wiley-VCH (2007)			
6.	Christof M. Niemeyer, Chad A. Mirkin (Editors) - Nanobiotechnology_ Concepts,			
	Applications and Perspectives-Wiley-VCH (2004)			
7.	Chad A. Mirkin, Christof M. Niemeyer - Nanobiotechnology II_ More Concepts			
	and Applications-Wiley-VCH (2007)			
8.	Oded Shoseyov, Ilan Levy NanoBioTechnology_ BioInspired Devices and			
-	Materials of the Future (2008, Humana Press)			
9.	Textbook of Nanoscience and Nanotechnology by B.S. Murty, P. Shankar, Baldev			
	Raj, B B Rath, James Murday			
10.	Arun Kumar - Nanomedicine in drug delivery-CRC Press _ Taylor & Francis			
	(2013).			
11.	Yuliang Zhao, Zhiyong Zhang, and Weiyue Feng - Toxicology of Nanomaterials-			
	Wiley- VCH (2016)			
12.	Diwan, Parag, and Ashish Bharadwaj, eds. The Nanoscope: Encyclopedia of			
	Nanoscience and Nanotechnology. Pentagon Press, 2005. (Vol 1-6)			

M.Sc. Biotechnology Semester –IV OMICS & Systems Biology (PBT4OSB)

Course objective:	• Bring awareness of the emerging fields of OMICS and Systems				
	Biology, biological systems as a whole and how parts of a systems				
	interact with each other To introduce the techniques involved in				
	Genomics, Proteomics, transcriptomics, Lipidomics and				
	Metabolomics.				
	 To describe the key features of human genome project 				
	• To understand the applications of the different OMICS				
	technology to screening testing and treatment of human				
	diseases.				
	• Perturbation of biological systems to study various responses in				
	the biological systems using high throughput techniques.				
	• Introduction to the modeling systems, databases, computational				
	tools used in systems biology Data mining: The unit aims at				
	introducing the concent of knowledge discovery process data				
	mining methods and various scientific application of data mining				
	The upit class and various scientific application of data mining.				
	field of health save				
Course outcome:	At the end of the course learners will be able to				
	Understand how the data is generated by OMICS technologies to				
	contribute to different databases.				
	Onderstand, compare and contrast the techniques involved in Conomics Protoomics transcriptomics intomics and				
	Metabolomics				
	 Will be able to apply the different technologies of OMICS to the 				
	screening, testing and treatment of human diseases.				
	Understand the structure and dynamics of a systems as a whole.				
	Apply the different approaches to study systems biology by top				
	down and bottom up approach.				
	• Introduction to concepts of knowledge discovery process and				
	data mining methods. Understand the application of data mining				
	in genomics, proteomics and development of tools in				
	bioinformatics. Have the knowledge of applications of systems				
	biology in development of personalized medicine, drug				
	development.				

Unit	Topic	Credit	Lectures
Unit-I OMICS- The OMICS Technology, A Broad Outlook	 Tools of Omics-Introduction to Epigenomics Human genome project- goals, conclusions and application. Structural and functional proteomics- protein- protein interaction and identification of interactions by various methods. Application of Proteomics and Genomics in human diseases –screening, testing and treatment of diseases. Metagenomics: concept, strategies, and applications in environmental biotochnology agriculture and health 	4	15
Unit-II Transcriptomics, Lipidomics and Metabolomics	 Introduction to Transcriptomics, Lipidomics And Metabolomics, Glycomics, Pharmacogenomics Techniques used in Lipidomics- Mass Spectroscopy, TLC, HPLC, GC and Capillary electrophoresis, MALDI. Technique used in Metabolomics- Mass Spectroscopy, Electrophoresis, chromate- graphy- GC, LC & NMR. Technique used in Transcriptomics- next generation sequencing, northern blotting, DDRT-PCR, microarrays, gel free assays like biolayer interference, SPR. Applications of transcriptomics in human diseases – screening, testing and treatment of diseases. (in clinical applications, personalized medicine, infectious diseases) 		15
Unit-III Introduction to Systems Biology	 Systems biology towards systems level understanding of biological systems Systems structure, systems dynamics, systems design and control, systems project Models and Modelling systems in systems biology What is a model? Key properties of models, Basic of computational models, networks. 		15

		1
	 data integration, standards, and model organism Perturbation of biological systems and 'Omics' as Quantitative high throughput experimental tools for systems biology Standards and formats for systems biology. Computational Databases and software tools in systems biology. Biological networks: metabolic networks, gene regulatory networks, PPI networks, genetic interaction (GI) networks, and signaling networks. 	
Unit-IV	 Introduction to Knowledge of discovery in 	15
Data mining and	databases (KDD) What is knowledge, need	
Application of	for KDD. KDD process outline, concept and	
Systems Biology	goals	
by stellis Biology	• Data Mining methods: Statistics -	
	classification correlation association	
	chassification, contrelation, association	
	analysis, regression, and clustering Machine	
	approaches.	
	 Text mining, and Pattern evaluation. 	
	• Data mining in scientific application	
	• Application of systems biology: 1. Systems	
	biology to systems medicine. 2. Application	
	of systems biology in drug discovery and	
	development 3 Systems biology and	
	synthetic hiology	
	Synthetic blology.	

1.	Bioinformatics and functional genomics (2003). Jonathan Pevsner John wiley &
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2.	Integration of omics approaches and systems biology for clinical applications.
	Antonia Vlahou, Harald Mischak, Jerome Zoidakis, Fulvio Magni. Wiley
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	science.
11.	Lipidomics-technologies and applications (2012) Dr. Kim Ekroos Wiley wch
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12.	Topics in current genetics-metabolomics- a powerful tool in systems biology Jens
	Nielsen \cdot Michael C. Jewett (Eds) Springer publications.
13.	Foundations of systems biology. First edition Hiraokikitano(2001) MIT press,
	Cambridge
14.	Systems biology Karthik Raman and Nagasuma Chandra, Resonance February
	2010.
15.	Systems biology a textbook, second edition Edda Klipp, Wolfram Liebermeister,
	Christoph Wierling Axel Kowald Wiley-vch publication.
16.	A new approach to decoding life: systems biology Trey Ideker Article <i>in</i> annual
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17.	systems biology and synthetic biology (2009) Pengcheng Fu, Sven Panke Wiley
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18.	Analysis of biological networks (2008) Bjorn. Junker, Falk Schreiber Wiley Inter-
	science.
19.	Knowledge discovery and data mining in biological databases Vladimir Brus I C
	The knowledge engineering review, vol. 14:3, 1999.
20.	Computational systems biology Andrieskreite, Roland Eils Elsevier academic
	press.
21.	introduction To Biological Networks Alpan Ravaland Animesh Ray CRC press
	(2013).
22.	Advanced systems biology methods in drug discovery and translational
	biomedicine Jun Zou Biomed research international volume 2013.

M.Sc. Biotechnology Semester –IV Drug Discovery & Clinical Study (PBT4DDC)

Course Objectives: Course Outcomes:	 The objective of this course is to have a firm Discovery and Clinical Studies. To provide students' knowledge about Clinical Indian Regulations, Pharmacovigilance and Clinical By the end of the course the student will: Able to learn about drug discovery-design pat silico tools. Able to understand the clinical trial as they will gain information on ruresponsibilities in clinical studies. 	foundati cal Trial nical Data hway usi design se iles-regul	on in Drug Design and Science. Ing some in- et up as well ation and
Unit	Topics	Credit	Lectures
Unit-I	Introduction to the drug discovery &	4	15
Clinical Research Informatics in Drug Discovery	 development Source of drugs Structural effects on drug action Drugs derived from natural products General principles of pharmacology Drug development and testing process Approaches to new drug discovery Computer-aided drug design Identification of novel drug candidates and drug targets Construction the signaling network of a drug using integer linear programming Identification for druggable targets of a disease 		
Unit II	Clinical Trial Design		15
Clinical Trial Design And Indian Regulations	 Basic framework of clinical trial Randomized clinical trials and different phases Adaptive randomization methods Seamless design Internal pilot design Design selection factors 		

	Regulations	
	The national regulatory body	
	Key documents in clinical research	
	• Regulatory requirements for the conduct of	
	clinical trials in India	
	The Roles and Responsibilities of	
	Stakeholders in the Sharing of Clinical Trial	
	Data	
	• Participants in clinical trials, Investigators,	
	Research institutions and universities	
	 Journals and Professional societies 	
Unit III	Scope and purposes of pharmacovigilance	15
Pharmaco-vigilance	Adverse Drug Reactions (ADR)	
	ADR classification	
	Nature and mechanism of ADR	
	Concept of safety	
	Phases and types of DATA	
	The process of Pharmacovigilance	
	• Signal detection, evaluation and investigation,	
	Communication	
	Methods of evaluating effectiveness of action	
	International regulatory collaboration	
	• WHO, CIOMS, ICH, ISoP, ISPE	
Unit-IV	Data management in clinical research: An	15
Clinical Data	overview	
Science	Data Sources and Data Types	
	Standards in Healthcare Data	
	Research Data Stewardship for Healthcare	
	Professionals	
	Preparing Data for Prediction Model	
	Development	
	Prediction Modeling Methodology	
	Clinical Decision Support System	

1.	Introduction to Basics of Pharmacology and Toxicology, Volume 1: General and					
	Molecular Pharmacology: Principles of Drug Action, Chapter 3 Gerard Marshall Raj					
	Ramasamy Raveendran, Editors ISBN 978-981-32-9778-4 ISBN 978-981-32- 9779-1					
	(eBook) https: oi.org/10.1007/978-981-32-9779-1					
2.	Basic & Clinical Pharmacology, 2017, Fourteenth Edition, Section I, Chapter 1. Bertram					
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	G. Katzung, Editor ISBN 978-1-259-64115-2 MHID 1-259-64115-5 ISSN 0891-2033					
3.	Software based approaches for drug designing and development: A systematic review					
	on commonly used software and its applications, Bulletin of Faculty of Pharmacy, Cairo					
	University 55 (2017) 203–210 Prasad G. Jamkhande, Mahavir H. Ghante, Balaji R.					
	Ajgunde http://dx.doi.org/10.1016/j.bfopcu.2017.10.001					
4.	Bioinformatics and Drug Discovery, Third Edition, (A Computational Platform and					
	Guide for Acceleration of Novel Medicines and Personalized Medicine, Chapter 10)					
	Richard S. Larson, Tudor I. Oprea https://doi.org/10.1007/978-1-4939-9089-4					
5.	Molecular docking studies, Chapter 5, Shodhganga					
6.	Clinical Trial Designs, Indian Dermatol Online J. 2019 Mar-Apr; 10(2): 193-201.					
	Brijesh Nair doi: 10.4103/idoj.IDOJ_475_18 PMCID: PMC6434767 PMID: 30984604					
7.	Experimental designs for small randomised clinical trials: an algorithm for choice,					
	Catherine Cornu et. al., doi: 10.1186/1750-1172-8-48 PMCID: PMC3635911 PMID:					
	23531234					
8.	Regulatory requirements for clinical trials in India: What academicians need to know,					
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	10.4103/ija.IJA_143_17					
9.	Regulatory environment for clinical research: Recent past and expected future,					
	Perspect Clin Res 2017;8:11-6. Bhave A, Menon S DOI: 10.4103/2229-3485.198551					
10.	National Academy Press, Committee on Strategies for Responsible Sharing of Clinical					
	Trial Data; (Chapter 3, The Roles and Responsibilities of Stakeholders in the Sharing of					
	Clinical Trial) Data, Board on Health Sciences Policy; Institute of Medicine. Washington					
	(DC): National Academies Press (US); 2015 Apr 20. The National Academies Press					
	International Standard Book Number-13: 978- 0-309-31629-3					
11.	An Introduction to Pharmacovigilance, Second Edition Patrick Waller and Mira					
	Harrison- Woolrych ISBN 9781119289753 (Adobe PDF)					
12.	Data management in clinical research: An overview, Indian J Pharmacol. 2012 Mar-					
	Apr; 44(2): 168–172. Binny Krishnankutty, Shantala Bellary, and Latha S. Moodahadu					
	doi: 10.4103/0253-7613.93842 PMCID: PMC3326906 PMID: 2252946					
13.	Fundamentals of Clinical Data Science Pieter Kubben, Michel Dumontier Andre Dekker					
	ISBN 978-3-319-99712-4 ISBN 978-3-319- 99713-1 (eBook)					
	https://doi.org/10.1007/978-3-319-99713-1					

M.Sc. Biotechnology Semester –IV Scientific Writing & Food Biotechnology (PBT4SWF)

Course Objectives: Course Outcomes:	 To develop skills for the processing and analysis of scientific data. To enable students to present their research results in the format of oral or poster presentations at conferences, to write scientific publications (theses, articles) and to prepare applications for scientific grants (research proposals). To inculcate good scientific writing practices. Think critically, organize and analyze scientific data. Develop advanced scientific writing skills to write research articles, 				
	presentations. Understand the best practices of	f scientific	writing by		
	adhering to research ethics and by avoiding plag	iarism.			
Unit	Topics	Credit	Lectures		
Unit-I	Introduction to scientific writing.	04	15		
Basic Scientific	• Basic scientific writing skills: style and				
Writing and	language, spelling, grammar, syntax, jargon and				
Plagiarism	 sentence structure. Elements of a scientific paper: abstract, introduction, materials & methods, results, discussion, references and drafting titles. Scientific writing process: thinking, planning, rough draft, revision of content. Processing data & application of statistics Displaying data: text, table, graph and defining terms and abbreviations. Statistical analysis and tools for experimental data. Referencing software: Mendeley, Endnote. Plagiarism: Definition, Common types of plagiarism, Intentional and Unintentional plagiarism, Detection of plagiarism by antiplagiarism tools (Turnitin, Duplichecker, Viper, Copyleaks), Penalties for plagiarism, Avoiding plagiarism. 				

Unit II	Guidelines for Medical writing.	15
Advanced	Scientific writing skills:	
Scientific Writing	• Writing a research paper for biomedical journal,	
	• Writing science research papers and articles,	
	Writing a research proposal,	
	• Writing a research report, writing popular	
	reports, writing thesis and dissertation, Writing	
	clinical study reports.	
	• Presentation skills: Oral presentation, Poster	
	Preparation & presentation, PowerPoint	
	presentations.	
	Research ethics, Scientific misconduct.	
Unit III	• Nutraceuticals and functional foods Definition,	15
Food	characteristic features, and classification,	
Biotechnology-	phytonutraceuticals,	
Nutraceuticals	• Prebiotics and Probiotics, Sources (with	
	examples e.g. microbes, plants, algae, animals),	
	Blue biotechnology, Food security, Food	
	preservation, Chemopreservation Food	
	processing (animal and sea food), Food	
	packaging	
Unit-IV	• Applications of nutraceuticals in human health	15
Food	and nutrition- health effects of commonly used	
biotechnology in	nutraceuticals and functional foods (case	
management of	studies), Safety and Regulatory guidelines	
health and	• Nutraceuitcals in management of health and	
disease	disease	
	• Development of designer foods for specific	
	chronic diseases	
	Nutraceutical adjuvants	

References:

1.	Thomas, C George. (2019). Research Methodology and Scientific Writing 2nd edition.
2.	Kumar, Ranjeet. (2011). Research methodology: a step-by-step guide for beginners 3rd edition.
3.	Jennifer Peat, Elizabeth Elliott, Louise Baur, and Victoria Keena. (2002). Scientific Writing (BMJ Books).
4.	J.R. Mathews & R.W.Mathews (2008) Successful Scientific Writing, 3rd Ed. Cambridge University Press.
5.	https://www.ema.europa.eu/en/documents/scientific-guideline/ich-e-3- structure-content-clinicalstudy-reports-step-5_en.pdf
6.	htps://www.emwa.org/documents/about_us/EMWAguidelines.pdf
7.	https://www.otago.ac.nz/hedc/otago615367.pdf
8.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3510958/
9.	http://medind.nic.in/iad/t02/i1/iadt02i1p21.pdf
10.	https://intranet.birmingham.ac.uk/as/registry/policy/conduct/plagiarism/intera ctive-course. aspx
11.	https://www.bowdoin.edu/dean-of-students/judicial-board/academic-honesty- and-plagiarism/ common-types-of-plagiarism.html
12.	https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism?wssl=1
13.	https://holyfamily.libguides.com/c.php?g=610218&p=4236572
14.	https://plagiarismdetector.net
15.	https://www.duplichecker.com

M.Sc. Biotechnology Semester –IV PRACTICAL- I (PBT4PR1) Paper-I

1.	Biosynthesis and characterization of eco-friendly silver nanoparticles by using
	plant/leaf extracts/green tea
2.	Synthesis and characterization of zinc sulfide nanoparticles by A reverse micelle
	method
3.	Synthesis and characterization of Fluorescent Carbon Nanoparticles from Candle
	Soot and its separation of using the Thin-Layer Chromatographic Method
4.	Synthesis of alginate beads and investigation of citric acid release from a nano shell
	coating of polymer
5.	Antimicrobial activity testing of Nanoparticles/nanocomposites

