SHIV NADAR UNIVERSITY

Masters Program in English

Department of English

School of Humanities and Social Sciences

Shiv Nadar University
Post office Shiv Nadar University
Gautam Buddha Nagar
Uttar Pradesh -201314

Department of English

The English Department at SNU offers graduate programs leading to M.A. and PhD degrees. The M.A. is a two-year program, while a PhD is a 4-year program. As part of a research–based university, students are encouraged to engage with the department's areas of research.

SNU's English faculty has wide-ranging, interdisciplinary research training reinforced by diverse learning and teaching experience in Indian and international universities. Their current research interests are in the areas of the novel, realism, translation studies, creative writing, philology, gender and sexuality, and Shakespeare studies.

This prospectus includes information about the M.A. English program for the 2019-20 academic year. Information about its PhD program will be provided separately.

The Department accepts only full-time students. M.A. students are admitted once a year in the Monsoon semester.

M.A. in English

The M.A. in English at SNU is designed to combine rigour with creativity. It will take students through the significant moments in English literary history and world literature but it also incorporates courses in critical and cultural theory, translation, creative writing and visual theory. Our pedagogy includes class room lectures designed to gradually draw a student into the complexity of texts, and also more interactive, seminar based formats possible only with small groups. Above all, our excellent student-teacher ratio has enabled us to put in place a rigorous, multi-tiered, and varied program of writing that will include compulsory courses in academic writing, good writing for the general public, writing narratives as well as an individually supervised M.A. research paper based on prescribed weekly readings. Most of these writing activities will be based on intensive one-to-one interactions between teacher and student. It is our intention to equip our M.A. students with the skills needed for a range of competitive examinations as well as for careers in publishing and the media. Most of all, however, we see potential academics in our best students and we are committed to supporting them through research careers in every possible way. Shiv Nadar University offers teaching assistantships and fee waivers which will bring down the cost of their education considerably.

Semester-wise break-up of the M.A program

The M.A. degree is awarded on the completion of sixteen courses, comprising 13 compulsory courses, 2 optional courses and 1 supervised essay of 8000-10000 words. Each of these courses carry 4 credits and candidates will need 16 x 4= 64 credits in order to successfully complete the M.A.

Courses will be spread across 4 semesters, as per the following schedule:

Semester 1	4 compulsory courses
Semester 2	3 compulsory courses and 1 optional course
Semester 3	3 compulsory courses and 1 optional course

Semester 4 3 compulsory courses and supervised essay.

Here is an overview of the courses offered:

Compulsory Core Courses	
Advanced Writing and Research Methods	Literary Theory
Writing Narratives	Translation Studies
The Long Renaissance	The Global 18th Century
Incipient Modernities: The Nineteenth Century and the Making of the Modern	Imperial Possession in Victorian Literature
Photographic Objects from Curation to Cultural Analytics	Feminist and Queer Writing
South Asian Writing	Conceptualizing World Literature
Methods in the Analysis of Culture	Supervised Research Paper
Optional Courses	
Post-Colonial Theory	Art and Technology
Literature and the Visual Arts	Modernism
Fairy Tale, Fantasy, and Myth	

Evaluation.
Rather than fall back on the traditional 3-hour examination as the sole mode of evaluating a student's performance in each course, the M.A program will follow multiple modes of evaluation stretching through the semester and aimed at testing the student's knowledge of the materials studied, the development of his or her analytical abilities and his or her ability to write with clarity and coherence. Each instructor will decide on and declare his or her evaluation methods at the beginning of the course. These may include tests, seminar presentations, participation at seminars and above all assessment of written work that students will be required to submit from time to time.

Structure of the Program

To successfully complete the Master's program a student needs to successfully complete 14 compulsory Core courses and two Optional courses over four semesters.

Each M.A. course carries 4 credits. The minimum credit requirement for successfully completing the M.A. is 64 credits.

A student who fails in any course during the program will be expected to retake it and complete the 64 credits to graduate.

Detailed Course Descriptions

I Advanced Writing and Research Methods: Writing as Profession 4 credits

This course will introduce post-graduate students to the art of research and formal research paper writing. Expect to be taken through the nitty-gritties of research training in genres of formal writing: research proposal, research paper, conference abstract, conference presentation, MLA citation, methods of researching library catalogues (card and digital), indexes and databases and how to access and gain membership in the major research libraries in Delhi.

Unit 1: Reading to Write

Brooks, Cleanth., Gregory Colomb, Joseph Willams Eds. *The Craft of Research*. Chicago, University of Chicago Press, 1995.

Foucault, Michele. "The Statement and the Archive" from *The Archaeology of Knowledge & the Discourse on Language*. New York: Pantheon Books, 1972

Gallaghar, Catherine and Stephen Greenblatt. "Introduction" Practicing New Historicism. Chicago: University of Chicago Press, 1997

Geertz, Clifford. "Thick Description: Toward an Interpretative Theory of Culture" in *The Interpretations of Culture*. New York: Basic Books Inc., 1973

MLA Handbook for Writers of Research Papers, Seventh Edition.

3 weeks

Unit 2: Pick an area for a research paper

Make a Bibliography

Annotate the Bibliography

Research Proposal

Write a literature Review

3 weeks

Unit 3: 5-page Paper

5-page paper due (1700 words)

Draft 1

Draft 2

3 weeks

Unit 4: 10-15 page Paper
10-15 page paper due (3500-4000 words)
Rough Draft 1
Rough Draft 2
Final Draft
Conference abstract
Conference presentation

5 weeks

II. Literary Theory **4 credits**

This course will familiarize the student with some key ideas in the history of literary theory and criticism. We shall read the relevant texts closely, beginning with the ancients and arriving at the first half of the twentieth century. From Plato to Fish, we will pay special attention to the epistemological and ontological presuppositions of each theorist. Students will write short papers on important areas covered in class. There will be an open-book exam at the end of the semester.

Unit 1: Text and World: The question of *mimesis*
Plato: Book X of *The Republic*
Aristotle: Excerpts from *Poetics*

2 weeks

Unit 2: Text and Author: Poetic subjectivity
Alexander Pope: Excerpts from *An Essay on Criticism*
William Wordsworth: Excerpts from "Preface to *Lyrical Ballads*"
ST Coleridge: Excerpts from *Biographia Literaria*
TS Eliot: "Tradition and the Individual Talent"

3 weeks

Unit 3: Text and Reader (A): Aesthetics
Immanuel Kant: Excerpt from *Critique of Judgment*
Edmund Burke: "The Sublime and the Beautiful Compared"

2 weeks

Unit 4: The Text Itself (A): Formalism
Wimsatt and Beardsley: "The Intentional Fallacy"
Viktor Shklovsky: Excerpts from "Art as Technique"

2 weeks

Unit 5: The Text Itself (B): Language and Semiotics
Mikhail Bakhtin: "Heteroglossia in the Novel"
Ferdinand de Saussure: Excerpts from *Course in General Linguistics*
Roland Barthes: Excerpts from *Mythologies*

3 weeks

Unit 6: Text and Reader (B): Reader Response Theory
Roland Barthes: "Death of the Author"
Stanley Fish: "How to Recognize a Poem When You See One."

2 weeks

Evaluation
Two assignments during the semester (2500 words each)
Final Exam (open book)
Class participation

III. Writing Narratives **4 credits**

This course is concerned with establishing a dialogue between the writing and analysis of narrative which will enable students to become better critics of their own work as well as the work of others. We will look at the fictional as well as the nonfictional narrative. While the primary texts will form the bulwark of the course, from time to time, other material will be circulated among the students by way of class handouts. The class itself will be a combination of seminar, workshopping and in-class writing. In addition, students will have to turn in homework as well as assignments for grading.

Unit 1: Life writing and translating experience into fiction
Vladimir Nabokov, *Speak, Memory* (Life writing),
Tim O'Brien, 'The Man I Killed' (short story)

4 weeks

Unit 2: Fiction
Short stories
Jhumpa Lahiri, 'Hell-Heaven'
Anton Chekhov, 'The Lady with the Dog'
Raymond Carver, 'What We Talk About When We Talk About Love'
Novel
Michael Ondaatje, *The English Patient*

7 weeks

Unit 3: Reportage
John Carlin, *Playing the Enemy: Nelson Mandela and the Game*

3 weeks

Secondary reading:
Sol Stein, *Stein on Writing,* St Martin's Griffin, 2000.