Paper-II

1.	Gel electrophoresis of lipids (lipoproteins exrtacted from various sources) to
	separate and identify the lipid fraction
2.	Preparation of report based on -Databases and data repositories used in systems
	Biology
3.	Detection assay for gene expression using micro array and qRT -PCR
	(demonstration)
4.	Identification of protein using analytical technique Mass spectroscopy
	(demonstration)

M.Sc. Biotechnology Semester –IV PRACTICAL- I (PBT4PR2)

4 Credits

Paper-III

1.	Exploration of various learning platforms in online courses listed below :						
	Online courses in fundamentals of Neuroscience from Harvard University						
	https://online-learning. harvard.edu/course/fundamentals-neuroscience-part-1-						
	electrical-properties-neuron? delta=0						
	Molecular Biology from MIT https://ocw.mit.edu/courses/biology/7-28-molecular-						
	biology-spring- 2005/						
	Introduction to Bioethics from Georgetown						
	https://bioethicsarchive.georgetown.edu/phlx101-						
	2/course.html#units/introduction						
2.	Write a research proposal on any topic of your interest from the MSc syllabus. For						
	research proposal contents and format refer to NSF guidelines.						
	https://www.nsf.gov/pubs/policydocs/pappg19_1/nsf19_1.pdf For reference work						
	use Mendeley Desktop. https://www.mendeley.com/guides/desktop						
3.	Complete an online course (Minimum 1 week) on the topic related to the						
	biotechnology. Write a comprehensive report on the studied course contents.						
	Swayam https://swayam.gov.in/						
	NPTEL https://nptel.ac.in/noc/						
	MOOC https://www.it.iitb.ac.in/frg/wiki/images/7/7b/Demo-PPT.pdf						
	E-learning https://www.bellevuecollege.edu/elearning/start/intro/						

1.	Estimation of total sugars from food products (dairy, fruit juices, bakery)
2.	Determination of acid value of natural fats and oils.
3.	Determination of iodine number of fats and oils.
4.	Estimation of vitamin B by HPLC (demonstration)
5.	Study of nutraceuticals important plants like Zinziber, Curcuma, Alovera, Asparagus,
	Ocimum etc.
6.	Estimation of antioxidant property of phytochemical by DPPH.
7.	Qualitative test for tannins, phenols, isoflavones, alkaloids using TLC.
8.	Estimation of food preservatives/additives (Parabens) from food sample by HPLC
	(demonstration).
9.	Estimate Cholesterol contents in given sample by Zak's methods
10.	Estimation of bio-burden by viable counts.
11.	Estimation of gluten from food sample.
12.	To study nutritional components (protein, carbohydrate, secondary metabolites,
	lipids, vitamin C) of following: Bee honey, Mushrooms, Lentils, Soya, Dairy product,
	Amla, Papaya, Spinach

Paper-IV

Practical References:

- Cappuccino, J. G., & Welsh, C. (2016). Microbiology: a Laboratory Manual.Benjamin-Cummings Publishing Company.2. Collins, C. H., Lyne, P. M., Grange, J. M., & Falkinham III, J. (2004). Collins andLyne's Microbiological Methods (8th ed.). Arnolds.3. Tille, P. M., & Forbes, B. A. Bailey & Scott's Diagnostic Microbiology,
- 2. Green, M. R., & Sambrook, J. (2012). Molecular Cloning: A Laboratory Manual. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press.
- Wilson K and Walker J. (2000). Principles and Techniques of Practical Biochemistry, 5th Edition, Cambridge University Press.2. Holme D and Peck H. (1998). Analytical Biochemistry, 3rd Edition, Longma
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JanardanBhagatShikshanPrasarakSanstha's CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC 'College with Potential for Excellence' Status Awarded by UGC 'Best College Award' by University of Mumbai

> Program: M.Sc. Revised Syllabus of M.Sc.-II Computer Science Choice Based Credit & Grading System (60:40) w.e.f. Academic Year 2020-21

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Preamble

This syllabus is an extension of the syllabus for semester - I and semester – II of MSc Computer Science, which came into existence in the academic year 2019-2020. As mentioned in the syllabus of semester I and II, the intended philosophy of the new syllabus is to meet following guidelines:

- Give strong foundation on core Computer Sciencesubjects.
- Expose student to emerging trends in a gradual and incrementalway.
- Prepare student community for the demands of ICT industry.
- Offer specialization on a chosenarea.
- Create research temper among students in the wholeprocess.

This syllabus for the semester - III and semester – IV has tried to continue the steps initiated in the semester- I and semester –II to meet the goals set. This proposes two core compulsory subjects in semester III. The student has to continue with the tracks they have taken in the semester II as elective subjects. The syllabus also includes project proposal as part of the practical course in elective subjects.

The semester - IV will have one compulsory subject. Student can choose one subject as specialization out of the two electives he or she has been pursuing since the semester - II. That means, there will be four specializations in the semester IV as mentioned below:

- CloudComputing
- Cyber and InformationSecurity
- Business Intelligence and Big DataAnalytics
- MachineLearning

The syllabus also offers an internship and project implementation in the semester – IV, each of which has weights equivalent to a full course. By introducing different electives as tracks in semester –II, espousing more of that tracks in the semester –III and offering

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the opportunity to choose the specialization based on the tracks pursed in semester –IV will give the student the added advantage of high level competency in the advanced and emerging areas of computer science. This will definitely equip the student with industry readiness as internship in an IT or IT-related organization gives a practical exposure to what is learned and what is practiced. The strong foundation given in the core courses in different semesters will give enough confidence to the learner to face and adapt to the changing trends and requirements of industry andacademia.

As one can easily notice, the syllabus offers lots of emphasis on student driven learning and learning through experience. Research is embedded in the course structure. By introducing Researching Computing in semester – I, Case study in semester – II, Project Proposal in semester – III and Project Implementation insemester – IV (which together has a weightage equivalent to almost two theory courses), the syllabus prepares a strong army of budding computer science researchers. The syllabus designed on the firm believe that by focusing on student driven research on cutting edge and emerging trends with lots of practical experience will make the learning more interesting and stimulating. It is hoped that the student community and teacher colleagues will appreciate the thrust, direction and treatment given in thesyllabus.

We thank all our colleagues in the University of Mumbai for their inputs, suggestions and critical observations. We acknowledge the contributions of experts from premier institutions and industry for making the syllabus more relevant. We thank the chairperson and members of the present and previous Adhoc Board of Studies in Computer Science of University for their constant support. Thanks to one and all who have directly or indirectly helped in this venture.

• Objectives of the Course:

- Offer specialization on a chosen area.
- Promote research based projects/activities in the emerging areas of technology convergence.
- To develop the confidence to the learners to face and adapt to the changing trends and requirements of industry and academia.
- Offer provision for internship and field work.

• Course Outcomes:

- Gain the knowledge of current technologies by internship.
- Hands on training on specialized subjects.
- Can get job opportunities like Software Developer, Network administrator, IT expert etc.
- Prepares strong army of budding computer science researchers.

Scheme of examination for Each Semester:

I. Continuous Internal Examination: 40 Marks

Sr. No.	Particular	Marks	
01	One periodical class test / online examination t conducted in the given semester	20 Marks	
	One case study /review / project with presentation curriculum to be assessed by the teacher conce	15 Marks	
02	Presentation	10 Marks	
	Written Document	05 Marks	
03	Active participation in routine class instructional del overall conduct as a responsible learner, manneri articulation and exhibit of leadership qualities in or related academic activities	05 Marks	

II. External Examination: 60 Marks

- There shall be five questions each of 12 marks.
- All questions shall be compulsory with internal options.
- Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

Question	Based on	Marks
Q.1	Unit I	12
Q.2	Unit II	12
Q.3	Unit III	12
Q.4	Unit IV	12
Q.5	Unit I,II,III,IV	12

III. Practical Examination: 50 Marks

Sr. No.	Particulars of External	Marks
1	Laboratory Work	40
2	Journal	05
3	Viva	05
	TOTAL	50

M.Sc. Computer Science Syllabus Credit Based System and Grading System Academic year 2020-21 SEMESTER - III

CODE	COURSE TYPE	SUBJECT	SCHEME OF INSTRUCTION (PERIOD PER WEEK)		SCHEME OF INSTRUCTION SCHEME OF EXAMIN			SCHEME OF EXAM		NO. OF
					(PERIOD PER WEEK) (MAX MARKS)			CREDITS		
			ТН	LAB	СА	EA	TOTAL			
PCS3UBI	CORE	Ubiquitous Computing	4	-	40	60	100	4		
PCS3SNA	CORE	Social Network Analysis	4	-	40	60	100	4		
PCS3E1A	Elective-I	Track A: Cloud Computing – II (Cloud Computing Technologies)	4	_	40	60	100	4		
PCS3E1B	Elective-I	Track B: Cyber and Information Security- II (Cyber Forensics)								
PCS3E2C	Elective-II	Track C: Business Intelligence and Big Data Analytics –II (Mining Massive Data sets)	4		40	60	100	4		
PCS3E2D	Elective-II	Track D: Machine Learning –II (Advanced Machine Learning)	4	-						
PCS3PPR1	CORE SUBJECT PRACTICAL	PCS3UBI+ PCS3SNA	-	4			100	4		
PCS3PPR2	ELECTIVE SUBJECT PRACTICAL	PCS3E1A/ PCS3E1B+ PCS3E2C/ PCS3E2D	-	4			100	4		
		TOTAL	-				600	24		

CODE	COURSE TYPE	SUBJECT	SCHE INSTR (PERIC	ME OF AUCTIO N OD PER CEK)	5 EX (N	SCHEME (KAMINAT 1AX MAR	OF ION KS)	NO. OF CREDIT S
			ТН	LAB	CA	EA	TOTAL	
PCS4SIM	CORE	Simulation and Modeling	4	-	40	60	100	4
PCS4S1A	Elective	Specialization - Track A: Cloud Computing –III (Building Clouds and Services)						
PCS4S2B		Specialization - Track B: Cyber and Information Security- II (Cryptography and Crypt Analysis)						4
PCS4S3C		Specialization - Track C: Business Intelligence and Big Data Analytics –III (Intelligent Data Analysis)	- 4	_	40	60	100	4
PCS4S4D		Specialization - Track D: Machine Learning –III (Computational Intelligence)						
PCS4PPR1	Practical of Simulatio n & Modeling and Specializa tion	PCS4SIM+PCS4S1A/ PCS4S2B/ PCS4S3C/ PCS4S4D	4				100	4
PCS4PPR2	Internshi p with industry		6				150	6
PCS4PPR3	Project Implemen tation		6				150	6
		TOTAL					600	24

SEMESTER - IV

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Structure of the syllabus

This is the syllabus for the semester–III and semester–IV of MSc Computer Science program of University of Mumbai to be implemented from the year 2020-21

Semester-III

The syllabus offers four theory courses and two practical courses in semester-III. Of the four theory courses, two are compulsory courses. The remaining two are electives. Each elective course has two tracks (track A and track B for elective I and track C and track D for elective II). A student is expected to continue with the track they have chosen in semester-II.

The syllabus proposes four subjects in semester-III. Each subject has theory and practical components.

Semester–III: Theory courses

The four theory courses offered in semester-III are:

- (i) UbiquitousComputing
- (ii) Social NetworkAnalysis
- (iii) Elective -I
 - (a) Track A: Cloud Computing II (Cloud ComputingTechnologies)
 - (b) Track B: Cyber and Information Security II (CyberForensics)

(iv) Elective –II

- (a) Track C: Business Intelligence and Big Data Analytics II (Mining Massive Data sets)
- (b) Track D: Machine Learning II (Advanced MachineLearning)

A student is expected to continue with the same tracks he or she has taken in semester-II for elective –I and elective –II. Each of these theory courses (compulsory as well as elective) is of four credits each and is expected to complete in 60 hours. The details are shown in the following table.

Course	Course	Lecture	Credits
Code	Nomenclature	In Hours	
PCS3UBI	Ubiquitous Computing	60	4
PCS3SNA	Social Network Analysis	60	4
PCS3E1A	Elective I - Track A: Cloud Computing –II (Cloud Computing Technologies)		
PCS3E1B	Elective I -Track B: Cyber and Information Security- II (CyberForensics)	60	4
PCS3E2C	Elective II - Track C: Business Intelligence and Big Data Analytics –II (Mining Massive Data sets)	60	4
PCS3E2D	Elective II - Track D: Machine Learning –II (Advanced Machine Learning)		
	Total Credits for Theory courses in Semester III	·	16

Semester III – Theory courses

Semester–III: Practical Laboratory Courses

The syllabus proposes two laboratory courses of 4 credits each. The laboratory experiments from the first two theory courses (PSCS301 and PSCS302) are combined together and are proposed as the first practical course (PSCSP5). Similarly, the laboratory experiments from the elective courses are combined together and taken as the second practical course (PSCSP6). The following table summarizes the details of the practical courses in the semester –III.

Course	Course Title	No of hours	Credits
Code			
PCS3PPR1	Ubiquitous Computing and Social Network	60+60=	04
	Analysis	120	
PCS3PPR2	Elective I and Elective II	60+60=	04
		120	
Total	Credits for Practical Laboratory courses in Semester–III		08

Semester-III: Practical Laboratory Courses

Project Proposal: The syllabus introduces a project proposal in the semester-III under lab course PSCSP6. As per this, a student is expected to select a topic for project based on the specialization he or she is planning to take in the semester-IV. Needless to say, the project proposal will be based on a topic related to the elective the student has been pursuing in semester –II and semester-III and intends to continue in semester-IV asspecialization.

The proposal will contain introduction, related works, objectives and methodology. The implementation, experimental results and analysis will be part of the Project implementation in the semester-IV.

Semester –IV

The syllabus proposes two subjects in semester-IV, each with theory and practical components. In addition, there will be internship with industry and a project implementation. The important feature of the semester-IV is the specialization a student can choose. A student can choose a specialization based on the electives one has been pursuing since semester–II. Since there are two electives in semester-III, a student can drop one and choose the other as the specialization in semester–IV.

Semester–IV: Theory courses

The two theory courses offered in semester-IV are:

- (i) Simulation and Modeling
- (ii) Specialization
 - (a) Track A: Cloud Computing III (Building Clouds and Services)
 - (b) Track B: Cyber and Information Security–III (Cryptography and Crypt Analysis)
 - (c) Track C: Business Intelligence and Big Data Analytics III (Intelligent Data Analysis)
 - (d) Track D: Machine Learning III (ComputationalIntelligence)

Each of these courses (core as well as the specialization) is expected to complete in 60 hours. The details are given in the following table.

Course Code	Course	Lecture In	Credits
	Nomenclature	Hours	
PCS4SIM	Simulation and Modeling	60	4
DCS451A	Specialization - Track A: Cloud Computing –III		
PC3431A	(Building Clouds and Services)		
	Specialization -Track B: Cyber and Information		
PCS4S2B	Security- II (Cryptography and Crypt Analysis)	60	4
DCS4S2C	Specialization - Track C: Business Intelligence and Big		
FC3433C	Data Analytics –III (Intelligent Data Analysis)		
	Specialization - Track D: Machine Learning –III		
PC3434D	(Computational Intelligence)		
	Total Credits for Theory courses in Semester-IV		08

Semester-IV: Theory courses

Semester–IV: Practical Laboratory courses

The syllabus proposes one laboratory course of 4 credits. The laboratory experiments from the two theory courses are combined together and are proposed as the first practical course (PSCSP7).

Semester-IV: Practical course

Course Code	Course Title	No of hours	Credits
PCS4PPR1	Simulation & Modeling and Specialization	60+60=	04
		120	

Semester–IV: Internship with industry

The syllabus proposes an internship for about 8 weeks to 12 weeks to be done by a student. It is expected that a student chooses an IT or IT-related industry and formally works as a full time intern during the period. The student should subject oneself with an internship evaluation with proper documentation of the attendance and the type of work he or she has done in the chosen organization. Proper certification (as per the guidelines given in Appendix 1 and 2) by the person, to whom the student was reporting, with Organization's seal should be attached as part of thedocumentation.

Semester–IV: Internship

Course Code	Course Title	No of hours	Credits
PCS4PPR2	Internship with industry	300	06

Semester–IV: Project Implementation

The syllabus proposes project implementation as part of the semester–IV. The project implementation is continuation of the project proposal the students has submitted and evaluated in semester-III. The student is expected to continue with the proposal made and examined in the semester-III and implement the same in the semester–IV. In addition, experimental set up, analysis of results, comparison with results of related works, conclusion and future prospects will be part of the project implementation. A student is expected to make a project implementation report and appear for a project viva. He or she needs to spend around 200 hours for the project implementation, which fetches 6 credits. The details are given below:

Course Code	Course Title	No of hours	Credits
PCS4PPR3	Project Implementation	200	06

Semester–IV: Project Implementation

Detailed syllabus of semester-III

Course Code	Course Title	Credits		
PCS3UBI	Ubiquitous Computing	04		
Unit I: Basics of Ubiquitous Computing				
Examples of Ubio	quitous Computing Applications, Holistic Framework for UbiCom	: Smart DEI,		
Modeling the H	Key Ubiquitous Computing Properties, Ubiquitous System	Environment		
Interaction, Arch	itectural Design for UbiCom Systems: Smart DEI Model, Smart	Devices and		
Services, Service	Architecture Models, Service Provision Life Cycle.			
Unit II: Smart Mo	biles, Cards and Device Networks			
Smart Mobile Dev	vices, Users, Resources and Code, Operating Systems for Mobile Co	mputers and		
Communicator De	evices, Smart Card Devices, Device Networks.			
Human–Compute	r Interaction (HCI): Explicit HCI, Implicit HCI, User Interfaces and Int	eraction for		
Devices, Hidden L	JI Via Basic Smart Devices, Hidden UI Via Wearable			
and Implanted De	evices, Human Centered Design (HCD).			
Unit III: Smart En	vironments			
Tagging, Sensing	and Controlling, Tagging the Physical World, Sensors and Sensor	or Networks,		
Micro Actuation	and Sensing: MEMS, Embedded Systems and Real Time Syste	ems, Control		
Systems.				
Unit IV: Ubiquito	us Communication			
Audio Networks, Data Networks, Wireless Data Networks, Universal and Transparent Audio,				
/ideo and Alphanumeric Data Network Access, Ubiquitous Networks, Network Design Issues.				
Γext book:				
 Ubiquitor 	us Computing Smart Devices, Environments and Interactions, Stefar	n Poslad,		

Wiley,2009.

References:

- Ubiquitous Computing Fundamentals. John Krumm, Chapman & Hall/CRC2009.
- Ambient intelligence, wireless networking and ubiquitous computing, Vasilakos, A., &Pedrycz, W. ArtechHouse, Boston, 2006.
- http://www.eecs.qmul.ac.uk/~stefan/ubicom.

	Practical Course on Ubiquitous Computing
Sr. No.	List of practical Experiments on Ubiquitous Computing
1	Design and develop location based messaging app
2	Design and develop chat messaging app which is a location-based
3	Design and develop app demonstrating Simple Downstream Messaging
4	Design and develop app demonstrating Send Upstream Messages
5	Design and develop app for Device Group Messaging
6	Implementing GCM Network Manager
7	Demonstrate use of OpenGTS (Open Source GPS Tracking System)
8	Context-Aware system Context-awareness is a key concept in ubiquitous computing. The Java Context- Awareness Framework (JCAF) is a Java-based context-awareness infrastructure and programming API for creating context-aware applications
9	Develop application demonstrating Human Computer Interaction
10	Write a Java Card applet

Course Code	Course Title	Credits		
PCS3SNA	Social Network Analysis	04		
Unit I: Introductio	Jnit I: Introduction to social network analysis (SNA)			
Introduction to i	networks and relations- analyzing relationships to understand	people and		
groups, binary ar	nd valued relationships, symmetric and asymmetric relationships	, multimode		
relationships, Usi	ng graph theory for social networks analysis- adjacency matrice	s, edge-lists,		
adjacency lists, gr	aph traversals and distances, depth-first traversal, breadth-first tra	aversal paths		
and walks, Dijkst	ra's algorithm, graph distance and graph diameter, social netw	orks vs. link		
analysis, ego-cent	ric andsocio-centric			
density.				
Unit II: Networks, Understanding n	, Centrality and centralization in SNA etworks- density, reachability, connectivity, reciprocity, group-	external and		
group-internal tie	s in networks, ego networks, extracting and visualizing ego networ	ks, structural		
holes, Centrality-	degree of centrality, closeness and betweenness centrality, loca	al and global		
centrality, centra	lization and graph centers, notion of importance within netw	vork, Google		
pagerank algorith	nm, Analyzing network structure- bottom-up approaches using	g cliques, N-		
cliques, N-clans, K	-plexes, K-cores, F-groups and top-down approaches using compo	nents, blocks		
and cut-points, la	mbda sets and			
bridges, and faction	ons.			
Unit III: Measures	s of similarity and structural equivalence in SNA			
Approaches to ne	twork positions and social roles- defining equivalence or similari	ty, structural		
equivalence, auto	morphic equivalence, finding equivalence sets, brute force and	Tabu search,		
regular equivale	egular equivalence, equivalence of distances: Maxsim, regular equivalence, Measuring			
similarity/dissimil	imilarity/dissimilarity- valued relations, Pearson correlations covariance and cross-products,			
Understanding cl	Inderstanding clustering- agglomerative and divisive clusters, Euclidean, Manhattan, and			
squared distances	quared distances, binary relations, matches: exact, Jaccard,Hamming,			

Unit IV: Two-mode networks for SNA

Understanding mode networks- Bi-partite data structures, visualizing two-mode data,

quantitative analysis using two-mode Singular value decomposition (SVD) analysis,

two-mode factor analysis, two-mode correspondence analysis, qualitative analysis using two-mode core-periphery analysis, two-mode factions analysis, affiliation and attribute networks.

Text book:

- Introduction to Social Network Methods: Robert A. Hanneman, MarkRiddle, University of California, 2005 [Published in digital form and available at http://faculty.ucr.edu/~hanneman/nettext/index.html].
- Social Network Analysis for Startups- Finding connections on the social web: MaksimTsvetovat, Alexander Kouznetsov, O'Reilly Media, 2011.
- Social Network Analysis- 3rd edition, John Scott, SAGE Publications, 2012.

Reference book:

- Exploratory Social Network Analysis with Pajek, Second edition: Wouter de Nooy, Andrej Mrvar, Vladimir Batagelj, Cambridge University Press, 2011.
- Analyzing Social Networks, Stephen P Borgatti, Martin G.Everett, Jeffrey C.
 Johnson, SAGE Publications, 2013.
- Statistical Analysis of Network Data with R: Eric D. Kolaczyk, GáborCsárdi, Springer, 2014.
- Network Analysis: Methodological Foundations, (Editors) UlrikBrandes, Thomas Erlebach. Springer, 2005.
- ModelsandMethodsinSocialNetworkAnalysis:(Editors)PeterJ.Carrington, John Scott,Stanley Wasserman, Cambridge University Press, 2005.

	Practical Course on Social Network Analysis
Sr	
No	List of Practical Experiments on Social Network Analysis
1	Write a program to compute the following for a given a network: (i) number of edges, (ii)
	number of nodes; (iii) degree of node; (iv) node with lowest degree; (v)
	the adjacency list; (vi) matrix of the graph.
2	Perform following tasks: (i) View data collection forms and/or import one-
	mode/two-mode datasets; (ii) Basic Networks matrices transformations
3	Compute the following node level measures: (i) Density; (ii) Degree;
	(iii) Reciprocity; (iv) Transitivity; (v) Centralization; (vi) Clustering.
4	For a given network find the following: (i) Length of the shortest path from a given node
	to another node; (ii) the density of the graph; (iii) Draw egocentric network of node G
	with chosen configuration parameters.
5	Write a program to distinguish between a network as a matrix, a network as an edge
	list, and a network as a sociogram (or "network graph") using 3 distinct networks
	representatives of each.
6	Write a program to exhibit structural equivalence, automatic equivalence, and
	regular equivalence from a network.
7	Create sociograms for the persons-by-persons network and the committee-by-
	committee network for a given relevant problem. Create one-mode network and two-
	node network for the same.
8	Perform SVD analysis of a network.
9	Identify ties within the network using two-mode core periphery analysis.
10	Find "factions" in the network using two-mode faction analysis.

Course Code	Course Title	Credits
PCS3E1A	Elective I- Track A: Cloud Computing -II	04
	(Cloud Computing Technologies)	
Unit I: Parallel and	d Distributed Computing	
Elements of parall	el computing, elements of distributed computing, Technologies for	distributed
computing: RPC, [Distributed object frameworks, Service oriented computing	
Virtualization – Ch	naracteristics, taxonomy, virtualization and cloud computing.	
Unit II: Computing	g Platforms definition and characteristics, Enterprise Computing, The internet a	as a platform
Cloud computing	services: SaaS, PaaS, IaaS, Enterprise architecture, Types	
of clouds.		
Unit III: Cloud Tec Cloud computing	hnologies platforms, Web services, AJAX, mashups, multi-tenant software, mouting: Thread programming High-throughput compu	ting: Task
	mputing. mieau programming, mgn-tinoughput compu	ling. Task
programming, Dat	ta intensive computing: Map-Reduceprogramming.	
Unit IV: Software Dev 2.0 platforms	Architecture , Enterprise software: ERP, SCM, CRM	
Custom enterprise	e applications and Dev 2.0, Cloud applications.	
Text book:		
 Enterprise Cambridg 	e Cloud Computing Technology, Architecture, Applications, Gautam je University Press, 2010	Shroff,
Mastering	g In Cloud Computing, RajkumarBuyya, Christian VecchiolaAnd	
ThamariS	elvi S, Tata Mcgraw-Hill Education,2013	
Cloud Cor	mputing: A Practical Approach, Anthony T Velte, Tata Mcgraw Hill, 2	2009
References:		
 Architecti PaaS, and 	ing the Cloud: Design Decisions for Cloud Computing ServiceModels I IaaS), Michael J. Kavis, Wiley CIO,2014	s (SaaS,
Cloud Con and More	mputing: SaaS, PaaS, IaaS, Virtualization, Business Models,Mobile, S e, Kris Jamsa, Jones & Bartlett Learning,2013	Security

	Practical Course on Elective I-Track A:Cloud Computing-II (Cloud Computing Technologies)				
Sr. No.	List of Practical Experiments on Elective I-Track A:Cloud Computing-II (Cloud Computing Technologies)				
1	Execute & check the performance of existing algorithms using CloudSim.				
2	Install a Cloud Analyst and Integrate with Eclipse/Netbeans. Monitor the performance of an Existing Algorithms.				
3	Build an application on private cloud.				
4	Demonstrate any Cloud Monitoring tool.				
5	Evaluate a Private IAAS Cloud using TryStack.				
6	Implement FOSS-Cloud Functionality - VDI (Virtual Desktop Infrastructure)				
7	Implement FOSS-Cloud Functionality VSI (Virtual Server Infrastructure) Infrastructure as a Service (IaaS)				
8	Implement FOSS-Cloud Functionality - VSI Platform as a Service (PaaS)				
9	Implement FOSS-Cloud Functionality - VSI Software as a Service (SaaS)				
10	Explore FOSS-Cloud Functionality- Storage Cloud				

Course Code	Course Title	Credits				
PCS3E1B	Elective I- Track B: Cyber and Information Security- II	04				
	(Cyber Forensics)					
Unit I: Computer Forensic Fundamentals: Introduction to Computer Forensics and objective, the						
Computer Forensics Specialist, Use of Computer Forensic in Law Enforcement, Users of						
Computer Foren	sic Evidence, Case Studies, Information Security Investigation	s. Types of				
Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law						
Enforcement Computer Forensic Technology, Types of Business Computer Forensic Technology,						
Specialized Forensics Techniques, Hidden Data, Spyware and Adware, Encryption Methods and						
Vulnerabilities, P	rotecting Data from Being Compromised, Internet Tracing Metho	ods, Security				
and Wireless Te	chnologies. Types of Computer Forensics Systems: Study differ	ent Security				
System: Internet,	Intrusion Detection, Firewall, Storage Area, Network Disaster Rec	overy, Public				
Key Infrastructure	e, Wireless Network, SatelliteEncryption,					
Instant Messaging (IM), Net Privacy, Identity Management, Biometric, Identity Theft.						
Unit II: Data Reco	very: Data Recovery and Backup, Role of Data Recovery, Hiding and	d Recovering				
Hidden Data. Evid	Hidden Data. Evidence Collection: Need to Collect the Evidence, Types of Evidences, The Rules of					
Evidence, Collection Steps. Computer Image Verification and Authentication: Special Needs of						
Evidence Authentication. Identification of Data: Timekeeping, Forensic Identification and						
Analysis of Technical Surveillance Devices,						
Reconstructing Past Events: How to Become a Digital Detective, Use a ble File Formats, Reconstructing Past Events: How to Become a Digital Detective, Use a ble File Formats, Reconstruction of the set of the						
Unusable File For	Inusable File Formats, Converting Files.					

Unit III: Network Forensics: Sources of Network Based Evidence, Principles of Internetworking,Internet Protocol Suite. Evidence Acquisition: Physical Interception, Traffic Acquisition Software,Active Acquisition. Traffic Analysis: Protocol Analysis, Packet Analysis, Flow Analysis, Higher-Layer Traffic analysis. Statistical Flow Analysis: Sensors, Flow Record Export Protocols, CollectionandAggregation,Analysis.Wireless:theIEEELayer2ProtocolSeries,WirelessAccessPoint,WirelessTrafficCaptureand

Analysis, Common Attacks, Locating Wireless Devices. Network Intrusion Detectionand

Analysis: NIDS/NIPS Functionality, Modes of Detection, Types of NIDS/NIPS, NIDS/NIPS Evidence Acquisition. **Unit IV: Network Devices and Mobile Phone Forensics:** Sources of Logs, Network Architecture,

Collecting and Analyzing Evidence, switches, routers, firewalls, interfaces Web Proxies: Need to Investigate Web Proxies, Functionality, Evidence, Squid, Web Proxy Analysis, EncryptedWebTraffic. MobilePhoneForensics: Crime and Mobile Phones, Voice, SMS and Identification of Data Interception in GSM, MobilePhone Tricks, SMS Security, Mobile Forensic.

Text book:

- Computer Forensics Computer Crime Scene Investigation, John R. Vacca, Second Edition, 2005.
- Network Forensics, Sherri Davidoff, Jonathan HAM, Prentice Hall, 2012.
- Mobile Phone Security and Forensic: A Practical Approach, Second Edition, Iosif
 I. Androulidkis, Springer, 2012.

References:

- Digital forensics: Digital evidence in criminal investigation", Angus M.Marshall, John – Wiley and Sons, 2008.
- Computer Forensics with FTK, Fernando Carbone, PACKT Publishing, 2014.
- Practical Mobile Forensics, SatishBommisetty, RohitTamma, Heather Mahalik, PACKT Publishing,2014.

Practical Course on Elective I-Track B: Cyber and Information Security- II (Cyber Forensics)				
Sr. No.	List of Practical Experiments on Elective I-Track B: Cyber and Information Security- II (Cyber Forensics)			
1	Write a program to take backup of mysql database			
2	Write a program to restore mysql database			
3	Use Drive Image XML to image a hard drive			
4	Write a program to create a log file			
5	Write a program to find a file in a directory			
6	Write a program to find a word in a file			
7	Create forensic images of digital devices from volatile data such as memory using			
	Imager for: (i) Computer System; (ii) Server; (iii) MobileDevice			
8	Access and extract relevant information from Windows Registry for investigation			
	respect to: (i) Computer System: (ii) Computer Network: (iii) Mobile Device:			
	(iv) Wireless Network			
9	Generate a report based on the analysis done using Registry View for different case			
	scenario of the following: (i) Computer System; (ii) Computer Network;			
	(iii) Mobile Device; (iv) Wireless Network			
10	Create a new investigation case using Forensic Tool: (i) Computer System; (ii) Computer Network; (iii) Mobile Device ;(iv) Wireless Network.			