Evaluation
A piece of life-writing (2000-2500 words) to be turned in at mid-term
Short story or piece of reportage (2000-2500 words) to be turned in as part of the final portfolio.
With the short story or piece of reportage the student will also submit a critical commentary that will analyse the process of creating the narrative and explain the creative decisions made in the process of composition. This will be turned in as part of the final portfolio
There will be an end-of-semester examination.

IV. Translation Studies **4 credits**

Students will study the various approaches to the history, theory, and criticism of literary and humanistic translation. Topics of discussion would include study of translation criticism which is the systematic study, evaluation, and interpretation of different aspects of translated works, translator's working methods, interviews with translators, multiple translations, the changing nature of interpretive

approaches, theoretical models of translation, and criteria for the evaluation of translations It is an interdisciplinary academic field closely related to literary criticism and translation theory.

Unit 1: Equivalence and equivalent effect

Walter Benjamin 'The Task of the Translator'. In L. Venuti (Ed.)., *The Translation Studies Reader*, 2000

Eugene Nida 'Principles of Translation as exemplified by Bible Translating'. R. A. Brower (ed.): *On Translation*, New York, OUP.

Swann's Way. (À la recherche du temps perdu #1) by Marcel Proust, Lydia Davis (Translator) 2004 by Penguin Classics (first published 1913) [pp 'Overture']

David Bellos. 2012. *Is That a Fish in Your Ear? Translation and the Meaning of Everything.* [Article: A Fish in Your Ear: The Short History of Simultaneous Interpreting, pp 259-273]

5 weeks

Unit 2: Translation Shift Approach & Linguistic approach to translation

Jakobson, Roman. "On Linguistic Aspects of Translation." In *Translation Studies Reader* by L. Venuti. 2000. Routledge.

Vinay, Jean-Paul and Darbelnet, Jean. 'A Methodology for Translation'. 1995. John Benjamins Publishing.

J C Catford, *A Linguistic Approach to Translation*. 1965. OUP

Zwart, K. M. van: 'Translation and original: Similarities and Dissimilarities, I', Target [pp 151 – 189]

4 weeks

Unit 3: Translation and Post-Structuralism

Season of Migration to the North, 2003 Penguin Classics Series

Derrida, J. (1985). Des Tours de Babel. J. Graham (Tr.). In J. Graham (Ed.), [*Difference in Translation* (pp. 165-207)]. Ithaca, London

Geeta Patel . 2002. "Lyrical Movements, Historical Hauntings on Gender, Colonialism, and Desire" in *Miraji's Urdu Poetry*. Stanford University Press.

3 weeks

Unit 4: Translation as a cultural act

K Ramanujan "Three Hundred Ramayanas"

Bassnett Susan. 1998. 'Postcolonial Translation: Theory and Practice'

Bassnett S, Lefevere A. 1998 'Constructing Cultures'. [The Translation Turn in Cultural Studies. pp 123-140]

2 weeks

Evaluation

A short paper and class presentation of 1000 words on each of the Module

Final assessment: A Critical Analysis of a translated work (last week)

Class Participation and peer review

V. The Long Renaissance 4 credits

This course will examine in detail four quintessential moments that visibly shaped thought and knowledge in the British Renaissance. We will read a prose fantasy by a leading humanist, poetry that

is mired in anxieties of love, politics and science, a play that puts self-doubt and skepticism at the heart of early modernity, and finally two books of an epic that gives aspiration, failure and the exercise of justification a grand lyric. The theme of wanting to know, sometimes more than what is obviously knowable, will underlie our reading and enquiry.

Unit 1: Utopia by Sir Thomas More

Stephen Greenblatt, "At the Table of the Great: More's Self-Fashioning and Self-Cancellation," in *Renaissance Self-Fashioning*

Quentin Skinner, "Sir Thomas More's 'Utopia' and the language of Renaissance humanism"

3 weeks

Unit 2: "In Defense of Poesie" by Philip Sidney

Selections of sonnets by Petrarch, Spenser, Sidney, Shakespeare, Marvel and Donne

Dolan, Francis E. "Taking the Pencil out of God's hand: Art, Nature and the Face Painting Debate in Early Modern England". *PMLA* 108. 2 (March 1993) 224-239

3 weeks

Unit 3: Hamlet by William Shakespeare

Peter Stallybrass, Roger Chartier, J. Franklin Mowery, and Heather Wolfe

"Hamlet's Tables and the Technologies of Writing in Renaissance England"

Selections from Kastan, David Scott, Ed. Critical Essays on Shakespeare's *Hamlet.* New York: G. K. Hall, 1995.

4 weeks

Unit 4: Book I & 2of Paradise Lost by John Milton

Fish, Stanley. *Surprised by Sin* Cambridge: Harvard University Press, 1967.

Guillory, John. "From the Superfluous to the Supernumerary: Reading Gender into *Paradise Lost*." In *Soliciting Interpretation: Literary Theory and Seventeenth-Century English Poetry*. Eds Elizabeth D. Harvey and Katherine Eisaman Maus. Chicago and London: Chicago UP, 1990. 68-88.

4 weeks

Evaluation

2 papers (2500 words each)

1 creative response to any one of the texts or themes under discussion (this can be a set of poems, a story, a pamphlet, graphic art, anything at all). Word limit can be negotiated depending on the genre)

1 final paper (3500-4000 words) and conference-style presentation at the end of the semester

VI. The Global 18th Century **4 credits**

It is impossible to understand 18th Century Europe without understanding the 18th century as a global phenomenon. This course will be interdisciplinary and will track various strands through literary analysis, cultural studies and history. Decades of the long eighteenth century are remarkable for the prose output of essayists, diarists, pamphleteers, writers of conduct books, and travelogues. The rise of political parties, mushrooming of clubs and coffee houses, and the new publishing houses gave huge impetus to prose writings. This course will also track that particular moment of European history when the common public started asking uncomfortable questions about 'imperialism'. From a geo-political perspective, this course will resonate deeply with 21st century political realities.

Unit 1: Primary Texts

Selections from Jonathan Swift's *Gulliver's Travels*
Excerpts from Mary Wortley Montagu's *Turkish Letters*
Secondary Texts:
Clement Hawes' introduction to the critical edition of *Gulliver's Travels*
Donna Landry, "Alexander Pope, Lady Mary Wortley Montagu, and the literature of social comment" in *The Cambridge Companion to English Literature* 1650-1740. 1999
Felicity Nussbaum, *Introduction to The Global Eighteenth Century*

4 weeks

Unit 2: Primary Text
Selections from Jonathan Swift's *A Tale of Tub*
Secondary Text:
Excerpt from Carole Fabricant's *Swift's Landscape*

3 weeks

Unit 3: Primary Text
Joseph Addision, The Musical Instruments of Conversation; On Giving Advice
On Long Winded People; Reflections by Richard Steele
Excerpts from Roger De Coverley Series
Example of Conduct Literature: Lady Sarah Pennington - An Unfortunate Mother's Advice to Her Absent Daughters
Secondary Texts:
Caroline Davis, "Publishing in the Eighteenth Century: Popular Print Genres" 2005
Critical Edition of Pennington's prose piece by Mary Lynette Austin, 2009.