Course Code	Course Title	Credits				
PCS3F1C	Elective I- Track C. Business Intelligence and Big Data	04				
	Analytics –II (Mining Massive Data sets)	04				
Unit I: Introduction To Big Data Big data: Introduction to Big data Platform, Traits of big data, Challenges of conventional						
systems, Web data, Analytic processes and tools, Analysis vs Reporting, Modern data analytic						
tools, Statistical concepts: Sampling distributions, Re-sampling, Statistical Inference, Prediction						
error. Data Analysis: Regression modeling, Analysis of time Series: Linear systems analysis,						
Nonlinear dynamics, Rule induction, Neural networks: Learning and Generalization, Competitive						
Learning,	Principal	Component				
Analysisand Neura	lNetworks,FuzzyLogic:ExtractingFuzzyModelsfromData,Fuzzy					
Decision Trees, St	ochastic Search Methods.					
Unit II: MAP REDUCE Introduction to Map Reduce: The map tasks, Grouping by key, The reduce tasks, Combiners						
Details of MapReduce Execution, Coping with node failures. Algorithms Using MapReduce:						
Matrix-Vector Multiplication, Computing Selections and Projections, Union, Intersection, and						
Difference, Natural Join. Extensions to MapReduce: Workflow						
Systems, Recursive extensions to MapReduce, Common map reduce algorithms.						
Unit III: SHINGLING OF DOCUMENTS Finding Similar Items, Applications of Near-Neighbor Search, Jaccard similarity of sets, Similarity						
of documents, Collaborative filtering as a similar-sets problem, Documents, k- Shingles, Choosing						
the Shingle Size, Hashing Shingles, Shingles built from Words. Similarity-Preserving Summaries of						
Sets, Locality-Sensitive hashing for documents. The						
Theory of Locality	heory of Locality-Sensitive functions. Methods for high degrees of similarity.					
Unit IV: MINING DATA STREAMS

Introduction to streams concepts – Stream data model and architecture, Stream computing, Sampling data in a stream, Filtering streams, Counting distinct elements in a stream, Estimating moments, Counting oneness in a Window, Decaying window, Real time analytics Platform(RTAP). Text book:

- Mining of Massive Datasets, AnandRajaraman and Jeffrey David Ullman, Cambridge University Press, 2012.
- BigData, BigAnalytics: Emerging Business Intelligence and Analytic Trends for

Today's Businesses, Michael Minelli, Wiley, 2013

References:

- Big Data for Dummies, J. Hurwitz, et al., Wiley, 2013
- Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data, Paul C. Zikopoulos, Chris Eaton, Dirk deRoos, Thomas Deutsch, George Lapis, McGraw-Hill,2012.
- Big data: The next frontier for innovation, competition, and productivity, James Manyika, Michael Chui, Brad Brown, Jacques Bughin, Richard Dobbs, Charles Roxburgh, Angela Hung Byers, McKinsey Global Institute May2011.
- Big Data Glossary, Pete Warden, O'Reilly, 2011.
- Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph, DavidLoshin, Morgan Kaufmann Publishers, 2013

Р	Practical Course on Elective II-Track C: Business Intelligence and Big Data Analytics - II		
	(Mining Massive Data sets -I)		
Sr. No	List of Practical Experiments on Elective II-Track C: Business Intelligence and Big		
	Data Analytics – II (Mining Massive Data sets -I)		
1	Generate regression model and interpret the result for a given data set.		
2	Generate forecasting model and interpret the result for a given data set.		
3	Write a map-reduce program to count the number of occurrences of each alphabetic		
	character in the given dataset. The count for each letter should be case-insensitive (i.e.,		
	include both upper-case and lower-case versions of the		
	letter; Ignore non-alphabetic characters).		
4	Write a map-reduce program to count the number of occurrences of each word in the		
	given dataset. (A word is defined as any string of alphabetic characters appearing		
	between non-alphabetic characters like nature's is two words. The count should be		
	case-insensitive. If a word occurs multiple times in a line, all		
	should be counted)		
5	Write a map-reduce program to determine the average ratings of movies. The		
	input consists of a series of lines, each containing a movie number, user number, rating		
	and a timestamp.		
6	Write a map-reduce program: (i) to find matrix-vector multiplication; (ii) to		
	computeselectionsandprojections;(iii)to find union, intersection, difference,		
	natural Join for a given dataset.		
7	Write a program to construct different types of k-shingles for given document.		
8	Write a program for measuring similarity among documents and detecting		
	passages which have been reused.		
9	Write a program to compute the n- moment for a given stream where n is given.		
10	Write a program to demonstrate the Alon-Matias-Szegedy Algorithm for second		
	moments.		

Note: The experiments may be done using software/tools like Hadoop / WEKA / R / Java etc.

Course Code	Course Title	Credits
PCS3E1D	Elective I- Track D: Machine Intelligence - II	04
	(Advanced Machine Learning Techniques)	

Unit I: Probability

A brief review of probability theory, Some common discrete distributions, Some common continuous distributions, Joint probability distributions, Transformations of random variables, Monte Carlo approximation, Information theory. Directed graphical models (Bayes nets): Introduction, Examples, Inference, Learning, Conditional independence properties of DGMs. Mixture models and EM algorithm: Latent variable models, Mixture models, Parameter estimation for mixture models, The EM algorithm.

Unit II: Kernels

Introduction, kernel function, Using Kernel inside GLMs, kernel trick, Support vector machines, Comparison of discriminative kernel methods.

Markov and hidden Markov models: Markov models, Hidden Markov Models (HMM), Inference in HMMs, Learning for HMMs. Undirected graphical models (Markov random fields): Conditional independence properties of UGMs, Parameterization of MRFs, Examples of MRFs, Learning, Conditional random fields (CRFs), applications of CRFs.

Unit III: Monte Carlo inference

Introduction, Sampling from standard distributions, Rejection sampling, Importance sampling, Particle filtering, Applications: visual object tracking, time series forecasting, Rao-Blackwellised Particle Filtering (RBPF). Markov chain Monte Carlo (MCMC) inference: Gibbs sampling, Metropolis Hastings algorithm, Speed and accuracy ofMCMC.

Unit IV: Graphical model structure learning

Structure learning for knowledge discovery, Learning tree structures, Learning DAG structure with latent variables, Learning causal DAGs, Learning undirected Gaussian graphical models, Learning undirected discrete graphical models. Deep learning: Deep generative models, Deep neural networks, Applications of deep networks.

Text book:

• Machine Learning: A Probabilistic Perspective: Kevin P Murphy, The MIT Press Cambridge(2012).

References:

- Introducing Monte Carlo Methods with R, Christian P. Robert, George Casella, Springer,2010
- Introduction to Machine Learning (Third Edition): EthemAlpaydin, The MIT Press (2015).
- Pattern Recognition and Machine Learning: Christopher M. Bishop, Springer (2006)

- Bayesian Reasoning and Machine Learning: David Barber, Cambridge University Press (2012).
- Statistical And Machine Learning Approaches For Network Analysis, Edited By Matthias Dehmer, Subhash C. Basak: John Wiley & Sons, Inc(2012)
- Practical Graph Mining with R: Edited by Nagiza-F-Samatova et al, CRC Press (2014)
- https://class.coursera.org/pgm/lecture/preview

Note:

OnemayuseprogramminglanguageslikeR,Python,Pajeketc

and open software/

toolslike(i)EGONet;(ii)Ora;(iii)Netlogo;(iv)Pajek;and(v)NetDraw;todothe

practical experiments.

M.Sc. II Computer Science

M.Sc. II Computer Science

	Practical Course on Elective II- Track D:Machine Intelligence-II(Advanced Machine Learning Techniques)		
Sr.	List of Practical Experiments on Elective II-		
No	Track D:Machine Intelligence-II(Advanced Machine Learning Techniques)		
1	Find probability density function or probability mass function, cumulative distribution		
	function and joint distribution function to calculate probabilities and quantiles for standard statistical distributions.		
2	Create a Directed Acyclic Graph (DAG) using (i) set of formulae (ii) set of vectors and (iii)		
2	set of matrices. Find parents and children of nodes. Read conditional independence		
	from DAG. Add and remove edges from graph.		
3	Create a Bayesian network for a given narrative. Set findings and ask queries [One may		
	use narratives like 'chest clinic narrative' and package gRain for the purpose].		
4	Implement EM algorithm.		
5	Use string kernel to find the similarity of two amino acid sequence where similarity is		
	defined as the number of a substring incommon.		
6	Demonstrate SVM as a binary classifier.		
7	Create a random graph and find its page rank.		
8	Apply random walk technique to a multivariate time series.		
9	Implement two stage Gibbs Sampler.		
10	Implement Metropolis Hastings algorithm.		

Detailed syllabus of semester – IV

Course Code	Course Title	Credits		
PCS4SIM	Simulation and Modeling	04		
Unit I: Introduction Introduction to Simulation, Need of Simulation, Time to simulate, Inside simulation software:				
Modeling the pro	Modeling the progress of Time, Modeling Variability, Conceptual Modeling: Introduction to			
Conceptual mode	eling, Defining conceptual model, Requirements of the concep	otual model,		
Communicating t	Communicating the conceptual model, Developing the Conceptual Model: Introduction, A			
framework for co	framework for conceptual modeling, methods of model simplification.			
Unit II: Model Ve	rification and Validation			
Data Collection a	and Analysis: Introduction, Data requirements, Obtainingdata, I	Representing		
unpredictable variability, Selecting statistical distributions. Obtaining Accurate Results:				
Introduction, The	e nature of simulation models and simulation output, Issues	in obtaining		
accurate simulati	accurate simulation results, example model, dealing with initialization bias: warm-up and initial			
conditions, Select	conditions, Selecting the number of replications and run-length. Searching the Solution Space:			
ntroduction, The nature of simulation experimentation, Analysis of results from a single				
scenario, Comparing alternatives, Search experimentation, and Sensitive analysis. Verification,				
Validation and Confidence: Introduction, Defining Verification and Validation, The difficulties of				
verification and va	alidation, Methods of verification and validation, Independent			
verification and validation.				

Unit III: Modeling and simulation modeling

Types of models, Analytical vs Simulation modeling, Application of simulation modeling, Level of abstraction, Simulation Modeling. Methods, System Dynamics, Discrete Event Modeling, Agent Based modeling: Introduction to Agent, Agent-based modeling, Time in agent based models, Space in agent based models, Discrete space, Continuous space movement in continuous space, Communication between agents, Dynamic creation and destruction of agents, Statics on agent population, Condition triggered events and

transitioninagents.Buildingagentsbasedmodels:Theproblemstatement,Phasesof

modeling, Assumptions, 3 D animation. Dynamics Systems: Stock and flow diagrams, examples of stock and flow diagrams. Multi-method modeling: Architecture, Technical aspects of combining modeling methods, Examples.

Unit IV: Design and behavior of models

Designing state-based behavior: Statecharts, State transitions, Viewing and debugging Statecharts at runtime, Statecharts for dynamic objects. Discrete events and Event model object: Discrete event, Event-the simplest low level model object, Dynamic events, and Exchanging data with external world. Presentation and animation: Working with shapes, groups and colors, Designing interactive models: using controls, Dynamic properties of controls, 3D Animation. Randomness in Models: Probability distributions, sources of randomness in the model, randomness in system dynamics model, random number generators, Model time, date and calendar: Virtual and real time: The model time, date and calendar, Virtual and real-time execution modes.

Text book:

- Simulation: The Practice of Model Development and Use by Stewart Robinson, John Wiley and Sons, Ltd, 2004.
- TheBigBookofSimulationModeling:MultiMethodModelingbyAndrei Borshchev, 2013.

References:

- Agent Based Modeling and Simulation, Taylor S,2014.
- Simulation Modeling Handbook: A Practical Approach, Christopher A. Chung, 2003.
- Object Oriented Simulation: A Modeling and Programming Perspective, Garrido, José M,2009.
- Simulation, Modeling and Analysis, Averill M Law and W. David Kelton, "Tata McGraw Hill, Third Edition, 2003.
- Process Control: Modeling, Design and Simulation, Wayne Bequette W, Prentice Hall of India, 2003.

	Practical course on Simulation and modeling		
Sr.	List of Practical Experiments		
No	on Simulation and modeling		
1	Design and develop agent based model by		
	Creating the agentpopulation		
	Defining the agentbehavior		
	Add a chart to visualize the modeloutput.		
	[Use a case scenario like grocery store, telephone call center etc for the purpose].		
2	Design and develop agent based model by		
	Creating the agentpopulation		
	Defining the agentbehavior		
	Adding a chart to visualize the modeloutput		
	Adding word of moutheffect		
	Considering product discards		
3	Design and develop agent based model by		
	Creating the agentpopulation		
	Defining the agentbehavior		
	Adding a chart to visualize the modeloutput		
	Adding word of moutheffect		
	Considering product discards		
	Consider deliverytime		
	Simulating agentimpatience		
	Comparing model runs with different parameter values		
	[Use a scenario like marketmodel]		

4	Design and develop System Dynamic modelby
	Creating a stock and flowdiagram
	Adding a plot to visualizedynamics
	ParameterVariation
	Calibration
	Use a case scenario like spread of contagious disease for the purpose
5	Design and develop a discrete-event model that will simulate process by:
	Creating a simplemodel
	Addingresources
	Creating 3Danimation
	Modelingdelivery
	[Use a case situation like a company's manufacturing and shipping].
6	Design and develop time-slice simulation for a scenario like airport model to design how passengers move within a small airport that hosts two airlines, each with their own gate. Passengers arrive at the airport, check in, pass the security checkpoint and then go to the waiting area. After boarding starts, each airline's
	representatives check their passengers' tickets before they allow them to board.
7	Verify and validate a model developed like bank model or manufacturing model
8	Create defense model to stimulate aircraft behavior
9	Stimulate the travelling sales man problem to compute the shortest path.
10	Stimulate the Urban dynamics to address the scenarios like:
	(a) The problem of public transportline
	(b) To compute the time taken for train to enter thestation

Course Code	Course Title	Credits
PCS4S1A	Specialization: Cloud Computing -III	04
	(Building Clouds and Services)	

Unit I: Specialized Cloud Mechanisms: Automated Scaling listener, Load Balancer, SLA monitor,

Pay-per-use monitor, Audit monitor, fail over system, Hypervisor, Resource Centre, Multi device

broker, State Management Database.

Unit II: Fundamental Cloud Architectures: Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture. Advanced

Cloud Architectures: Hypervisor Clustering Architecture, Load Balanced Virtual Server Instances Architecture, Non-Disruptive Service Relocation Architecture, Zero Downtime Architecture, Cloud Balancing Architecture, Resource Reservation Architecture, Dynamic Failure Detection and Recovery Architecture, Bare-Metal Provisioning Architecture, Rapid Provisioning Architecture, Storage Workload Management Architecture

Unit III: Cloud Management: System Center 2012 and Cloud OS, Provisioning Infrastructure:

Provisioning Infrastructure with Virtual Machine Designing, Planning and Implementing.

Managing Hyper-V Environment with VMM 2012. Provisioning Self-service with App Controller.

Unit IV: Implementing Monitoring: Real-time monitoring with Operations Manager, Proactive monitoring with Advisor, Operations Design, Planning, Implementation, Administration, Monitoring, Alerting, Operations and Security reporting. Building private clouds: Standardization with service manager, Service Manager 2012: Design, Planning, Implementing, Incident Tracking, Automation with orchestrator, System Orchestrator 2012.

Text book:

- Cloud Computing Concepts, Technology & Architecture, Thomas Erl, ZaighamMahmood, and Ricardo Puttini, Prentice Hall, 2013.
- Cloud Security A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley Publishing, Inc., 2010.
- Open Stack Cloud Computing Cookbook, Kevin Jackson, Cody Bunch, Egle
 Sigler, Packt Publishing, Third Edition, 2015.

Reference:

- Tom Fifield, Diane Fleming, Anne Gentle, Lorin Hochstein, Jonathan Proulx, Everett Toews, and Joe, Topjian, OpenStack Operations Guide, O'Reilly Media, Inc, 2014.
- NIST Cloud Computing Standards Roadmap, Special Publication 500-291, Version 2, NIST, July 2013, http://www.nist.gov/itl/cloud/upload/NIST_SP-500- 291_Version-2_2013_June18_FINAL.pdf
- https://www.openstack.org
- http://cloudstack.apache.org
- http://www.foss-cloud.org/en/wiki/FOSS-Cloud
- http://www.ubuntu.com/cloud/openstack/autopilot

	Practical Course on Cloud Computing -III (Building Clouds and Services)		
Sr.	List of Practical Experiments on Cloud Computing -III (Building Clouds and Services)		
No			
1	Managing private cloud with App Controller		
2	Perform the practical Using Orchestrator for automation		
3	Implement Windows Azure Pack		
4	Implement VMWAreESXi Server		

5	Managing and working of XEN for server virtualization
6	Implement Hyper-V server virtualization using server 2012
7	Managing vmware ESXi with vCentre server
8	Perform Practical to Manage xen server or Xen center
9	Design and Understanding blade server with cisco UCS/HP eva simulator
10	Perform Provisioning Self-service with App Controller

Course Code	Course Title	Credits
PCS4S2B	Specialization: Cyber and Information Security	04
	(Cryptography and Crypt Analysis)	

Unit I: Introduction to Number Theory

Topics in Elementary Number Theory: O and notations, time estimates for doing arithmeticdivisibility and the Euclidean algorithm, Congruence: Definitions and properties, linear congruence, residue classes, Euler's phi function, Fermat's Little Theorem, Chinese Reminder Theorem, Applications to factoring, finite fields, quadratic residues and reciprocity: Quadratic residues, Legendre symbol, Jacobi Symbol. (proofs of the theorems are not expected to cover).

Unit II: Simple Cryptosystems

Shift Cipher, Substitution Cipher, Affine Cipher, Vigenère Cipher, Vermin Cipher, Hill Cipher, Permutation Cipher, Stream Cipher, Cryptanalysis of Affine Cipher, Substitution Cipher, Vigenère Cipher and Hill Cipher, Block Ciphers, Algorithm Modes, DES, Double DES, Triple DES, Meet-in-Middle Attack, AES, IDEA algorithm. Cryptographic Hash Functions: Hash Functions and Data Integrity, Security of Hash Functions, Secure Hash

Algorithm, Message Authentication Code, Nested MACs, HMAC.

Unit III: RSA Cryptosystem

The RSA Algorithm, Primarily Testing, Legendre and Jacobi Symbols, The Solovay- Strassen Algorithm, The Miller-Rabin Algorithm, Factoring Algorithm: The pollard p-1 Algorithm, Dixon's Random Squares Algorithm, Attacks on RSA, The Rabin Cryptosystem. Public Key Cryptosystems: The idea of public key Cryptography, The Diffie-Hellman Key Agreement, ElGamal Cryptosystem, The Pollard Rho Discrete

Logarithm Algorithm, Elliptic Curves, Knapsack problem. Unit IV: Key Distribution and Key Agreement Scheme

Diffie-Hellman Key distribution and Key agreement scheme, Key Distribution Patterns, Mitchell-Piper Key distribution pattern, Station-to-station protocol, MTI Key Agreement scheme. Public-Key Infrastructure:What is PKI?, Secure SocketLayer, Certificates,

Certificate Life cycle, Trust Models: Strict Hierarchy Model, Networked PKIs, The web browser Model, Pretty Good Privacy.