3 weeks

Unit 4: Primary Text
Excerpts from Pepys and Evelyn's Diaries
Secondary Texts:
Dan Doll and Jessica Munnis, Essays on the Seventeenth –and Eighteenth-Century Diary and Journal, 2006
Srinivas Aravamudan's chapter titled "Lady Mary in the Hammam" in Tropicpolitans, an excerpt from *Enlightenment Orientalism.*

4 weeks

Evaluation
Reading Comprehension in-class exam
Long paper (min. 10 double spaced pages)
Power-point presentation on long-paper

VII. Incipient Modernities : The Nineteenth Century and the Making of the Modern 4 credits

This course locates, in the literature of the nineteenth century, some of the most characteristic conceptual breakthroughs that have come to constitute what we , from the standpoint of the 21st century, would call the contemporary. Ranging through three continents this course focuses on issues such as the relationship between teleology and totalitarianism ; the dissolution of the linear progressive notions of time ; print, circulation and hybridization ; the relationship between speech

and silence as well as the contingency of semiotic systems . The course will focus on the writings of Dostoevsky, Baudelaire, Melville and Kaliprasanna Sinha, but literary material will be put in conversation with thinkers such as Walter Benjamin, Dipesh Chakrabarty and Jaques Derrida who have written on time, the universe of signs and urban modernity.

Course Outcomes

This course is designed to internationalize the 19th century and in this sense help students gain an entry into the domain called "World Literature" that has is becoming increasingly central to literary studies
The course will familiarize students with contemporary thinking on topics such as time, semiotics, urban modernity, colonial hybridity.
Students will get to read some of the greatest literature that came out of the 19th century.
Detailed Course Description

Unit 1: Primary Texts 4 weeks

Fyodor Dostoyevsky, *Crime and Punishment* trans. Richard Pavear and Larissa Volokhonsky

Marshal Berman, *All that is Solid Melts in the Air* Section 4

Unit 2: Primary Texts 4 weeks

Baudelaire , Selections from *Flowers of Evil* trans. James McGowan and *Prose Poems* trans. Arthur Symons

Baudelaire, " Painter of Modern Life"

Walter Benjamin, *Writer of Modern Life*

Unit 3-Primary Texts 4 Weeks

Herman Melville "Billy Budd ,Sailor" and "Benito Cereno"

Jaques Derrida, "Signature, Event, Context"

Fredrick Jameson, *The Political Unconscious* Chapter 1.

Unit 4-Primary Texts 3 weeks

Kaliprasanna Sinha, *Hootum Pyanchar Noksha* trans. Chitralekha Basu

Dipesh Chakrabarty *Provincializing Europe* Chapter 1.

Ranajit Guha "A Colonial City and its Times"

Evaluation

Students will be required to four term papers based on the four units. Papers pertaining to particular units will be submitted soon after the completion of the unit.

Each term paper will be marked out of 25.

VIII. Modernism **4 credits**

This course is meant to introduce the students to the major debates of the literary movement of Modernism in the early-mid 20th century. The selection of texts represents the range of experimentation with form and content that the movement exhibited. The texts emerge from as varied a set of places as Germany and Argentina, England and Russia, and Romania and Ireland, testifying to the transcontinental nature of the movement. The background readings from Bertolt Brecht, Frederic Jameson and Henri Bergson help us understand the new equations of the formal and the thematic that Modernism brought about.

Unit 1
Bertolt Brecht, *Mother Courage*
Eugene Ionesco, *Rhinoceros*

4 weeks

Unit 2
Virginia Woolf - *To the Lighthouse*
James Joyce - The Dead (from *The Dubliners*)
Jorge Louis Borges – "The Approach to Al-Mu'tasim", "The Garden of Forking Paths", " The Library of Babel", "The Secret Miracle".

7 weeks

Unit 3
T.S. Eliot - *The Wasteland*
Wilfred Owen – "Dulce et decorum est", "A Terre"
Anna Akhmatova – "The Muse", "Epigram", "In Memoriam, July 19, 1914"
W. B. Yeats – "Leda and the Swan", "Among School Children"

3 weeks

Background Readings
Bertolt Brecht, 'The Street Scene', 'Theatre for Pleasure or Theatre for Instruction', and 'Dramatic Theatre vs Epic Theatre', in *Brecht on Theatre: The Development of an Aesthetic*, ed. and tr. John Willet (London: Methuen, 1992) pp. 68–76, 121–8.
Henri Bergson, 1913 'The Intensity of Psychic States' in *Time and Free Will: An Essay on the Immediate Data of Consciousness*, George Allan & Company: London.
Fredric Jameson, 'Introduction' to *The Modernist Papers*, Verso: 2007.

Evaluation
Mid-semester - Written Assignment (Choice between 10 questions) - 1500 words
Final Submission - Written Assignment (Question decided individually for candidates in consulation with the instructor) - 2500 words

IX. Feminist and Queer Writing **4 credits**

This course is meant to introduce students to important feminist and queer literature produced between the late 19th and the early 21st century. Whereas the section "Feminist Interventions" is meant as an exploration of feminist subjectivities across regions and races, the section "Queer Interrogations" studies how queer expressions have used existing social discourses to make place for same-sex desire in their worlds. The background readings open up the theoretical debates about categories of 'women' and 'LGBT', explore intersectionality as an analytical force, and subject feminist and queer claims to questions of form.

Unit 1: Feminist interventions

Selections from Carol Ann Duffy: 'Warming her pearls', 'How many sailors to sail a ship?', 'Havisham', 'Valentine', 'Mrs. Midas', 'Anne Hathaway', "The Lovers", "Mrs Lazarus"
Audre Lorde: *Zami: A New Spelling of My Name* (Crossing Press: 1982)
Ismat Chughtai, *A Life in Words*, translated by M. Asaduddin (Penguin: 2012)

7 weeks

Unit 2: Queer interrogations

Oscar Wilde, *The Picture of Dorian Gray*
Pandey Bechan Sharma 'Ugra' , *Chocolate and Other Writings on Male Homoeroticism*, translated by Ruth Vanita (Duke University Press: 2009)
Geetanjali Shree, *The Roof Beneath Their Feet*, translated by Rahul Soni (Harper Collins India: 2010)

7 weeks

Background Readings
Eve Kosofsky Sedgwick, "Introduction: Axiomatic" to *Epistemology of the Closet* (University of California Press: 1990)
Judith Butler, "Subjects of Sex/Gender/Desire" in *Gender Trouble: Feminism and the Subversion of Identity* (Routledge: 1990)
bell hooks, "Black Women: Shaping Feminist theory" in *Feminist Theory: From Margin to Centre* (Pluto Press: 2000)

Evaluation

Mid-semester - Written Assignment (Choice between 10 questions) - 1500 words
Final Submission - Written Assignment (Question decided individually for candidates in consultation with the instructor) - 2500 words

X. South Asian Writing: Production of the Popular in South Asia **4 credits**

The course shall examine the ways in which forms of the popular were produced as well as received in South Asia primarily in the 19th and 20th centuries when cheap printing, production and circulation technologies became widely available in the region. The course will also unpack theoretical categories such as "popular", "culture" and "taste" fundamental to engaging with the histories. Finally, each unit of the course will also undertake a close reading of the forms of the popular novel, music, magazine and visual culture. At the end of the course, the student shall be able to not only

critically engage with the theoretical concepts of popular culture, s/he will also be demonstrate a broad understanding of the historical development of the different forms of the popular in South Asia. Finally, the student will also be able to apply these frameworks to a reading and analysis of popular texts.

Unit 1: Introduction. Conceptualising the Popular

1. Raymond Williams, "The Analysis of Culture", *Cultural Theory and Popular Culture: A reader,* ed. John Storey. Georgia: Uni. Of Georgia Press, 1998.
2. Theodor Adorno and Max Horkheimer, "The Culture Industry: Enlightenment as Mass Deception", *Media and Cultural Studies: Keyworks*, Malden: Blackwell Publishing, 1944.
3. Pierre Bourdieu, "The Aesthetic Sense as a Sense of Distinction", *Distinction: A Social Critique of the Judgment of Taste*, London: Routledge, 1979.
4. Certeau, Michel de, "'Making Do': Uses and Tactics", *The Practice of Everyday Life*, Berkeley: University of California Press, 1984.

Unit 2: Reading the novel

Primary Text: The Mysteries of London, GWM Reynolds
(http://www.gutenberg.org/files/47312/47312-h/47312-h.htm)

1. Meenakshi Mukherjee on Indian Writing in English: From *The Perishable Empire,* Essays on Indian Writing in English, Delhi: OUP, 2003.
2. Priya Joshi on the reading of English novels: From *In Another Country*, Colonialism, Culture, and the English Novel in India, NY: Columbia Uni Press, 2002.
3. A.R. Venkatachalapathy on Reynolds (Tamil): from *The Province of the Book*: *Scholars, Scribes, and Scribblers in Colonial Tamilnadu*, Ranikhet: Permanent Black, 2011.
4. Jennifer Dubrow on Urdu "A space for debate: fashioning the Urdu novel in colonial India", Comparative Literature Studies 53, no. 2 (2016): 289-311.
5. Francesca Orsini on the first novels in Hindi: From *Print and Pleasure: Popular Literature and Entertaining Fictions in Colonial North India*, Ranikhet: Permanent Black, 2009.

Unit 3: Reading Periodicals

Primary Text: *Femina*, 1977 issue

1. Francesca Orsini on the proliferation of magazines in the 1920s from *Hindi Public Sphere, 1920-1940: Language and Literature in the Age of Nationalism*. New Delhi, New York: Oxford University Press, 2002.
2. Kamran Asdar Ali on reading pulp: "Pulp Fictions: Reading Pakistani Domesticity", Social Text (2004) 22 (1 (78)): 123-145.
3. V.S. Naipaul on women's magazines: "Woman's Era" from *A Million Mutinies Now,* Delhi: Viking, 1991.

Unit 3: Reading Religion:

Primary Text: Calendar Art from the Priya Paul Collection of Popular Art and *Kalyan Kalpataru*, Oct 2015 issue (http://kalyana-kalpataru.org/PDF%20%28Full%20Issues%29/kk_annual_2015.pdf)

1. Akshaya Mukul on the Gita Press: *Gita Press and the Making of Hindu India*, Delhi: Harper Collins, 2015.
2. Gautam Bhadra on Bengali almanacs: "Pictures in Celestial and Worldly Time: Illustrations in Nineteenth Centurey Bengali Almanacs", *New Cultural Histories of India*, ed. Partha Chatterjee, Tapati Guha-Thakurta, Bodhisattva Kar, Delhi: OUP, 2013.
3. Chris Pinney on Calendar Art: sections from *Photos of the Gods, 'Photos of the Gods': The Printed Image and Political Struggle in India*, London: Reaktion Books, 2004.
4. Patricia Oberoi on Calendar Art: "'Unity in Diversity?' Dilemmas of Nationhood in Indian Calendar Art", Contributions to Indian Sociology 36, no. 1–2 (Feb 1, 2002): 191–232,

Unit 4: Reading the English Popular:

Primary Text: Moni Mohsin, *The Diary of a Social Butterfly*

1. Suman Gupta, "Indian 'Commercial Fiction' in English, the Publishing Industry and Youth Culture", *Economic and Political Weekly*, Vol. 47, No. 5 (Feb 4, 2012), 46-53.
2. Priya Joshi, "Chetan Bhagat: Remaking the novel in India", *A History of the Indian Novel in English*, ed. Ulka Unjaria, Cambridge: CUP, 2015.

Unit 5: Reading Music

Primary Text: Sumangala Damodaran's IPTA songs

1. Sumangala Damodaran, "Songs of Protest– A Forgotten Tradition from the 1940s and 50s", "Protest Through Music" http://www.india-seminar.com/2008/588/588_sumangala_damdaran.htm).
2. Vebhuti Duggal, "Imagining Sound through the Pharmaish: Radios and Request-Postcards in North India, c. 1955–1975." *BioScope: South Asian Screen Studies* 9, no. 1 (June 2018): 1–23.
3. Stephen Putnam Hughes, "Play It Again, Saraswathi Gramophone, Religion, and Devotional Music in Colonial South India", *More Than Bollywood: Studies in Indian Popular Music*, eds. Gregory D. Booth, Bradley Shope, NY: OUP, 2014.

Evaluation

Response papers and an end term long paper (4000-5000 words), each accounting for 50% of the grade.

XI Methods in the Analysis of Culture **4 credits**

This course seeks to equip students from the humanities and especially the social sciences with methods which they might fruitfully deploy when engaging with problems related to culture. The course is made up of four units . The first comprises a set of readings that engage with one of the central problems in the analysis of modern culture : the deeply ambiguous role of technology in the production of culture . The second unit will address another cultural effect of modern capitalism – its capacity to produce desire. The third and fourth sections focus on recent methodological breakthroughs that have unfolded in the key domains of women's and post-colonial studies.

Unit 1: Culture and Industrial Capitalism

Theodor Adorno, 'Culture Industry Reconsidered' in *The Culture Industry – selected essays on mass culture*. Edited and with an introduction by J. M. Bernstein, London, Routledge, 1991, pp. 98-106.
Walter Benjamin, "The Work of Art in the Age of its Technological Reproducibility " in Walter Benjamin, *Selected Writing 1935- 1938* , Harvard University Press, 2002,pp 101-134

3 weeks

Unit 2: Desire of the insubstantial

Marx, "On the fetishism of commodities" From *Capital* Vol. 1, Part 1, Chapter 1, Section 4.
Freud ,"Fetishism" from the *Complete Psychological Works of Sigmund Freud* . J. Strachey tras. Hogarth Press, pp 147-57
Jean Baudrillard,*The System of Objects* Verso, 1966

4 weeks

Unit 3: Gendering Cultural Studies

Donna Haraway, "A Cyborg Manifesto: Science, Technology, and Socialist Feminism in the Late Twentieth Century" in *Simians, Cyborgs and Women: The Reinvention of Nature*. Routledge: New York, 1991, 149-181.
Gloria Anzaldua, "How To Tame a Wild Tongue." in *Borderlands/La Frontera: The New Mestiza*. Aunt Lute Books: San Francisco. 1999, 75-86.
bell hooks, "Gangsta culture" in *We Real Cool: Black Men and Masculinity.* Routledge: New York, 2004, 15-31.

Supplementary Readings
Linda Zerelli, "We Feel Our Freedom': Imagination and Judgment in the Thought of Hannah Arendt" Political Theory 33, No. 2 (April 2005): 158-188.
Moira Weigel" Further Materials Towards A Theory of The Man Child" The New Inquiry. July 9, 2013.
Wendy Brown, "Freedom and the Plastic Cage." in *States of Injury: Power and Freedom in Late Modernity.* Princeton University Press; New York. 1995, 3-29.

4 weeks

Unit 4: Post-colonial Cultural Studies

Gayatri Chakraborty Spivak, "Moving Devi" in *Other Asias*. Blackwell Publishing: Oxford, 2003, 178-208.

Rajeswari Sunderajan, "The Ameena Case" in *The Scandal Of The State*: Women: *Law and Citizenship in the Postcolonial State.* Duke University Press; Durham, 2003, 45-71.

Supplementary Readings
Dipesh Chakraborty, "Of Garbage, Modernity and the Citizen's Gaze." in *Habitations of Modernity: Essays in The Wake of Subaltern Studies.* University of Chicago Press: Chicago, 2002, 65-79.
Bill Ashcroft, "Sugar and slavery" in MSF Dias ed. *Legacies of Slavery: Comparative Perspectives*. Cambridge Scholars Publishing: Newcastle, UK, 2008, 108-125.

3 weeks

Evaluation.
Evaluation in this course will be continuous and conducted throughout the semester. The object of evaluation will be to test a student's knowledge of the material taught through the course and the development of her analytical, critical and writing abilities. A final grade will be awarded on the basis of written presentations in seminars, participation in seminars and a 2,000 words term paper to be submitted at the end of the course. The course instructor may also set a short written examination to test the student's knowledge of the texts taught.

XII. The Literary and the Visual **4 credits**
This course which focuses on material drawn from Europe between the seventeenth and nineteenth centuries aims to equip students with the ability to move between literary and visual forms and to track ways in which expressive strategies mutate in this process. The course will focus on formal categories such as realism and the differing ways in which chronotopes are deployed by literary and visual forms , but it will also take students through a set of paintings and novels to demonstrate how these forms can be brought into an interanimating relationship.