Text book:

- Discrete Mathematics and Its Applications, Kenneth H. Rosen, 7th Edition, McGraw Hill,2012.
- Cryptography Theory and Practice, 3rd Edition, Douglas R. Stinson, 2005.

Reference:

- Network Security and Cryptography, AtulKahate, McGraw Hill, 2003.
- Cryptography and Network Security: Principles and Practices, William Stalling, Fourth Edition, Prentice Hall, 2013.
- Introduction to Cryptography with coding theory, second edition, Wade Trappe, Lawrence C. Washington, Pearson, 2005.

	Practical Course on Specialization: Cyber & Information Security (Cryptography and		
	Crypt Analysis)		
Sr.	List of Practical Experiments on Specialization: Cyber & Information Security		
No	(Cryptography and Crypt Analysis)		
1	Write a program to implement following:		
	Chinese ReminderTheorem		
	Fermat's LittleTheorem		
2	Write a program to implement the (i) Affine Cipher (ii) Rail Fence Technique (iii) Simple		
	Columnar Technique (iv) Vermin Cipher (v) Hill Cipher to perform		
	encryption and decryption.		
3	Write a program to implement the (i) RSA Algorithm to perform encryption and decryption.		
4	Write a program to implement the (i) Miller-Rabin Algorithm (ii) pollard p-1		
	Algorithm to perform encryption and decryption.		
5	Write a program to implement the ElGamal Cryptosystem to generate keys and		
	perform encryption and decryption.		
6	Write a program to implement the Diffie-Hellman Key Agreement algorithmto		
	generate symmetric keys.		
7	Write a program to implement the MD5 algorithm compute the message digest.		
8	Write a program to implement different processes of DES algorithm like (i) Initial		
	Permutation process of DES algorithm, (ii) Generate Keys for DES algorithm, (iii) S-Box		
	substitution for DES algorithm.		
9	Write a program to encrypt and decrypt text using IDEA algorithm.		
10	Write a program to implement HMAC signatures.		

Course Code	Course Title	Credits
PCS4S3C	Specialization: Business Intelligence and Big Data	04
	Analytics (Intelligent Data Analysis)	

Unit I: Clustering

Distance/Similarity, Partitioning Algorithm: K-Means; K-Medoids, Partitioning Algorithm for large data set: CLARA; CLARANS, Hierarchical Algorithms: Agglomerative (AGNES); Divisive (DIANA), Density based clustering: DBSCAN, Clustering in Non- Euclidean Spaces, Clustering for Streams andParallelism.

Unit II: Classification

Challenges, Distance based Algorithm: K nearest Neighbors and kD-Trees, Rules and Trees based Classifiers, Information gain theory, Statistical based classifiers: Bayesian classification, Document classification, Bayesian Networks. Introduction to Support

Vector Machines, Evaluation: Confusion Matrix, Costs, Lift Curves, ROC Curves, Regression/model trees: CHAID (Chi Squared Automatic Interaction Detector). CART (Classification And Regression Tree).

Unit III: Dimensionality Reduction

Introduction to Eigen values and Eigen vectors of Symmetric Matrices, Principal- Component Analysis, Singular-Value Decomposition, CUR Decomposition.

Unit IV: Link Analysis And Recommendation Systems

Link analysis: PageRank, Efficient Computation of PageRank, Topic-Sensitive PageRank, Link Spam. Recommendation Systems: A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering, Dimensionality Reduction.

Text book:

- Mining of Massive Datasets, AnandRajaraman and Jeffrey David Ullman, Cambridge University Press, 2012.
- DataMining:IntroductoryandAdvancedTopics,MargaretH.Dunham,Pearson, 2013.

Reference:

- Big Data for Dummies, J. Hurwitz, et al., Wiley, 2013.
- Networks, Crowds, and Markets: Reasoning about a Highly Connected World, David Easley and Jon Kleinberg, Cambridge University Press, 2010.
- Lecture Notes in Data Mining, Berry, Browne, World Scientific, 2009.
- Data Mining: Concepts and Techniques third edition, Han and Kamber, Morgan Kaufmann, 2011.
- Data Mining Practical Machine Learning Tools and Techniques, Ian H. Witten, Eibe Frank, The Morgan Kaufmann Series in Data Management Systems, 2005.
- Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL and Graph, David Loshin, Morgan Kaufmann Publishers,
 - 2013.

	Practical Course on Specialization: Business Intelligence & Big Data Analytics							
	(Intelligent Data Analysis)							
Sr.	List of Practical Experiments on Specialization: Business Intelligence & Big							
No.	Data Analytics (Intelligent Data Analysis)							
1	Pre-process the given dataset and hence apply clustering techniques like K- Means, K-Medoids. Interpret the result.							
2	Pre-process the given data set and hence apply partition clustering algorithms. Interpret the result							
3	Pre-process the given data set and hence apply hierarchical algorithms and density based clustering techniques. Interpret the result.							

4	Pre-process the given data set and hence classify the resultant data set using tree								
	classification techniques. Interpret the result.								
5 Pre-process the given data set and hence classify the resultant data set using Stat									
	based classifiers. Interpret the result.								
6	Pre-process the given data set and hence classify the resultant data set using support								
vector machine. Interpret the result.									
7	Write a program to explain different functions of Principal Components.								
8	Write a program to explain CUR Decomposition technique.								
9	Write a program to explain links to establish higher-order relationships among entities in								
	Link Analysis.								
10	Write a program to implement step-by-step a Collaborative Filtering								
	Recommender System.								
The e	xperiments may be done using software/ tools like R/Weka/Java etc.								

Course Code	Course Title	Credits
PCS4S4D	Specialization: Machine Learning -III	04
	(Computational Intelligence)	

Unit I: Artificial Neural Networks

The Artificial Neuron, Supervised Learning Neural Networks, Unsupervised Learning Neural Networks, Radial Basis Function Networks, Reinforcement Learning, Performance Issues.

Unit II: Evolutionary Computation

Introduction to Evolutionary Computation, Genetic Algorithms, Genetic Programming, Evolutionary Programming, Evolution Strategies, Differential Evolution, Cultural Algorithms, Coevolution.

Unit III: Computational Swarm Intelligence

Particle Swarm Optimization(PSO) - Basic Particle Swarm Optimization, Social Network Structures, Basic Variations and parameters, Single-Solution PSO. Advanced Topics and applications. Ant Algorithms- Ant Colony Optimization Meta-Heuristic, Cemetery Organization and Brood Care, Division of Labor, Advanced Topics and applications.

Unit IV: Artificial Immune systems, Fuzzy Systems and Rough Sets

Natural Immune System, Artificial Immune Models, Fuzzy Sets, Fuzzy Logic andReasoning, Fuzzy Controllers, Rough Sets.

Text book:

• Computational Intelligence- An Introduction (Second Edition): Andries P. Engelbrecht, John Willey & Sons Publications(2007).

Reference:

- Computational Intelligence And Feature Selection: Rough And Fuzzy Approaches, Richard Jensen QiangShen, IEEE Press Series On Computational Intelligence, A John Wiley & Sons, Inc., Publication, 2008.
- Computational Intelligence And Pattern Analysis In Biological Informatics, (Editors).UjjwalMaulik,SanghamitraBandyopadhyay,JasonT.L.Wang,John Wiley & Sons, Inc, 2010.

- Neural Networks for Applied Sciences and Engineering: From Fundamentals to Complex Pattern Recognition 1st Edition, SandhyaSamarasinghe, Auerbach Publications, 2006.
- Introduction to Evolutionary Computing (Natural Computing Series) 2nd ed, A.E. Eiben, James E Smith, Springer;2015.
- Swarm Intelligence, 1st Edition, Russell C. Eberhart, Yuhui Shi, James Kennedy, Morgan Kaufmann,2001
- Artificial Immune System: Applications in Computer Security, Ying Tan, Wiley- IEEE Computer Society, 2016.
- Computational Intelligence and Feature Selection: Rough and FuzzyApproaches 1st Edition, Richard Jensen, QiangShen, Wiley-IEEE Press, 2008

	Practical Course on Specialization: Machine Intelligence (Computational Intelligence)
Sr	List of Practical Experiments on Specialization:
No	Machine Intelligence
	(Computational Intelligence)
1	Implement feed forward neural network for a given data.
2	Implement Self Organizing Map neural network.
3	Implement Radial Basis Function neural network with gradient descent.
4	Implement a basic genetic algorithm with selection, mutation and crossover as
	genetic operators.
5	Implement evolution strategy algorithm.
6	Implement general differential evolution algorithm.
7	Implement gbest and Ibest of PSO.
8	Implement simple Ant colony optimization algorithm.
9	Implement basic artificial immune system algorithm.
10	Apply different defuzzification methods for centroid calculation of a given fuzzy
	rule base.
Note:	: The above practical experiments may use programming languages like C, Java, R etc.

Scheme of Examination for Theory Courses

There will be internal and external examination for the theory courses. The weightage of internal/external and scheme of examination will be as per common guidelines provided by the University for the PG courses in the faculty of Science.

Scheme of Examination for Practical Courses

There will not be any internal examination for practical courses.

External Examination for practical courses:

The evaluation of the external examination of practical course is given below:

Sr	Semester	Course	Particul	ar	No of Marks		Total
No		Code			questions	per	Marks
						question	
			Laboratory	experiment			
			Question		2	40	80
		PCS3PPR1	Journal		-	10	10
1			Viva		-	10	10
		Ma	arks for each cours	100			
			Laboratory	experiment	2	25	50
		II PCS3PPR2	Question				
			Journal		-	10	10
2			Viva		-	10	10
			viva on Project	Document	ation	10	
			Proposal	Presentati	on	10	30
				Viva		10	
	·		Total Marks		100		

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Sr	Semester	Course	Particular			No of	Marks	Total
No		Code				questions	per	Marks
							question	
			Laborator	y exper	iment			
	question					2	40	80
1	IV	PCS4PPR1	Journal			-	10	10
			Viva			-	10	10
				Total Marks			100	
					Qualit	y and	40	
				Internship	releva	nce		100
			Intern-	conduct	Docur	nentation	30	
2			ship		Preser	ntation	30	
	IV	PCS4PPR2		Internship	Viva		50	50
			Total Marks				150	C
					Qualit	y and	40	
				Project	relevance			100
			Project	conduct	Docur	nentation	30	1
			Implem		Preser	ntation	30	
3	IV	PCS4PPR3	entation					
				Project viva			50	50
			Total Marks				150	D

Guide lines for maintenance of journals:

A student should maintain a journal with at least six practical experiments for each part of the practical course. Certified journals need to be submitted at the time of the practical examination.

Guidelines for Project Proposal in Semester - III

- Student should take a topic related to the specialization he or she is planning to take inSemester-IV.
- Should have studied the related topics in the elective he or she has chosen in semester-II and semester-III
- A student is expected to devote at least 2 to 3 months of study as part of topic selection and itsdocumentation.
- The student should be comfortable to implement the proposal in the semester IV.

Guidelines for Documentation of Project Proposal in Semester –III

Student is expected to make a project proposal documentation which should contain the following:

- **Title:** A suitable title giving the idea about what work isproposed.
- **Introduction:** An introduction to the topic of around 3-5 pages, giving proper back ground of the topic discussed.
- **Related works:** A detailed survey of the relevant works done by others in the domain. Student is expected to refer at least 5 research papers in addition to text books and weblinks in the relevant topic. It may be around 7 to 10pages.
- **Objective:** A detailed objective of the proposal is needed. It may be of 1 to 2 pages.
- **Methodology:** A proper and detailed procedure of how to solve the problem discussed. It shall contain the techniques, tools, software and data to be used. It shall be of around 3 to 5pages.

The report may be of around 20 pages, which needs to be signed by the teacher in charge and head of the Department. Students should submit the signed project proposal documentation at the time of viva as part of the University examination.

Guidelines for internship in Semester - IV

- Internship should be of 2 to 3 months with 8 to 12 weeksduration.
- A student is expected to find internship by himself or herself. However, the institution should assist their students in getting internship in goodorganizations.
- The home institution cannot be taken as the place of internship.
- A student is expected to devote at least 300 hours physically at theorganization.
- Internship can be on any topic covered in the syllabus mentioned in the syllabus, not restricted to the specialization.
- Internship can be done, in one of the following, but not restricted to, types of organizations:
 - Software developmentfirms
 - Hardware/ manufacturingfirms
 - Any small scale industries, service providers likebanks
 - Clinics/ NGOs/professional institutions like that of CA, Advocateetc
 - Civic Depts like Ward office/post office/police station/punchayat.
 - Research Centres/ University Depts/ College as research Assistant for research projects or similarcapacities.

Guidelines for making Internship Report in Semester –IV

A student is expected to make a report based on the internship he or she has done in an organization. It should contain thefollowing:

- **Certificate:** A certificate in the prescribed Performa (given in appendix 1) from the organization where the internshipdone.
- **Evaluation form:** The form filled by the supervisor or to whom the intern was reporting, in the prescribed Performa (given in appendix2).

- **Title:** A suitable title giving the idea about what work the student has performed during theinternship.
- **Description of the organization:** A small description of 1 to 2 pages on the organization where the student hasinterned
- Description about the activities done by the section where the intern has worked: A description of 2 to 4 pages about the section or cell of the organization where the intern actually worked. This should give an idea about the type of activity a new employee is expected to do in that section of the organization.
- **Description of work allotted and actually done by the intern:** A detailed description of the work allotted and actual work performed by the intern during the internship period. Intern may give a weekly report of the work by him or her if needed. It shall be of around 7 to 10pages.
- Self assessment: A self assessment by the intern on what he or she has learnt during the internship period. It shall contain both technical as well as inter personal skills learned in the process. It shall be of around 2 to 3pages.

The internship report may be around 15 pages and this needs to be submitted to the external examiner at the time of University examination.

Guidelines for Research Implementation in Semester - IV

- Student should continue with topic proposed and evaluated at the semester –III.
- The topic has to be related with the specialization he or she has chosen in the semester IV.
- A student is expected to devote at least 3 to 4 months of efforts for the implementation.
- Student should submit a detailed project implementation report at the time of viva.

Guidelines for Documentation of Project Proposal in Semester –IV

A Student should submit project implementation report with following details:

- **Title:** Title of the project (Same as the one proposed and evaluated at the semester IIexamination).
- **Implementation details:** A description of how the project has been implemented. It shall be of 2 to 4pages.
- Experimental set up and results: A detailed explanation on how experiments were conducted, what software used and the results obtained. Details like screen shots, tables and graphs can come here. It shall be of 6 to 10pages.
- Analysis of the results: A description on what the results means and how they have been arrived at. Different performing measures or statistical tools used etc may be part of this. It shall be of 4 to 6pages.
- **Conclusion:** A conclusion of the project performed in terms of its outcome (May be half apage).
- **Future enhancement:** A small description on what enhancement can be done when more time and resources are available (May be half apage).
- **Program code:** The program code may be given asappendix.

The report may be of around 20 pages (excluding program code), which needs to be signed by the teacher in charge and head of the Department. Student should submit the signed project implementation report along with evaluated copy of the project proposal documentation (of semester –III) at the time of Project evaluation and viva as part of the University examination.

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Appendix 1

(Proforma for the certificate for internship in official letter head)

This	is	to	certify	that	Mr/Ms_	of
			(College/I	Institution	worked as an intern as part of her MSc course in
Compu	iter Sc	ience o	of Universi	ity of M	umbai. The	e particulars of internship are givenbelow:
Interns	hipsta	rtingda	ate:			
Interns	hipen	dingda	te:			
Actual	numb	er of d	aysworked	l:		
Tentati	ve nu	mber o	fhourswor	ked:		Hours
Broad	area o	f work	:			
A smal	l desc	ription	of work d	one by t	he intern d	uring the period:
Signatu	are:					
Name:						
Design	ation:					
Contac	t num	ber:				
Email:						

(seal of the organization)

Appendix 2

(Proforma for the Evaluation of the intern by the supervisor/to whom the intern was

reporting in the organization)

Professional Evaluation of intern

Nameofintern:

College/institution:_____

[Note: Give a score in the 1-5 scale by putting $\sqrt{}$ in the respectivecells]

Sr	Particular	Excellent	Very	Good	Moderate	Satisfactory
No			Good			
1	Attendance					
2	Punctuality					
3	Adaptability					
4	Ability to shoulder					
	responsibility					
5	Ability to work in					
	a team					
6	Written and oral					
	communication					
	skills					
7	Problem solving					
	skills					
8	Ability to grasp					
	new concepts					
9	Ability to					
	complete task					
10	Quality of work					
	done					

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Comments:

Signature:

Name:

Designation:

Contact number:

Email:

(seal of the organization)
S.Y.B.Com. Computer Programming





Janardan Bhagat Shikshan Prasarak Sanstha's CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC 'College with Potential for Excellence' Status Awarded by UGC 'Best College Award' by University of Mumbai

Program: B.Com. Revised Syllabus of S.Y.B.Com. Applied Component Choice Based Credit & Grading System (75:25) w.e.f. Academic Year 2020-21

APPLIED COMPONENT Computer Programming Based on Credit Based and Grading System

Name of the Programme: S.Y.B.Com

Course Title: Computer Programming I and II (Skill enhancement Course)

Credit Structure: No. of Credits per Semester for Theory - 02

No. of Credits per Semester for Practical - 01

No. of lectures per Practical: 03

Work load (No. of theory lectures per week): 03

No. of practicals per week : 1 practical of 3 lecture periods

Scheme of Examination:

Theory - 75 marks: 2¹/₂ hours at the end of each semester.