Unit 1: Time and Space
Gotthold Ephraim Lessing, *Laocoon : An Essay on the Limits of Painting and Poetry* translated by Edward Allen McCormick, Chapters 16-18
Mikhail Bakhtin "Forms of time and of the Chronotope in the Novel" (excerpt) from *The Dialogical Imagination* translated by Caryl Emerson and Michael Holquist.

3 weeks

Unit 2: Realism
E.H .Gombrich, *Art and Illusion* (excerpts)
Norman Bryson *Vision and Painting* (excerpts)
Roland Barthes , *S/Z* Trans. Richard Miller.
Jaques Ranciere, *The Future of the Image.* trans. Gregory Elliott. Chapter 3, "Painting in the Text"

6 weeks

Unit 3: Painting and the Novel
Titian , "Venus of Urbino"
Vermeer "The Lace maker"
Peter de Hooch , "Woman Reading a Letter"
Jane Austen, *Mansfield Park*
Hogarth, "Industry and Idleness" all 12 plates

Charles Dickens, *Oliver Twist*

5 weeks

Evaluation

Evaluation in this course will be continuous and conducted throughout the semester. The object of evaluation will be to test a student's knowledge of the material taught through the course and the development of her analytical, critical and writing abilities. A final grade will be awarded on the basis of written presentations in seminars, participation in seminars and a 2,000 words term paper to be submitted at the end of the course. The course instructor may also set a short written examination to test the student's knowledge of the texts taught.

XIII. Fairy Tale, Fantasy and Myth **4 credits**

The course is an introductory survey of the migration of traditional tales from common storytelling circles into the literary culture of mythology, the fairy tales and contemporary fantasy fiction and their adaptations in film. Topics include the heroic quest, the fantastic and sorcery and witches. Emphasis on the mythical narrative structure and on the cultural significance of specific myths and tales.

Unit 1: The Folk Narrative

Meider, Wolfgang. 1987. "Grim Variations: From Fairy Tales to Modern Anti-Fairy Tales." *Tradition and Innovation in Folk Literature*. Hanover and London: University Press of New England.

E.T.A. Hoffmann, "The Sandman". Tales From the German, comprising specimens from the most celebrated authors. Translated by John Oxenford and C. A. Feiling. London: chapman and hall, 186, strand. 1844. C. Whiting, Beaufort House, Strand.

Bascom, William. 1965. "The Forms of Folklore: Prose Narratives." *Journal of American Folklore* 78.307: 3-20.

Mirror, Mirror on the Wall: Women Writers Explore Their Favorite Fairy Tales. 1998. Kate Bernheimer (ed). Anchor; Reissue edition (1998). [2 Selected Tales: Chitra Banerjee Divakaruni & Alice Adams

4 weeks

Unit 2: History and Structure

Zipes, Jack. 2003. "Once There Were Two Brothers Named Grimm." Introduction to *The Complete Fairy Tales of the Brothers* Grimm, 3rd ed. New York: Bantam. xxiii-xxxvi.

Propp V. *Discussion of Tale-Types and Motifs, Morphology of the Folktale.* University of Texas Press, 1968.

Secondary Reading: Travers PL. *What the Bee Knows: Reflections on Myth, Symbol, and Story*. 1994.

4 weeks

Unit 3: Analysis Assignment

Choose, watch and evaluation of two of the films from the given list. This assignment would include the explanation of how the film relates to concepts and ideas from class – not just "it's a folktale" or "it shows tradition," but a thorough discussion of its folkloristic elements.

Films Tentative list:

Ever After (1998) by Andy Tennant – with Drew Barrymore in a new version of "Cinderella" (with Leonardo da Vinci as her fairy godmother)
The Thirteenth Warrior (1999) by John McTiernan – Beowolf version where an Arab courtier teams up with Vikings to slay a monster
Pirates of the Carribean (2003) by Gore Verbinski – A rogue (and cursed) pirate tries to save a kidnapped princess
O Brother Where Art Thou? (2000) by Joel Coen – retelling of Homer's Odyssey with escaped Southern convicts -- involves much traditional music.

6 weeks

Evaluation

1. Short Paper and presentation of 1000 words from Module I and Module II
2. Analysis Assignment from Module 3 (1000 words)
3. Final short paper based on folk narrative structure (1000 words)

XIV. Conceptualizing World Literature: concepts and debates 4 credits

This course will introduce students to the concept of 'world literature'; its origins and promises. In the second part of the course, students will be familiarized with various debates associated with 'world literature'. Students will also be taught how to critically analyze two literary texts (written in different languages and in different historical eras). Re-naming of this field, is the latest phenomenon and final part of the course will be comprehensive discussions related to re-naming of WeltLiteratur.

Unit 1: Anticipations

Primary Text:
Excerpts from *Johann Wolfgang Von Goethe on World Literature*, 1827.
Eric Auerbach, "Philology and WeltLiteratur" 1952.
Secondary Text:
Rabindranath Tagore, World Literature, 1907

3 weeks

Unit 2: Debates

Primary Text:
Franco Moretti, "Conjectures on World Literature." *New Left Review* 2000.
Excerpts from Pascale Casanova, *The World Republic of Letters.*, 2004.
Secondary Text
Aamir R. Mufti, "Orientalism and the Institution of World Literatures", Critical Inquiry 2010.

4 weeks

Unit 3: Comparative Study: Victorian novel/Hindi Upanyas.

Primary Text
Charlotte Bronte, *Shirley*
Gillian Wright trans. Srilal Shukla, *Raag Darbari*, 1991.

Secondary Reading:
Burkhard Niederhoff "Perspective-Point of View."

4 weeks

Unit 4: Renaming the field

Primary Text:

Gayatri Chakraborty Spivak and David Damrosch, "Comparative Literature/World Literature: A Discussion" 2011.

Emily Apter, *Against World Literature*, 2013.

Jonathan Arac, "World English/World Literature" *Blackwell Companion To The English Novel*, 2014.

Secondary Texts:

Francesca Orsini on *Significant Geographies*

Excerpts from David Damrosch. *How to Read World Literature*. , 2009.

3 weeks

Evaluation

Reading Comprehension in-class exam

Long paper (min. 10 double spaced pages)

Power-point presentation (on long-paper)

XV. Postcolonial Theory **4 credits**

This course is meant to introduce students to the major debates within the field of Postcolonial Theory. The debates are outlined under three subheadings which familiarize the students with, first, the field of postcolonial literature and how it responds to the long history of the Empire, second, an exploration of how Postcolonial Theory is deeply invested in revising Eurocentric discourse and studying its consequences, and third, an investigation of how colour prejudice has been both the primary medium and the effect of the long duree of colonial domination.

Unit 1: Writing Back

Achebe, Chinua. "African Writer," in *Colonial Discourse and Postcolonial Theory*, Patrick Williams and Laura Chrisman, Eds. New York: Columbia UP, 1994.

Ashcroft, Bill, et al., "Introduction", "Cutting the ground: critical models of post-colonial literatures", "Theory at the crossroads: indigenous theory and post-colonial reading", "Rethinking the post-colonial: post-colonialism in the twenty first century" in *The Empire Writes Back: Theory and Practice in Post-Colonial Literatures*. London, Routledge, 1989.

4 weeks

Unit 2: Changing Discourse

Said, Edward., "Introduction", "The Scope of Orientalism", "Orientalism Structures and Restructures", in Orientalism, New York: Pantheon, 1978.

James, C. L. R., "Preface to the First Edition", "The Property", "The Owners", "Parliament and Property", "The San Domingo Masses Begin", "And the Paris Masses Complete", in The Black Jacobins: Toussaint L'Ouverture and the San Domingo Revolution, New York: The Dial Press, 1938.

5 weeks

Unit 3: Colouring Perceptions

hooks, bell. "Representing Whiteness in the Black Imagination," in Grossberg, Lawrence et al., *Cultural Studies*. London: Routledge, 1990.

Fanon, Frantz., “Introduction”, “The Black Man and Language”, “The Woman of Colour and the White Man”, “The Man of Colour and the White Woman”, “The Black Man and Psychopathology” in Black Skin, White Masks. New York: Grove Press, 1962.

5 weeks

Evaluation

Mid-semester - Written Assignment (Choice between 10 questions) - 1500 words
Final Submission - Written Assignment (Question decided individually for candidates in consultation with the instructor) - 2500 words

XVI. Art and Technology

The course will discuss, mainly, the relation between art and technology, where 'technology' is understood not only as the various techniques of production, fabrication and fabulation that are available at specific moments of production; but also as a condition which makes some techniques possible or impossible.

While taking a few examples from painting and sculpting and literary writing, the discussion will mainly focus on how we understand the relation between art and technology, often seen as opposites of each other.

After a discussion of the history of various techniques that available technology makes possible or impossible, we shall move on to more contemporary issues of 20th century art and 21st century art as well: graphic images made of ASCII code printing, to digital videography and 'live' coverage of events. The concept of 'virtuality' will be introduced.

Unit 1 12 hrs

A theoretical consideration of what technology means and does in contemporary society.

Reading:

Gilbert Simondon, 'Technical Mentality'

Walter Benjamin, 'The Work of Art in the Age of Technological Reproducibility'

Stanislaw Lem, excerpts from *Summa Technologica*.

Unit 2 12 hrs

A discussion of selected stories by Walter Miller Jr., and of positive and negative evaluations of 'technology', with a focus on Section One of 'A Canticle for Leibowitz'

A discussion of Ursula Le Guin's 'The World for the World is Forest'

Unit 3 13 hrs

A return to the theoretical discussion of 'technology', along with a discussion of visual material from recommended readings.

Donna Harraway, 'The Cyborg Manifesto'

Martin Heidegger, 'The Questsion Concerning Technology'

Compulsory Readings:

Gilbert Simondon, 'Technical Mentality'

Martin Heidegger, 'The Question Concerning Technology'

Donna Haraway, 'The Cyborg Manifesto'

Stanislaw Lem, excerpts *Summa Technologica*

Walter Benjamin, 'The Work of Art in the Age of Technological Reprducibility'

Recommended Readings

Philosophy

Bernard Stiegler, *Technics and Time* vol. 1

Fiction

Selections from fiction by Walter Miller Jr.

'Big Joe and the Nth Generation'

'Conditionally Human'

Section One of *A Canticle for Leibowitz*

Ursula Le Guin, 'The Word for the World is Forest'

Visual Material

Documentaries

BBC 'Life: Primates', the Chimpanzee Section

BBC 'Life:Birds'

Movies

Terminator 1-3

Solaris (Tarkovsky, 1972)

(animation)

Ghost in the Shell 1-2 (anime)

Graphic

H R Giger

Performance Art

Stellarc

Stefanie Trojan

Marina Abramovic

Ted Talks

https://www.ted.com/talks/neil_harbisson_i_listen_to_color?language=en

https://www.ted.com/talks/hugh_herr_the_new_bionics_that_let_us_run_climb_and_dance

https://www.youtube.com/watch?v=TqtiM1hK6lU

Assessment

Attendance and Class Participation:

Classroom Presentation:

Mid-term Assignment:

Term-end Assignment:

XVII Imperial Possession in Victorian Literature

Following Thomas Richards's definition of an empire as 'a nation in overreach', this module explores how Victorian literature engaged with and helped constitute England's possession of 'too many territories too far away from home to control them effectively'. It examines both the objects and processes of such imperial possession, and how they shaped metropolitan culture in the nineteenth century. We will read literary texts in juxtaposition with advertisements, illustrations, and articles from nineteenth-century imperial journals to explore the wide cultural context running through imperial possession.

Learning Outcomes: By the end of the course, students should be able to demonstrate a broad understanding of the trajectory of British imperial expansion in the nineteenth century and the role of Victorian literature in shaping imperial culture. They should be able to apply knowledge of critical methodologies such as new historicism, postcolonial studies, gender studies, and cultural studies to the set texts. They should also be able to critically evaluate concepts of 'free trade', imperial networks and trans-colonial communities. They should demonstrate the ability to work effectively with a wide range of pre1900 primary material, including digital copies of Victorian periodicals.

Outline Syllabus:

Unit 1: Introduction **2 Weeks**

Weeks 1 and 2: Introduction to Nineteenth-Century British Imperialism

Week 1:

- Thomas Richards, *The Imperial Archive* (1993). Introduction
- *At Home with the Empire*, ed. by Catherine Hall and Sonya Rose (2006). Introduction
- *Commodities and Culture in the Colonial World* (London: Routledge, 2018), ed. By Supriya Chaudhuri et all. Introduction.
  [Draws on Arjun Appadurai's edited volume- *The Social Life of Things*]

Week 2:

- Anderson, Benedict, *Imagined Communities* (1983). Introduction
- Said, Edward, *Culture and Imperialism* (1994). Introduction.

Unit 2 and Introduction to Unit 3 **5 Weeks**

Unit 2: The Empire at Home

Week 3: Great Exhibition of 1851

The Great Exhibition of 1851, ed. by Louise Purbrick (2001), Introduction.

Jeffrey Auerbach and Peter Hoffenberg, *Britain, the Empire, and the World at the Great Exhibition of 1851* (2008)

Week 4: Tobacco: Charles Dickens, *Great Expectations* (1861)
Elaine Freedgood, *The Ideas in Things* (2006). Chapter 3.

Week 5: Diamond: Wilkie Collins, *The Moonstone* (1868); Daly, Suzanne, *The Empire Inside: Indian Commodities in Victorian Domestic Novels*, Chapter 3

Week 6: Reading Week [will use this for mid-term essay on a journal article on imperial possessions- especially at the Great Exhibition]

Week 7: Introduction to Unit 3

Discuss Broad Theme Imperial Expansion and Literary Genre
Patrick Brantlinger, *Rule of Darkness* (1988); John MacKenzie, ed., *Imperialism and Popular Culture* (1986); Nikki Hessell, *Romantic Literature and the Colonised World* (2018). Introduction

Unit 3: Empire Abroad: Conflict, Exploration and Emigration **7 Weeks**

Week 8: Nineteenth-Century Poetry and Empire [syllabus for this week to be confirmed-will be a selection of Romantic poetry]

Week 9, 10: The Indian Rebellion
Selections of Mary Eliza Leslie's 1858 poetry on the Rebellion from *Anglophone Poetry in Colonial India, 1780-1913: A Critical Anthology,* ed. by Mary Ellis Gibson

Edward Money, *The Wife and the Ward; or, a Life's Error* (1859) [scanned pdf available through googlebooks]
Gautam Chakravarty, *The Indian Mutiny and the British Imagination* (2004)

Week 10,12: Missionary Expeditions
David Livingstone, *Missionary travels and researches in South Africa* (1857) (selections)
Some representations of David Livingstone in the *Missionary Magazine and Chronicle* (1836-66)
[Livingstone was the most of the London Missionary Society's missionaries]
Anna Johnston, *Missionary Writing and Empire, 1800-1860* (Cambridge: Cambridge University Press, 2003)

Week 13,14 : Emigration Narratives
Caroline Chisholme, *The A.B.C. of Colonization* (1850)
--, 'A Bundle of Emigrant Letters', *Household Words*, 30 March 1850.
Advertisements for Colonial Emigration in British Newspapers
Anthony Trollope, *Harry Heathcote of Gangoil* (1873)
Illustrations of *Harry Heathcoote* from the *Graphic*, wherein the novel was first published.
James Hammerton, *Emigrant* Gentlewomen (1979); Jude Piesse, *British Settler Emigration in Print* (2016); Tamara Wagner, *Victorian Narratives of Failed Emigration* (2016)

Evaluation
Assessment Methods:
10%- class presentations –analysis of journal articles on any of the main imperial themes discussed in class
40%- a 2000 word mid-term essay
50%- a 2500 word end-term essay

XVIII Photographic Objects: From Curation to Cultural Analysis

How do we, as 'readers' of photographs, understand the still image? How can these understandings be communicated through formal descriptions in the process of building digital photographic collections? This course investigates photographs from diverse contexts — from early Victorian photography to photographs on the social web (e.g. Flickr and Instagram) — in order to gain a clear idea of the choices that need to be made while creating repositories that may aid their study. Beyond theoretical paradigms, the lectures focus on computational methods that may be used to describe and analyse the digitised photographic object.