Practical - 25 marks: 01 hour at the end of each semester

Conduct of Semester End Theory Examination (Total 75 marks)

- (a) At the end of each semester, examination of 2¹/₂ hours duration of 75 marks based on three units shall be held.
- (b) All questions shall be compulsory with internal choice within the questions. Each Question may be sub-divided into sub questions as a, b, c, d & e, etc. & the allocation of Marks depends on the weightage of the topic.

Question	Based on	Marks
Q.1	Objective based on Unit I,II,III	15
Q.2	Unit I	20
Q.3	Unit II	20
Q.4	Unit III	20

SEMESTER III Computer Programming - I

Course Code:UC3AP1

Course Outcome:

- 1) To give brief knowledge of computer hardware, software and system.
- 2) To understand all functionality of Word.
- 3) To use excel in different functions corresponding to different scenario.
- 4) To perform operations in excel as per the need

Unit	Details	Lectures			
Ι	Introduction to Computer Systems	15			
	(a) Computer Fundamentals: History and basic structure of a computer.				
	Types of Computers: Super, mainframe, mini and micro computers. Types				
	of micro computers: Desktop, laptop, tablet PC, PDA (Personal Digital				
	Assistant). Units of measurement of computer memory: BITS, BYTES, KB,				
	MB, GB, TB, etc. Terms: Hardware and Software.				
	(b)Hardware Devices: Components of motherboard: I.C.s, bus lines, clock,				
	micro processor chip, memory chips, ports, power supply. Types of Input				
	and Output Devices. Types of Primary memory and Secondary memory storage devices.				
	(c)Software: System and Application software, Types of System and				
	Application software. FOSS. Types of Operating System, examples like				
	DOS, UNIX, LINUX, Windows, Different versions of Windows. Features				
	of Windows, Compilers and Interpreters, Higher and Lower Level				
	languages, Compiler and Interpreter based languages.				
II	(a) Introduction to a word processor: create and save a document.	15			
	(b) Edit and format text: text style (B, I, U), font type, font size, text colour,				
	alignment of text. Format paragraphs with line and/or paragraph spacing. Add				
	headers and footers, numbering pages, grammar and spell check utilities,				
	subscript and superscript, insert symbols, use print preview, and print a				
	document.				
	(c) Insert pictures, change the page setting, add bullets and numbering, borders				
	and shading, and insert tables – insert/delete rows and columns, merge and split				
	cells.				
	(d) Use of drawing tools, shapes and mathematical symbols.				
III	Spread Sheet Package (Microsoft Excel)				
	(a) Concept of Workbook, Worksheet, Cell				
	(b) Types of data, Entering, Editing, Deleting data, Fill command, Series				
	command, Custom list	15			
	(c) Selecting, Inserting, Deleting cells, Rows, Columns, Ranges, Cell				
	tormatting				
	(d) References: Mixed, Relative, Absolute.				
	(e) Formulas, Operators, Precedence of operators, Circular reference				

(f) Library Functions:-	
(i) Financial Functions:- FV(), PMT(), PV()	
(ii) Statistical Functions:- ABS(), AVERAGE(), MEDIAN(), MODE(),	
STDEV(), VAR()	
(iii) String Functions:- LEN(), RIGHT(), LEFT(), MID(), PROPER(),	
UPPER(), LOWER()	
(iv) Logical Functions: - AND (), OR(), NOT(), IF()	
(g) Hiding/ unhiding Rows, Columns; Background of sheet.	
(h) Data Validation, Conditional formatting, sorting, filter with customized	
condition, subtotal.	

(i) Chart Wizard: Bar, Pie, Line, Scatter plot.

Books and References:						
Sr. No.	Title	Author/s	Publisher	Edition	Year	
1	Computer Fundamentals	Rajaraman	PHI	4 th	2014	
2	Computer Fundamentals	P.K. Sinha	BPB	4^{th}	2016	
3	Excel 2019 All-in-One For Dummies Book	Greg Harvey	John Wiley & Sons Inc	1 st	-	
4	Excel 2007 Bible Book	John Walkenbach	Wiley india Pvt. Ltd	1 st	-	

 Write a paragraph perform the following activities: Select, copy and paste text in a document Select, cut and paste text in a document
 Select, copy and paste text in a document Select, cut and paste text in a document
2. Select, cut and paste text in a document
3. Replace text in a document using Find option
2 Write a paragraph perform the following activities:
1. Create a bulleted list of the items in a document
2. Create a numbered list of the items in a document
3 Write a paragraph perform the following activities:
1. Change the Font style of text using the ribbon
2. Change the Font style of text using a short cut menu
3. Change the Font size of text using the ribbon
4. Change the Font size of text using a short cut menu
4 Write a paragraph perform the following activities:
1. Align text to the left
2. Align text to the center
3. Align text to the right
4. Align text to both left and right margins
5 Creating an excel sheet to demonstrate bar graph, pie chart etc.
6 Demonstrating financial and statistical functions in spreadsheet
7 Demonstrating string and logical functions in spreadsheet
8 Demonstrating data analysis, sorting, filter with customized condition, subtotal

SEMESTER IV Computer Programming - II

Course Code:UC4AP1

Course Objectives:

The objective of this paper is to introduce various concepts of programming to the students using Python.

Expected learning outcomes:

- 1) Students should be able to understand the concepts of programming before actually starting to write programs.
- 2) Students should be able to develop logic for Problem Solving.
- 3) Students should be made familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc.

Unit	Details	Lectures
I	 Introduction to Python Language: Overview, Features of Python, Execution of a Python Program, Python Interpreter, Comparison of Python with C and Java, Installing Python, Writing & Executing, IDLE Data Types, Variables And Other Basic Elements: Comments, Data types-Numeric, Compound, Boolean, Dictionary, Sets, Mapping, Basic Elements of Python, Variables Input and Output Operations: Input Function, Output Statements, Command Line Arguments Operators: Arithmetic operators, Assignment operators, Unary minus operator, Relational operators, Logical operators, Bitwise operators, Membership operators, Identity operators, Precedence of Operators, Associativity of Operators Functions: Defining & Calling a Function, Returning Results, Returning Multiple Values, Built-in Functions, Parameters and Arguments, 	15
II	 Control Statements: The range function, the iterative for statement. The conditional statements if, if-else, if-elif-else. The iterative statements while, while-else, for-else. The continue statement to skip over one iteration of a loop, the break statement to exit the loop. Nested compound statements. Lists and Tuples: Lists, List Functions and Methods, List Operations, Tuples 	15
Ш	 Dictionaries: Creating a Dictionary, Operators in Dictionary, Dictionary Methods, Using for Loop with Dictionaries, Operations on Dictionaries. Strings :Creating Strings, Functions of Strings, Working with Strings, Length of a String, Indexing & Slicing, Repeating & Concatenation of Strings, Length of a String & Slicing, Repeating & Concatenation of Strings, Length of a String, Indexing & Slicing, Repeating & Concatenation of Strings, Length of a String, Indexing & Slicing, Repeating & Concatenation of Strings, Length of a String, Indexing & Slicing, Repeating & Concatenation of Strings, Length of strings, Indexing & Slicing, Repeating & Concatenation of Strings, Length of strings, Indexing & Slicing, Repeating & Concatenation of Strings, Length of strings, Indexing & Slicing, Repeating & Concatenation of Strings, Length of a String, Indexing & Slicing, Repeating & Concatenation of Strings, Length of a String, Indexing & Slicing, Repeating & Concatenation of Strings, Length of a Strings, Indexing & Slicing, Repeating & Concatenation of Strings, Length of a Strings, Indexing & Slicing, Repeating & Concatenation of Strings, Length of a Strings, Indexing & Slicing, Repeating & Concatenation of Strings, Length of a Strings, Strings, Length of a Strings, Indexing & Slicing, Repeating & Concatenation of Strings, Length of a Strings, Indexing & Slicing, Repeating & Concatenation of Strings, Length of a Strings, Indexing & Slicing, Repeating & Concatenation of Strings, Length of a Strings, Strings, Indexing & Slicing, Repeating & Concatenation of Strings, Length of a Strings, Slicing, Repeating & Concatenation of Strings, Length of a Strings, Slicing, Indexing & Slicing, Repeating & Concatenation of Strings, Slicing, S	15

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Beginning Python: From Novice to Professional,	Magnus Lie Hetland,	Apress		
2	Practical Programming: An Introduction to Computer Science Using Python 3,	Paul Gries, et al.	Pragmatic Bookshelf	2/E	2014
3	Introduction to Computer Science using Python	Charles Dierbach	Wiley		2013

List of P	ractical: (Can be done in python)
1	Installing and setting up the Python IDLE interpreter. Executing simple statements like expression
	statement (numeric and Boolean types), assert, assignment, delete statements; the print function
	for output.
2	Script and interactive modes; defining a function in the two modes; executing a script;
	interactively executing a statement list (semicolon-separated sequence of simple statements); the
	input function
3	Programs based conditional constructs, for statement and the range function;
4	Programs based on lists and its Functions, interactively using the built-in functions len, sum, max,
	min
5	Programs related to string manipulation and String functions
6	Programs based on the while statement
7	Programs using break and continue statements.
8	Programs related to dictionaries
9	Programs using list comprehensions and anonymous functions





Janardan Bhagat Shikshan Prasarak Sanstha's CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC 'College with Potential for Excellence' Status Awarded by UGC 'Best College Award' by University of Mumbai

> Program: B.A. Revised Syllabus of S.Y.B.A. Applied Component Choice Based Credit & Grading System (75:25) w.e.f. Academic Year 2020-21

Syllabus for III and IV Semester APPLIED COMPONENT Computer Programming Based on Credit Based and Grading System with Effect from the Academic Year 2020-21

Name of the Programme: S.Y.B.A.

Course Title: Computer Programming I and II (Applied Component)

Credit Structure: No. of Credits per Semester for Theory - 02

No. of Credits per Semester for Practical - 01

No. of lectures per Practical: 3

Work load (No. of lectures per week): 3

No. of practicals per week : 1 practical of 3 lecture periods

Scheme of Examination:

Theory - 75 marks: 2.5 hours at the end of each semester.

Practical - 25 marks: 01 hour at the end of each semester

Conduct of Semester End Theory Examination (Total 75 marks)

- (a) At the end of each semester, examination of 2.5 hours duration of 75 marks based on three units shall be held.
- (b) Pattern of Theory question paper at the end of each semester: Q1, Q2 and Q3 each shall be of 20 marks with internal choices based on units I, II and III respectively. Q.4 shall be of 15 marks with questions based on units I, II and III.

Conduct of Practical exam at the end of semesters III and IV (Total 25 marks)

- (a) Practical Exam:15 Marks
- (**b**) Viva and Journal: 05 marks.
- (c) Active Participation: 05 Marks.
- 1. The questions to be asked in the practical examination shall be from the list of practicals mentioned in the practical topics. A few simple modifications may be expected during the examination.
- 2. The semester end practical examination on the machine will be of ONE hour.
- 3. Students should carry a certified journal with minimum of 06 practicals (mentioned in the practical topics) at the time of examination.
- 4. Number of students per batch for the regular practical should not exceed 20. Not more than two students should be allowed on one computer at a time.

S.Y.B.A. Semester – III			- III
Course Name: Computer Programming-I		Course Code: UA3CP1	
Periods per week (1 Period is 50 minutes) 3		3	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	21/2	75
	Internal		25

Course Outcome:

- 1) To give brief knowledge of computer hardware, software and system.
- 2) To give idea of PPT and introduce all the functions in MS Power Point.
- 3) To prepare presentations PPT with all technical aspects.
- 4) To use excel in different functions corresponding to different scenario.
- 5) To perform operations in excel as per the need

Unit	Details	Lectures
Ι	Introduction to Computer Systems	15
	(a) Computer Fundamentals: History and basic structure of a computer.	
	Types of Computers: Super, mainframe, mini and micro computers. Types	
	of micro computers: Desktop, laptop, tablet PC, PDA (Personal Digital	
	Assistant). Units of measurement of computer memory: BITS, BYTES, KB,	
	MB, GB, TB, etc. Terms: Hardware and Software.	
	(b)Hardware Devices: Components of motherboard: I.C.s, bus lines, clock,	
	micro processor chip, memory chips, ports, power supply. Types of Input	
	and Output Devices. Types of Primary memory and Secondary memory	
	storage devices.	
	(c)Software: System and Application software, Types of System and	
	Application software. FOSS. Types of Operating System, examples like	
	DOS, UNIX, LINUX, Windows, Different versions of Windows. Features	
	of Windows, Compilers and Interpreters, Higher and Lower Level	
TT	languages, Compiler and Interpreter based languages.	1.5
11	MS Power Point	15
	(a) Introduction of PPT, why PPT, Uses of PPT.	
	(b) Taskbar- File, Home, Insert, Design, Transition, Animations, Slide	
	Show, Review, View.	
	(c) File – Copy Paste, Cut Paste, New file, Delete PPT, Save PPT.	
	(d) Home – insert new slide, Layout, cut, paste, delete, Find, Replace,	
	Select, Text Alignment	
	(e) Insert – Table, picture, clip art, shapes, smart art, charts, header, footer,	
	audio, video, equations symbols.	
	(f) Design – Page setup, slide orientation, colours, fonts, background styles,	
	Hide background graphics	
	(g) Transitions – sound, duration.	
	(h) Animations – animation pane	
	(i) Slide Show – broadcast, set up slide show, hide slide. Record. Use	
	timings, media control. Resolution	

	 (j) Review – Spelling, research, translate, language, New comment, compare. (k) View – Slide sorter, notes page, slide master hand out master, Zoom, Fit to window, Grey scale, color, arrange all, cascade, switch windows, 	
	macros.	
III	 Spread Sheet Package (Microsoft Excel) (a) Concept of Workbook, Worksheet, Cell (b) Types of data, Entering, Editing, Deleting data, Fill command, Series command, Custom list (c) Selecting, Inserting, Deleting cells, Rows, Columns, Ranges, Cell formatting (d) References: Mixed, Relative, Absolute. (e) Formulas, Operators, Precedence of operators, Circular reference (f) Library Functions:- (i) Financial Functions:- FV(), PMT(), PV() (ii) Statistical Functions:- ABS(), AVERAGE(), MEDIAN(), MODE(), STDEV(), VAR() (iii) String Functions:- LEN(), RIGHT(), LEFT(), MID(), PROPER(), UPPER(), LOWER() (iv) Logical Functions:- AND(), OR(), NOT(), IF() (g) Hiding/ unhiding Rows, Columns; Background of sheet. (h) Data Validation, Conditional formatting, sorting, filter with customized condition, subtotal. 	15
	(i) Chart Wizard: Bar, Pie, Line, Scatter plot.	