Unit 1: The image as an instance

This unit focuses on the photograph as an image and as an object in use. It explores ideas from visual studies, art history, and from material culture.

Barthes, Roland. 'Rhetoric of the Image.' *Image - Music - Text*. Ed. Stephen Heath. London: Fontana Press. 1977. Print. pp 32-51.

Barthes, Roland. *Camera Lucida: Reflections on Photography*. New York: Farrar, Straus, and Giroux. 1981. Print.

Benjamin, Walter. 'Little History of Photography.' *Selected Writings*, Volume 4: 1938-1940. Ed. and Trans. Michael W. Jennings and Howard Eiland. Cambridge, Massachusetts & London: Belknap Press of Harvard University Press. 2002. Print.

Tagg, John. The Burden of Representation: Essays on Photographies and Histories. Minneapolis: University of Minnesota Press. 1988. Print.

Edwards, Elizabeth and Janice Hart. *Photographs Objects Histories: On the Materiality of Images*. London: Routledge. 2004. Print.

Burgin, Victor. *Thinking Photography*. London: Macmillan, 1982. Print.

Scott, Clive. *The Spoken Image: Photography and Language.* London: Reaktion, 1999. Print.

Unit 2: Collections and Archives

This unit considers the issues of collections and archives specifically for photographic material.

Benjamin, Walter. 'Unpacking My Library: A Talk about Book Collecting.' *Illuminations*. New York: Schocken Books. 1968. Print.

Benjamin, Walter. *The Arcades Project.* Harvard University Press. 1999. [Excerpt]

Sekula, Allan. 'Reading An Archive: Photography Between Labour and Capitalism.' *The Photography Reader*. ed. Liz Wells. New York: Routledge, 2003. pp 443-452

Stoler, Ann L. *Along the Archival Grain: Epistemic Anxieties and Colonial Common Sense.* Princeton, NJ: Princeton University Press. 2009.

Derrida, Jacques, and Eric Prenowitz. 'Archive Fever: A Freudian Impression.' *Diacritics*, vol. 25, no. 2, 1995, pp. 9–63.

Unit 3: Cultural Analytics

Moretti, Franco. *Graphs, Maps, Trees*. London: Verso. 2007.

Lev Manovich. *Cultural Analytics: Visualizing Cultural Patterns in the Era of 'More Media'.DOMUS,* Spring 2009.

Lev Manovich. *AI Aesthetics*. Moscow: Strelka Press, 2018.

Leonard, Peter and Douglas Duhaime. *Neural Neighbours: Capturing Image Similarity* [scholarly project]. Available at: https://yaledhlab.github.io/neural-neighbors/

Wexler, Laura, et al. *Photogrammar* [scholarly project]. Available at: http://photogrammar.yale.edu/about/team/

Evaluation

Students will be required to submit an essay exploring a theoretical aspect discussed in the module. Students will also present a short paper at a student-led seminar based on the course content. An individual or group project may also be assigned. 100% Continuous Assessment.

Faculty Contact Details

Name	Designation	Office	Campus Phone:	Email address

			012023819100	
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Tulika Chandra	Associate Professor	321	111	tulika.chandra@snu.edu.in
Vikram Kapur	Associate Professor and Postgraduate Advisor	372	275	Vikram.Kapur@snu.edu.in
Sambudha Sen	Head of the Department	322	397	sambudha.sen@snu.edu.in
Vinayak Das Gupta	Assistant Professor	371	692	vinayak.dasgupta@snu.edu.in
Teja Varma Pasupati	Assistant Professor	381	695	Teja.pasupati@snu.edu.in
Aakriti Mandhwani	Assistant Professor	383	328	aakriti.mandhwani@snu.edu.in
Diviani Chaudhuri	Assistant Professor	333	387	diviani.chaudhuri@snu.edu.in

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Research Methodology

II. COURSE CODE: ENG 601

III. COURSE CREDITS (L:T:P): 4

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): (3:1:0)

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY): None

VII. SCHOOL/ DEPARTMENT: English

VIII. COURSE CONTENT & SYLLABUS:

This course enables the student to become familiar with the rules, tools, and methods that go into conducting research in the Humanities. Students are exposed to the theory as well as the practice of research. On the theoretical side, students read a selection of essays on different modes and methodologies of research (archive study, field survey, statistical analysis, etc.). These essays are presented and discussed in class. On the practical side, students work towards producing a well-researched, 2500-word academic paper (on a single primary text) by the end of the semester. This work takes the form of an initial response paper (initial impressions of the primary text; possible theses); a literature review around a finalized thesis; and finally, the end-term research paper.

IX. EVALUATION SCHEME:

Presentation 1	10 Marks
Primary text Response	15 Marks
Literature Review	25 Marks
Presentation 2	10 Marks
End Term paper	40 Marks

X. RECOMMENDED READING(S):

Research Methods for English Studies (Gabriele Griffin)

MLA Handbook for Writers of Research Papers [Seventh Edition or later]

The Spiral Guide to Research Writing (Martin Maner)

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE:** Critical Practicum

II. **COURSE CODE :** ENG 602

III. **COURSE CREDITS (L:T:P**): 4

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): (4: 0 : 0)

V. **COURSE TYPE (Core/Elective):** Core

VI. PREREQUISITE/S (IF ANY): None

VII. SCHOOL/ DEPARTMENT: English

VIII. COURSE CONTENT & SYLLABUS:

a. The aim of this course is to equip the student with a sound background in Western literary theory. We will read the important texts of theory and criticism, beginning with the ancients and arriving at the major critical schools of the twentieth century. From Plato to Barthes, we will pay attention to the philosophical presuppositions of each theorist. A copy of each essay/text to be studied in class will be provided by the teacher ahead of the lecture

IX. EVALUATION SCHEME:

a. Assignment 1 25 marks
b. Assignment 2 25 marks
c. Final Exam 50 marks

X. RECOMMENDED READING(S):

a. *English Critical Texts: Sixteenth Century to Twentieth Century* (D.J. Enright and Ernst de Chickera)
b. *Literary Criticism from Plato to the Present: An Introduction* (M. A. R. Habib)
c. *Modern Criticism and Theory: A Reader* (David Lodge and Nigel Wood)
d. *Literary Theory: An Introduction* (Terry Eagleton)
e. *A Glossary of Literary Terms* (M H Abrams)

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: Advanced Academic Writing**

II. **COURSE CODE : English 603**

III. **COURSE CREDITS (L:T:P): L:4**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): L:4**

V. **COURSE TYPE (Core/Elective): Core**

VI. **PREREQUISITE/S (IF ANY): None**

VII. **SCHOOL/ DEPARTMENT: Humanities and Social Sciences/English**

VIII. **COURSE CONTENT & SYLLABUS:**

Course description

This course is designed to train students for the purpose of writing as scholars for a community of scholars. The course will be a mixture of seminar, workshop and research. In the first few weeks, we will focus in on critical reading and writing and how to make an insightful argument or offer a unique perspective. Students will be given handouts of literary essays for that purpose. Then we will focus in on the synthesis essay. The main aim of a synthesis essay is to make insightful connections. It is, above all, not a summary. Students will write two synthesis essays over the course of the semester. They will learn how to narrow down a general topic to a specific topic, develop a working thesis statement, and use their sources to offer an interesting argument or unique perspective. For a final project, students will do a literature review on a topic of their choice. Right through the semester, students will be expected to use the correct pedagogy for critical writing and follow the conventions of style.

Learning objectives and outcomes

The students will learn to analyse, critique, summarize and work towards a thesis statement. They will also learn how to present a logical and focused argument to support a thesis by using reliable and varied evidence to support claims and cite and document quotes using the correct format. Since research is an integral part of the course, the students will also learn how to use research to create a thesis statement and argue a certain stance or offer a unique perspective.