Books and References:						
Sr. No.	Title	Author/s	Publisher	Edition	Year	
1	Computer Fundamentals	Rajaraman	PHI	4 th	2014	
2	Computer Fundamentals	P.K. Sinha	BPB	4 th	2016	
3	Exploring Microsoft PowerPoint	Rebecca Lawson, Robert Grauer	Pearson	1 st	-	
4	Better PowerPoint (R): Quick Fixes Based On How Your Audience Thinks Book	Stephen Kosslyn	Oxford university	1 st	-	
5	Excel 2019 All-in-One For Dummies Book	Greg Harvey	John Wiley & Sons Inc	1 st	2019	
6	Excel 2007 Bible Book	John Walkenbach	Wiley india Pvt. Ltd	1 st	2007	

S.Y.B.A. Computer Programming

S.Y.B.A.		Semester – III	
Course Name: Practical of Computer Programming-I		Course Code: UA3PCP	
Periods per week (1 Period is 50 minutes)		3	
Credits		1	
		Hours	Marks
Evaluation System	Practical Examination	1	25

List o	List of Practical: (Can be done in or any imperative language)		
1	Creating Power Point Presentation and save the file. Apply Designs, Fonts, Colors, Effects		
2	Creating PPT and insert new slide at particular position, delete, copy, cut, paste slide, apply		
	background styles, transitions with duration		
3	Creating PPT and insert table in a slide, clip art and picture		
4	Creating PPT and insert audio, video, apply animations		
5	Creating an excel sheet to demonstrate bar graph, pie chart etc.		
6	Demonstrating financial and statistical functions in spreadsheet		
7	Demonstrating string and logical functions in spreadsheet		
8	Demonstrating data analysis, sorting, filter with customized condition, subtotal		

S.Y.B. Sc. Computer Science		Semester – IV	
Course Name: Computer Programming-II		Course Code: UA4CP2 (sample)	
Periods per week (1 Period is 50 minutes)			
Credits			
		Hours	Marks
Evaluation SystemTheory Examination		2.5	75
	Internal		25

Course Outcome:

- Knowledge of internet and networking concepts
 Knowledge and implementation of word processor
 Knowledge of internet security

Unit	Details	Lectures
I	 Internet: World Wide Web, web servers, web clients, web sites, web pages, web browsers, blogs, news groups, HTML, web address, e-mail address, downloading and uploading files from a remote site. Internet protocols: TCP/IP, SMTP, POP3, HTTP, HTTPS. Remote login and file transfer protocols: SSH, FTP, TELNET, SMTP. Web services: chat, email, video conferencing, e-Learning, e-Banking, eShopping, e-Reservation, social networking. 	15
II	Mobile technologies: SMS, MMS, 3G, 4G. Cyber-safety: Safely browsing the web and using social networks: identity protection, proper usage of passwords, privacy, confidentiality of information, cyber stalking, reporting cybercrimes Safely accessing websites: viruses and malware, adware	15

III	Introduction to a word processor: create and save a document.	
	Edit and format text: text style (B, I, U), font type, font size, text colour,	
	alignment of text. Format paragraphs with line and/or paragraph spacing. Add	
	headers and footers, numbering pages, grammar and spell check utilities, subscript	15
	and superscript, insert symbols, use print preview, and print a document.	15
	Insert pictures, change the page setting, add bullets and numbering, borders and	
	shading, and insert tables – insert/delete rows and columns, merge and split cells.	
	Use of drawing tools, shapes and mathematical symbols.	

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Information and Computer Technology	-	Central	First	2014
			Board of	Edition	
			Secondary		
			Education		
2	Information Technology NVEQF Level 1	-	Central	First	2014
			Board of	Edition	
			Secondary		
			Education		
3	The Word Tutorials:	-	-	-	-
	https://www.tutorialspoint.com/word/index.ht				
	<u>m</u>				
4	The Internet Tutorials:	-	-	-	-
	https://www.tutorialspoint.com/internet_techn				
	o-logies/index.htm				

S.Y.B. Sc. Computer Science		Semester – IV	
Course Name: Practical of Computer Programming-II		Course Code: UA4PCP	
		(sample)	
Periods per week (1 Period is 50 minutes)			
Credits			
		Hours	Marks
Evaluation System Practical Examination		1	25

List of P	ractical: (Can be done in or any imperative language)
1	Demonstrate the generation and use of gmail or any email ID.
2	Uploading and downloading files in mail.
3	Use of search engine in optimistic way
4	Demonstrate creation of own youtube channel
5	Demonstrate creation of own video and upload it on the same channel
6	Write a paragraph about the sports activities in your school. Give a heading to this
	paragraph. Bold and Underline the heading. Save this document in your computer.
7	Write a paragraph perform the following activities:
	1. Select, copy and paste text in a document
	2. Select, cut and paste text in a document
	3. Replace text in a document using Find option
8	Write a paragraph perform the following activities:

	1. Create a bulleted list of the items in a document
	2. Create a numbered list of the items in a document
9	Write a paragraph perform the following activities:
	1. Change the Font style of text using the ribbon
	2. Change the Font style of text using a short cut menu
	3. Change the Font size of text using the ribbon
	4. Change the Font size of text using a short cut menu
10	Write a paragraph perform the following activities:
	1. Align text to the left
	2. Align text to the centre
	3. Align text to the right
	4. Align text to both left and right margins





Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

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Program: B.Sc.

Revised Syllabus of S.Y.B.Sc. Mathematics Choice Based Credit & Grading System (75:25) w.e.f. Academic Year 2020-21

JANARDAN BHAGAT SHIKSHAN PRASARAK SANSTHA'S CHANGU KANA THAKUR

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ART'S, COMMERCE AND SCIENCE COLLEGE, NEW PANVEL AUTONOMOUS

BOARD OF STUDIES IN MATHEMATICS MATHEMATICS FROM THE ACADEMIC YEAR 2020-2021

S.Y.B.Sc.

Introduction:

Mathematics pervades all aspects of life, whether at home, in civic life or in the workplace. It has been central to nearly all major scientific and technological advances. Many of the developments and decisions made in our community rely to an extent on the use of mathematics. Besides foundation skills and knowledge in mathematics for all citizen in the society, it is important to widen mathematical experience for those who are mathematically inclined.

Aims and Objectives:

- 1. Giving students sufficient knowledge of fundamental principles, methods and a clear perception of boundless power of mathematical ideas and tools and know how to use them by analysing, modeling, solving and interpreting.
- 2. Reflecting on the broad nature of the subject and developing mathematical tools for continuing further study in various fields of science
- 3. Enhancing students overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment
- 4. A student should get adequate exposure to global and local concerns by looking at many aspects of mathematical Sciences

Outcomes:

- 1. Students knowledge and skills will get enhanced and they will get confidence and interest in mathematics, so that they can master mathematics effectively and will be able to formulate and solve problems from mathematical perspective.
- 2. Students thinking ability and attitude will change towards learning mathematics and practicals will improve their logical and analytical thinking.

Teaching Pattern for Semester-III

- 1. Three lectures per week per course. Each lecture is of 48 minutes duration.
- One Practical (2L) per week per batch for courses USC3MT1, USC3MT2 combined and one Practical (3L) per week for course USC3MT3 (the batches to be formed as prescribed by the University). Each practical session is of 48 minutes duration.

Teaching Pattern for Semester-IV

- 1. Three lectures per week per course. Each lecture is of 48 minutes duration.
- 2. One Practical (2L) per week per batch for courses USC3MT1, USC3MT2 combined and one Practical (3L) per week for course USC3MT3 (the batches to be formed as prescribed by the University). Each practical session is of 48 minutes duration.

Scheme of Examination

Faculty of Science

(Undergraduate Programmes)

Credit Based Evaluation System

HOHOUS The performance of the learners shall be evaluated into two components. The learners Performance shall be assessed by Internal Assessment with 25% marks in the first component by conducting the Semester End Examinations with 75% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

(A) Internal Assessment: 25% (25 Marks)

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in	20 Marks
	the given semester	
02	Active participation in routine class instructional deliveries and	05 Marks
	overall conduct as a responsible learner, mannerism and articulation	
	and exhibit of leadership qualities in organizing related academic	
	activities	

Question Paper Pattern

(Periodical Class Test for the Courses at Under Graduate Programmes)

Maximum Marks: 20 Questions to be set: 02 Duration: 40 Minutes All Questions are Compulsory

	-Th		
~~C	Sr. No.	Particular	Marks
at les	Q-01	Match the Column / Fill in the Blanks / Multiple Choice Ques-	10 Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		tions/ Answer in One or Two Lines (Concept based Questions) (1	
$\mathcal{O}^{\mathcal{O}}$		Marks / 2 Marks each)	
Y	Q-02	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

## (B) Semester End Examination: 75% (75 Marks)

Duration: The examination shall be of  $2\frac{1}{2}$  hours duration.

## **Question Paper Pattern**

Sr. No.	Particular
1	There shall be four questions.
2	On each unit there will be one question and fourth question will be based on
	entire syllabus.
3	Question number 1, 2 and 3 will be of 20 marks each (40 marks with internal
	options) and question number 4 will be of 15 marks (30 marks with internal
	options).
4	All questions shall be compulsory with internal options.
5	Question may be subdivided into sub-questions $a, b, c, \odot$ and the allocation
	of marks depends on the weightage of the unit.

## **Passing Standard**

Department of Mathematica

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 10 out of 25) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 30 Out of 75) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

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## **Semester End Practical Examinations**

At the end of the Semesters III & IV, Practical examinations of three hours duration and 150 marks shall be conducted for the courses USC3MTP, USC4MTP.

In semester III, the Practical examinations for USC3MT1 and USC3MT2 are held together by the college. The Practical examination for USC3MT3 is held separately by the college.

In semester IV, the Practical examinations for USC4MT1 and USC4MT2 are held together by the college. The Practical examination for USC4MT3 is held separately by the college.

#### Paper Pattern

The question paper shall have three parts A,B, C.

Each part shall have two Sections.

Section I: Objective in nature: Attempt any Eight out of Twelve multiple choice questions.  $(8 \times 3 = 24 \text{ Marks})$ 

Section II: Problems: Attempt any Two out of Three.

 $(8 \times 2 = 16 \text{ Marks})$ 

Practical	Part A	Part B	Part C	Marks out	Duration
Course		-10 Det.		of	
USC3MTP	Questions from	Questions from	Questions from	120	3
	USC3MT1	USC3MT2	USC3MT3		
USC4MTP	Questions from	Questions from	Questions from	120	3
	USC4MT1	USC4MT2	USC4MT3		

## Marks for Journals and Viva:

For each course USC3MT1, USC3MT2, USC3MT3 and USC4MT1, USC4MT2, USC4MT3

1. Journals: 05 marks.

2 Viva:05 marks.

## List of Courses for Semester-III

#### **PAPER I: CALCULUS-III**

				offi
Cource Code	Unit	Topic	Credit	Lecture
				per Week
	Unit I	Functions of several variables		
USC2MT1	Unit II	Differentiation	2	3
	Unit III	Applications	Å	NC.

## PAPER II: ALGEBRA-III

Cource Code	Unit	Topic	Credit	Lecture
		Co.		per Week
	Unit I	Vector spaces over $\mathbb{R}$		
USC2MT1	Unit II	Linear Transformations and Ma-	2	3
		trices		
	Unit III	Determinants		

## PAPER III: DISCRETE MATHEMATICS

Cource Code	Unit	Topic	Credit	Lecture per Week
	Unit I	Graphs		
USC2MT1	Unit II	Preliminary Counting	2	3
10)	Unit III	Advanced Counting		

#### **PRACTICAL-III**

		· · · · · · · · · · · · · · · · · · ·	0		
	ent of 1		PRACTICAL-III		
)epai	Cource Code	Part	Paper	Credit	Lecture per Week
	USC3MTP	A B C	USC3MT1 USC3MT2 USC3MT3	3	5

## List of Courses for Semester-IV

#### **PAPER I: CALCULUS-IV**

Cource Code	Unit	Topic	Credit	Lecture
				per Week
	Unit I	Riemann Integration		
USC2MT1	Unit II	Indefinite Integrals and Improper	2	3
		Integrals		
	Unit III	Applications		

# PAPER II: ALGEBRA-IV

64

		100		
Cource Code	Unit	Topic	Credit	Lecture
				per Week
	Unit I	Inner Product Spaces		
USC2MT1	Unit II	Eigenvalues and Eigenvectors	2	3
	Unit III	Diagonalization		

## PAPER III: ORDINARY DIFFERENTIAL EQUATIONS

Cource Code	Unit	Topic	Credit	Lecture
	ave			per Week
	Unit I	Second order differential equa-		
×	00	tions		
USC2MT1	Unit II	Power Series solution of ordinary	2	3
5 D .		differential equations		
O,	Unit III	Laplace Transform		

#### **PRACTICAL-IV**

	Ŭ,	Unit III	Laplace Transform			
PRACTICAL-IV						
$\mathcal{O}_{\mathcal{O}}$						
	Cource Code	Part	Paper	Credit	Lecture per Week	
		А	USC4MT1			
	USC4MTP	В	USC4MT2	3	5	
		С	USC4MT3			

## Syllabus for Semester-III

Jours

#### (b) Differentiability of vector fields, denition of differentiability of a vector field at a

- point, Jacobian matrix, differentiability of a vector field at a point implies continuity. The chain rule for derivative of vector fields (statements only)
- (c) Mean value inequality.
- (d) Hessian matrix, Maxima, minima and saddle points.

(a) Second order Taylors formula for scalar fields.

- (e) Second derivative test for extrema of functions of two variables.
- (f) Method of Lagrange Multipliers.

#### Page 19

## USC3MT1: CALCULUS-III

## Note: All topics have to be covered with proof in details (unless mentioned otherwise) and with examples.

#### 1. Unit I: Functions of several variables

- (a) The Euclidean inner product on  $\mathbb{R}^n$  and Euclidean norm function on  $\mathbb{R}^n$ , distance between two points, open ball in  $\mathbb{R}^n$ , definition of an open subset of  $\mathbb{R}^n$ , neighborhood of a point in  $\mathbb{R}^n$ , sequences in  $\mathbb{R}^n$ , convergence of sequences- these concepts should be specically discussed for n = 2 and n = 3.
- (b) Functions from  $\mathbb{R}^n \to \mathbb{R}$  (scalar fields) and from  $\mathbb{R}^n \to \mathbb{R}^m$  (vector fields), limits, continuity of functions, basic results on limits and continuity of sum, difference, scalar multiples of vector fields, continuity and components of a vector fields.
- (c) Directional derivatives and partial derivatives of scalar fields.
- (d) Mean value theorem for derivatives of scalar fields.  $\sqrt[3]{\circ}$

#### 2. Unit II: Differentiation

- (a) Differentiability of a scalar field at a point of  $\mathbb{R}^n$  (in terms of linear transformation) and on an open subset of  $\mathbb{R}^n$ , the total derivative, uniqueness of total derivative of a differentiable function at a point, simple examples of finding total derivative of functions such as  $f(x, y) = x^2 + y^2$ , f(x, y, z) = x + y + z, differentiability at a point of a function f implies continuity and existence of direction derivatives of f at the point, the existence of continuous partial derivatives in a neighborhood of a point implies differentiability at the point.
- (b) Gradient of a scalar field, geometric properties of gradient, level sets and tangent planes.
- (c) Chain rule for scalar fields.
- (d) Second order partial derivatives, mixed partial derivatives, sucient condition for equality of mixed partial derivative.

#### 3. Unit III: Applications

## (15 Lectures)

(15 Lectures)

#### (15 lectures)

#### **Recommended Text Books:**

- 1. T. Apostol: Calculus, Vol. 2, John Wiley.
- 2. J. Stewart, Calculus, Brooke/ Cole Publishing Co.

#### Additional Reference Books

- 1. G.B. Thoman and R. L. Finney, Calculus and Analytic Geometry, Ninth Edition, Addison-Wesley, 1998.
- 2. Sudhir R. Ghorpade and Balmohan V. Limaye, A Course in Multivariable Calculus and Analysis, Springer International Edition.
- 3. Howard Anton, Calculus- A new Horizon, Sixth Edition, John Wiley and Sons Inc, 1999.

#### Suggested Practicals (Sem III)

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- 1. Sequences in  $\mathbb{R}^2$  and  $\mathbb{R}^3$  limits and continuity of scalar fields and vector fields ,using definition and otherwise, iterated limits.
- 2. Computing directional derivatives, partial derivatives and mean value theorem of scalar fields.
- 3. Total derivative, gradient, level sets and tangent planes.
- 4. Chain rule, higher order derivatives and mixed partial derivatives of scalar fields.
- 5. Taylors formula, differentiation of a vector field at a point, nding Hessian/Jacobean matrix, Mean Value Inequality.
- 6. Finding maxima, minima and saddle points, second derivative test for extrema of functions of two variables and method of Lagrange multipliers.
- 7. Miscellaneous Theoretical Questions based on full paper

## **USC3MT2: ALGEBRA-III**

## Note: All topics have to be covered with proof in details (unless mentioned otherwise) and with examples.

#### 1. Unit I: Vector Spaces over $\mathbb{R}$

## (15 Lectures)

- (a) Definition of a Vector Spaces over  $\mathbb{R}$  and examples.
- (b) Subspaces definition and examples.
- (c) The sum and intersection of subspaces, direct sum of vector spaces.
- (d) Linear combination of vectors, convex sets, linear span of a subset of a vector space.
- (e) Linear dependence and independence of a set.
- (f) Basis of a vector space, basis as a maximal linearly independent set and a minimal set of generators. Dimension of a vector space.

#### 2. Unit II: Linear Transforations and Matrices

#### (15 Lectures)

- (a) Linear transformations: definition, properties and examples, Kernel and image of a linear transformation, Rank-Nullity theorem (with proof), Linear isomorphisms, inverse of a linear isomorphism, Matrix and linear transformation.
- (b) The matrix units and elementary matrices.
- (c) Row space, column space of an  $m \times n$  matrix, row rank and column rank of a matrix.
- (d) Equivalence of rank of an  $m \times n$ matrix A and rank of the linear transformation  $L_A : \mathbb{R}^n \to \mathbb{R}^m(L_A(A) = AX)$ . The dimension of solution space of the system of linear equations AX = 0 equals n rank (A).
- (e) The solutions of non-homogeneous systems of linear equations represented by AX = B and the general solution of the homogeneous system.

#### 3. Unit III: Determinants

#### (15 Lectures)

- (a) Definition of determinant as an n-linear skew-symmetric function. Determinant of a matrix as determinant of its column vectors (or row vectors).
- (b) Existence and uniqueness of determinant function via permutations.
  - (c) Laplace expansion of a determinant, Vandermonde determinant, determinant of upper triangular and lower triangular matrices.
- (d) Linear dependence and independence of vectors in  $\mathbb{R}^{\mathbb{m}}$  using determinants, The existence and uniqueness of the system AX = B, where A is an  $n \times n$ matrix with  $det(A) \neq 0$ .
- (e) Cofactors and minors of a matrix, Adjoint of an  $n \times n$  matrix A.
- (f) Cramer's rule.
- (g) Determinant as area and volume.

#### **Recommended Books:**

- 1. Serge Lang: Introduction to Linear Algebra, Springer Verlag.
- 2. S. Kumaresan: Linear Algebra A geometric approach, Prentice Hall of India Private Limited.

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#### **Additional Reference Books:**

- 1. M. Artin: Algebra, Prentice Hall of India Private Limited.
- 2. K. Hoffman and R. Kunze: Linear Algebra, Tata McGraw-Hill, New Delhi.
- 3. Gilbert Strang: Linear Algebra and its applications, International Student Edition.
- 4. L. Smith: Linear Algebra, Springer Verlag.
- 5. A. Ramachandra Rao and P. Bhima Sankaran: Linear Algebra, Tata McGrawHill, New Delhi.
- 6. T. Banchoff and J. Wermer: Linear Algebra through Geometry, Springer Verlag Newyork, 198
- 7. Sheldon Axler : Linear Algebra done right, Springer Verlag, Newyork.
- 8. Klaus Janich : Linear Algebra.
- 9. Otto Bretcher: Linear Algebra with Applications, Pearson Education.
- 10. Gareth Williams: Linear Algebra with Applications, Narosa Publication.

#### Suggested Practicals (Sem III)

- 1. Subspaces: Determine whether a given subset of a vector space is a subspace.
- 2. Linear dependence and independence of subsets of a vector space.
- 3. Rank-Nullity Theorem.
- 4. System of linear equations.

5. Determinant, calculating determinants of  $2 \times 2$  matrices,  $n \times n$  diagonal, upper triangular matrices using definition and laplace exapansion.

- 6. Finding inverses of Finding inverses of  $n \times n$  matrices using adjoint
- 7. Determinant, calculating determinants of  $2 \times 2$  matrices,  $3 \times 3$  matrices using adjoint.
- 8. Miscellaneous Theoretical Questions based on full paper
# **USC3MT3: DISCRETE MATHEMATICS**

Note: All topics have to be covered with proof in details (unless mentioned otherwise) and with examples.

#### 1. Unit I: Graphs

### (15 Lectures)

- (a) Introduction to graphs: Types of graphs: Simple graph, directed graph, (One example/graph model of each type to be discussed).
- (b) Graph Terminology: Adjacent vertices, degree of a vertex, isolated vertex, pendant vertex in a undirected graph, The handshaking Theorem for an undirected graph (statement only), Theorem: An undirected graph has an even number odd vertices (statement only).
- (c) Some special simple graphs (by simple examples): Complete graph, cycle, wheel in a graph, Bipartite graph, regular graph.
- (d) Representing graphs and graph isomorphism: Adjacency matrix of a simple graph, Incidence matrix of an undirected graph,
- (e) Connectivity: Paths, circuits, simple paths, simple circuits in a graph (simple examples), Connecting paths between vertices (simple examples), Euler paths and circuits, Hamilton paths and circuits, Diracs Theorem (statement only), Ores Theorem (statement only), Planar graphs, planar representation of graphs, Eulers formula. Kuratowskis Theorem (statement only).
- (f) Algorithms: Shortest path problem: Construction of Eulerian path by Fleurys Algorithm, The shortest path algorithm - Dijkstras Algorithm, Floyds Algorithm to find the length of the shortest path.

# 2. Unit II: Preliminary Counting

#### (15 Lectures)

- (a) Finite and infinite sets, countable and uncountable sets with examples
- (b) Addition and Multiplication Principle, counting sets of pairs, Two ways counting.
- (c) Stirling numbers of second kind. Simple recursion formulae satisfied by S(n;k) for  $k = 1, 2, \cdots, n1, n$
- (d) Pigeonhole principle and its strong form, its applications to geometry, monotonic sequences etc.

#### 3. Unit III: Advanced Counting

- (a) Binomial and Multinomial Theorem, Pascal identity, examples of standard identities with emphasis on combinatorial proofs.
- (b) Permutation and combination of sets and multi-sets, circular permutations, emphasis on solving problems.
- (c) Non-negative and positive solutions of equation  $x_1 + x_2 + \cdots + x_k = n$
- (d) Principal of inclusion and exclusion, its applications, derangements, explicit formula for  $d_n$ , deriving formula for Eulers function  $\phi(n)$

#### **Recommended Books:**

- 1. R. Wilson, Introduction to Graph theory, Fourth Edition, Prentice Hall.
- 2. K. H. Rosen, Discrete Mathematics and Its Applications, McGraw Hill Edition.
- 3. B. Kolman, Robert Busby, Sharon Ross: Discrete Mathematical Structures, Prentice-Hall India.
- 4. N. Biggs, Discrete Mathematics, Oxford.
- 5. Norman Biggs: Discrete Mathematics, Oxford University Press.
- 6. Richard Brualdi: Introductory Combinatorics, John Wiley and sons.
- 7. V. Krishnamurthy: Combinatorics-Theory and Applications, Affiliated East West Press.
- 8. Discrete Mathematics and its Applications, Tata McGraw Hills.
- 9. Schaums outline series: Discrete mathematics,
- 10. Applied Combinatorics: Allen Tucker, John Wiley and Sons

# Additional Reference Books:

- 1. D. B. West, Introduction to graph Theory, Pearson.
- 2. F. Harary, Graph Theory, Narosa Publication.
- 3 Graham, Knuth and Patashnik, Concrete Mathematics, Pearson Education Asia Low Price Edition.

### Suggested Practicals (Sem III)

- 1. Drawing a graph, counting the degree of vertices and number of edges.
- 2. Representing a given graph by an adjacency matrix and drawing a graph having given matrix as adjacency matrix.
- a. Finding cut vertices.
  b. Finding cut vertices.
  b. Finding cut vertices.
  b. Finding cut vertices.
  b. Finding cut vertices.
  c. Finding cut vertices.
  <li 3. Determining whether the given graph is connected or not. Finding connected components

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# Syllabus for Semester-IV

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# **USC4MT1: CALCULUS-IV**

Note: All topics have to be covered with proof in details (unless mentioned otherwise) and with examples.

### 1. Unit I: Riemann Integration

### (15 Lectures)

Approximation of area, Upper/Lower Riemann sums and properties, Upper/Lower integrals, Definition of Riemann integral on a closed and bounded interval, Criterion of Riemann integrability, if a < c < b then  $f \in \mathbb{R}[a, b]$ , if and only if  $f \in \mathbb{R}[a, c]$  and  $f \in R[c, b]$  and  $\int_a^b f = \int_a^c f + \int_c^b f$  Properties:

- (a)  $f, g \in R[a, b] \implies f + g, f g, \lambda f \in R[a, b]$
- (b)  $\int_{a}^{b} (f+g) = \int_{a}^{b} f + \int_{a}^{b} g$

(c) 
$$\int_a^b \lambda(f) = \lambda \int_a^b f$$

- (d)  $f \in R[a, b] \implies |f| \in R[a, b] \text{ and } |\int_a^b f| \le \int_a^b |f|$ (e) If  $f \ge 0$ , and  $f \in C[a, b] \implies f \in R[a, b]$
- (f) If f is bounded with finite number of discontinuities then  $f \in R[a, b]$ , generalize this if f is monotone then  $f \in R[a, b]$

# 2. Unit II : Indefinite and improper integrals

# (15 lectures)

(15 lectures)

Continuity of  $F(x) = \int_a^x f(t) dt$  where  $f \in R[a, b]$ , Fundamental theorem of calculus, Mean value theorem, Integration by parts, Leibnitz rule, Improper integrals type 1 and type 2, Absolute convergence of improper integrals, Comparison tests, Abels and Dirichlets tests (without proof).

# 3. Unit III : Applications

(a)  $\beta$  and  $\Gamma$  functions and their properties, relationship between  $\beta$  and  $\Gamma$  functions (without proof).

(b) Applications of definite Integrals : Area between curves, finding volumes by slicing, volumes of solids of revolution Disks and Washers, Cylindrical Shells, Lengths of plane curves, Areas of surfaces of revolution.

#### **References:**

- 1. Calculus Thomas Finney, ninth edition section 5.1, 5.2, 5.3, 5.4, 5.5, 5.6.
- 2. R. R. Goldberg, Methods of Real Analysis, Oxford and IBH, 1964.
- Autonomous 3. Ajit Kumar, S. Kumaresan, A Basic Course in Real Analysis, CRC Press, 2014.
- 4. T. Apostol, Calculus Vol.2, John Wiley.
- 5. K. Stewart, Calculus, Booke/Cole Publishing Co, 1994.
- 6. J. E. Marsden, A.J. Tromba and A. Weinstein, Basic multivariable calculus.
- 7. Bartle and Sherbet, Real analysis.

#### Suggested Practicals (Sem IV)

- 1. Calculation of upper sum, lower sum and Riemann integral.
- 2. Problems on properties of Riemann integral.
- 3. Problems on fundamental theorem of calculus, mean value theorems, integration by parts, Leibnitz rule.
- 4. Convergence of improper integrals, applications of comparison tests, Abels and Dirichlets tests, and functions.
- 5. Beta Gamma Functions

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- 6. Problems on area, volume, length.
- 7. Miscellaneous Theoretical Questions based on full paper

# **USC4MT2: ALGEBRA-IV**

Note: All topics have to be covered with proof in details (unless mentioned otherwise) and with examples.

#### 1. Unit I: Inner Product Spaces

# (15 Lectures)

- (a) Dot product in  $\mathbb{R}^n$ , Definition of general inner product on a vector space over  $\mathbb{R}$  and examples
- (b) Norm of a vector in an inner product space. Cauchy-Schwarz inequality, Triangle inequality, Orthogonality of vectors, Pythagoras theorem and geometric applications in R², Projections on a line, The projection being the closest approximation, Orthogonal complements of a subspace, Orthogonal complements in R² and R³. Orthogonal sets and orthonormal sets in an inner product space, Orthogonal and orthonormal bases. Gram-Schmidt orthogonalization process, Simple examples in R³, R⁴

#### 2. Unit II: Eigenvalues and eigenvectors

#### (15 Lectures)

- (a) Eigenvalues and eigenvectors of a linear transformation  $T: V \to V$ , where V is a finite dimensional real vector space, Eigenvalues and eigenvectors of linear transformations examples.
- (b) Eigenvalues of  $n \times n$  real matrices.
- (c) The linear independence of eigenvectors corresponding to distinct eigenvalues of a linear transformation.
- (d) The characteristic polynomial of an  $n \times n$  real matrix, characteristic roots.
- (e) Similar matrices, characteristic polynomials of similar matrices.
- (f) The characteristic polynomial of a linear transformation  $T: V \to V$ , where V is a finite dimensional real vector space.

# 3. Unit III: Diagonalization

#### (15 Lectures)

(a) Diagonalizability of an  $n \times n$  real matrix and a linear transformation of a finite dimensional real vector space to itself. Definition : Geometric multiplicity and Algebraic multiplicity of eigenvalues of an  $n \times n$  real matrix and of a linear transformation.

- (b) An  $n \times n$  matrix A is diagonalisable if and only if  $\mathbb{R}^n$  has a basis of eigenvectors of A if and only if the sum of dimension of eigenspaces of A is n if and only if the algebraic and geometric multiplicities of eigenvalues of A coincide. Examples of non diagonalizable matrices.
- (c) orthogonal diagonalization and Quadratic Forms.
- (d) orthogonal diagonalization of  $n \times n$  real symmetric matrices.

#### **Recommended Books:**

- 1. Serge Lang: Introduction to Linear Algebra, Springer Verlag.
- 2. S. Kumaresan: Linear Algebra A geometric approach, Prentice Hall of India Private Limited.

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#### **Additional Reference Books:**

- 1. M. Artin: Algebra, Prentice Hall of India Private Limited.
- 2. K. Hoffman and R. Kunze: Linear Algebra, Tata McGraw-Hill, New Delhi.
- 3. Gilbert Strang: Linear Algebra and its applications, International Student Edition.
- 4. L. Smith: Linear Algebra, Springer Verlag.
- 5. A. Ramachandra Rao and P. Bhima Sankaran: Linear Algebra, Tata McGrawHill, New Delhi.
- 6. T. Banchoff and J. Wermer: Linear Algebra through Geometry, Springer Verlag Newyork, 198
- 7. Sheldon Axler : Linear Algebra done right, Springer Verlag, Newyork.
- 8. Klaus Janich : Linear Algebra.
- 9. Otto Bretcher: Linear Algebra with Applications, Pearson Education.
- 10. Gareth Williams: Linear Algebra with Applications, Narosa Publication.

#### Suggested Practicals (Sem IV)

- 1. Inner Product Spaces, examples. Orthogonal complements in  $\mathbb{R}^2$  and  $\mathbb{R}^3$
- 2. Gram-Schmidt method
- 3. Finding characteristic polynomial, eigenvalues of  $2 \times 2$  and  $3 \times 3$  matrices.
- 4. Eigenvalues and eigenvectors of linear transformation
- 5. Diagonalization and orthogonal diagonalization.
- 6. Orthogonal Diagonalization Forms
- 7. Miscellaneous Theoretical Questions based on full paper

# USC4MT3: ORDINARY DIFFERENTIAL EQUATIONS

Note: All topics have to be covered with proof in details (unless mentioned otherwise) and with examples.

#### 1. Unit I: Second order Linear Differential equations

(15 Lectures)

- (a) First order and first degree differential equations
- (b) Homogeneous and non-homogeneous second order linear differentiable equations: The space of solutions of the homogeneous equation as a vector space. Wronskian and linear independence of the solutions. The general solution of homogeneous differential equations. The general solution of a non-homogeneous second order equation. Complementary functions and particular integrals.
- (c) The homogeneous equation with constant coefficients. auxiliary equation. The general solution corresponding to real and distinct roots, real and equal roots and complex roots of the auxiliary equation.
- (d) Non-homogeneous equations: The method of undetermined coefficients. The method of variation of parameters.

#### 2. Unit II: Power Series solution of ordinary differential equations (15 Lectures)

- (a) A review of power series.
- (b) Power series solutions of first order ordinary differential equations.
- (c) Regular singular points of second order ordinary differential equations.
- (d) Frobenius series solution of second order ordinary differential equations with regular singular points.

# 3. Unit III: Laplace Transforms

#### (15 Lectures)

- (a) Introduction, Properties of Laplace transform
- (b) Laplace transform of elementary functions Problems using properties-Laplace transform of special function, unit step function and Dirac delta function
- (c) Laplace transform of derivatives and Integrals, Evaluation of integral using Laplace Transform, Initial Value Theorem, Final Value Theorem and problems, Laplace Transform of periodic function
- (d) Introduction, Properties of inverse Laplace transform, Problems (usual types)
- (e) Convolution Theorem, Inverse Laplace Transform using Convolution theorem

#### **Recommended Books:**

- 1. G. F. Simmons, Differential Equations with Applications and Historical Notes, McGraw Hill, 1972.
- 2. E. A. Coddington , An Introduction to Ordinary Differential Equations. Prentice Hall, 1961.
- 3. W. E. Boyce, R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, Wiely, 2013.
- 4. D. A. Murray, Introductory Course in Differential Equations, Longmans, Green and Co., 1897.
- 5. A. R. Forsyth, A Treatise on Differential Equations, MacMillan and Co., 1956.
- 6. Dr. S. Sreenath, S.Ranganatham, Dr. M.V.S.S.N.Prasad and Dr. N. Ramesh Babu, Fourier Series and Integral Transforms, S.Chand and Company Ltd

#### **Additional Reference Books:**

- 1. M.K. Venkataraman, Engineering Mathematics volume 3, National Publishing Co.
- 2. P.Kandasamy and others, Engineering Mathematics volume 3,S.Chand and Co.
- 3. Stanley Grossman and William R.Devit, Advanced Engineering Mathematics, Harper and Row publishers
- 4. Murray R Spiegel, Schaum's Outline of Laplace Transforms

### Suggested Practicals (Sem IV)

- 1. Finding general solution of homogeneous and non-homogeneous equations, use of known solutions to find the general solution of homogeneous equations.
- 2. Solving equations using method of undetermined coefficients and method of variation of parameters.
- 3. Power series solutions of first order ordinary differential equations.
- 4. Frobenius series method for second order ordinary differential equations.
- 5. Laplace transform of elementary functions
- 6. Laplace transform of derivatives and Integrals
- 7. inverse Laplace transform & Convolution theorem
- 8. Miscellaneous

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