Method of instruction

The method of instruction will be a combination of the seminar and the workshop. At various points in the semester, we will be in seminar mode where we will discuss literary essays. At other points, we will shift to the workshop mode where the emphasis will be on discussing student work. As the course proceeds, students will be required to do research outside class. Although we will not be using computers in class, the internet will be useful in terms of research as well as reading outside class. Hence, access to it is a must.

IX. EVALUATION SCHEME:

The students will produce two synthesis essays that will be 2,500 words long. The first one will be turned in during the seventh week of class or the week starting September 17. The second one will be turned in after the midterm in the week starting October 27. After that students will work on the literature review which will be 4000 words long and turned in by class time on Wednesday, December 3.

As far as word limits are concerned, you can go ten percent below or over the word limit. Hence, a 2500-word essay should fall between 2250 words and 2750 words. You will lose points if you go outside these word limits. The two synthesis essays will each account for 30 percent of your grade. The literature review is worth the balance 40 percent.

Attendance is a given. You must come to all scheduled classes. If for some reason you cannot make it then make sure you email me well in advance.

All work should be typed and double-spaced and handed in as a hard copy. Hand-written copies and e-mailed assignments will not be accepted.

X. RECOMMENDED READING(S):

MLA Handbook for Writers of Research Papers, Seventh Edition, Modern Language Association, 2009

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Global Swift

II. COURSE CODE : 631

III. COURSE CREDITS (L:T:P): L-4

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4

V. COURSE TYPE (Core/Elective): Elective

VI. PREREQUISITE/S (IF ANY): None

VII. SCHOOL/ DEPARTMENT: English, School of Social Sciences

VIII. COURSE CONTENT & SYLLABUS: COURSE CONTENT:

This course is designed to train students in learning the exciting new ways in which the global eighteenth century opens up new ways of reading. We will be using maps and historical documents to juxtapose traditional approaches to the literary period of the neo-Augustan period in English literature with more recent approaches that look at the neo-Augustans as very self consciously writing in a world that was global in its scope. We have two principal texts to accomplish this work of literary training - the travelogue Gulliver's Travels and the anthology of essays The Global Eighteenth Century. Grading for this course will depend on students' participation in class discussion and a student's demonstration of reading comprehension. The principal writing assignment is a 2000 word research presentation where each student chooses any one area of library and Internet research (contemporary maps, travel routes, memoirs, trading company documents, mercantile trade, the migration of servants and slaves and sailors) that illuminates the global dimension of the English 18th century. If time permits we will discuss the modern novel Coetzee's Foe.

IX. EVALUATION SCHEME: Long paper with mid term drafts =70%.
PPT= 10%
Attendance and pop quizzes+ 20%

X. RECOMMENDED READING(S):
Books by Felicity Nussbaum and Clement Hawes on the global eighteenth century, selections from Srinivas Aravamudan's 2014 book on the Oriental tale, authoritative edition of Gulliver's Travels, short piece by Begum Rokeya.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: English in the Vernacular: Parallels between 19th Century Victorian Novel and 20th Century Hindi Upnyas

II. COURSE CODE : ENG 632

III. COURSE CREDITS (L:T:P): 4

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 hours

V. COURSE TYPE (Core/Elective): Elective

VI. PREREQUISITE/S (IF ANY): None

VII. SCHOOL/ DEPARTMENT: English

VIII. COURSE CONTENT & SYLLABUS: This course is a comparative study between Victorian novel and Hindi Upanyas. This course will try to analyze whether Hindi Upanyas has the imprints of Victorian novel or not.

IX. EVALUATION SCHEME:

Assignment 1	**25marks**
Assignment 2	**25 marks**
Research Project	**40 marks**
Presentation	**10 marks**

X. RECOMMENDED READING(S):

- **Jane Eyre**
- **Great Expectations**
- **MiddleMarch**
- **Nirmala**
- **Rag Darbari**
- **Genette, Gérard ([1972] 1980). *Narrative Discourse. An Essay in Method*. Oxford: Blackwell.**
- **Genette, Gérard ([1983] 1988). *Narrative Discourse Revisited*. Ithaca: Cornell UP.**

SHIV NADAR UNIVERSITY

GRADUATE COURSE

XI. COURSE TITLE: Literary Theory I

XII. COURSE CODE: ENG624

XIII. COURSE CREDITS (L:T:P): 4:0:0

XIV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4:0:0

XV. COURSE TYPE (Core/Elective): Core

XVI. PREREQUISITE/S (IF ANY): None

XVII. SCHOOL/ DEPARTMENT: English

XVIII. COURSE CONTENT & SYLLABUS:

This course will familiarize the student with key ideas in the history of literary theory and criticism. We shall read the relevant texts closely, beginning with the ancients and arriving at the first half of the twentieth century. From Plato to Fish, we will pay special attention to the epistemological and ontological presuppositions of each theorist. We will also identify the central problematic of the theorist—be it the question of mimesis/representation, authorial psyche, reader response, or of language and meaning. Students will write short papers on important areas covered in class. There will be an open-book exam at the end of the semester.

TEXTS FOR STUDY:

Plato: Book X of *The Republic*
Aristotle: Excerpts from *Poetics*
Philip Sidney *An Apology for Poetry*
Samuel Johnson "Preface to Shakespeare"
Alexander Pope: Excerpts from *An Essay on Criticism*
William Wordsworth: Excerpts from "Preface to *Lyrical Ballads*"
ST Coleridge: Excerpts from *Biographia Literaria*
TS Eliot: "Tradition and the Individual Talent"
Immanuel Kant: Excerpt from *Critique of Judgment*
Edmund Burke: "The Sublime and the Beautiful Compared"
Wimsatt and Beardsley: "The Intentional Fallacy"
Viktor Shklovsky: Excerpts from "Art as Technique"
Mikhail Bakhtin: "Heteroglossia in the Novel"
Ferdinand de Saussure: Excerpts from *Course in General Linguistics*
Roland Barthes: Excerpts from *Mythologies*
Roland Barthes: "Death of the Author"

Stanley Fish: "How to Recognize a Poem When You See One."

XIX. EVALUATION SCHEME:

Item	**Marks**
Class participation	10
Assignment 1 (2500 words)	20
Assignment 2 (2500 words)	20
Final Exam (open book)	50

XX. RECOMMENDED READING(S):

The Critical Tradition: Classic Texts and Contemporary Trends (David H Richter)
The Norton Anthology of Theory and Criticism, 2nd Edition (Eds Leitch et al.)
English Critical Texts: Sixteenth Century to Twentieth Century (D.J. Enright and Ernst de Chickera)
Modern Criticism and Theory: A Reader (David Lodge and Nigel Wood)
Literary Theory: An Introduction (Terry Eagleton)
A Glossary of Literary Terms (M H Abrams)

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Advanced Academic Writing & Research Methods

II. COURSE CODE : ENG635

III. COURSE CREDITS (L:T:P): 4

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:1:0

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY):None

VII. SCHOOL/ DEPARTMENT: SHSS English

VIII. COURSE CONTENT & SYLLABUS:

This course is built around the final submission due at the end of the semester – a 5000 words research paper on a topic of your choice that you will arrive at through the readings and shorter papers (1700-2000 words) you write in the first few weeks of the semester. I will assigns essays and readings in the first 3-4 weeks on which the shorter essays will be based. These papers will become the groundwork for the longer research essay for which the students will build a bibliography (MLA style) learn to annotate it, write a proposal for the paper and then the paper itself in 2 drafts.

The classes will run workshop style with lots of in-class writing, exercises and peer-review work towards revision and rewriting.

IX. EVALUATION SCHEME: The final grade will be tabulated on the final draft of the final paper.

X. RECOMMENDED READING(S): Readings will be provided in class in the first couple of weeks. Expect to read essays by Mark Doty ("O Description"), Stanley Fish (How to Read a Sentence and How to Write One), Richard E Miller & Ann Jurecic (Habits of the Creative Mind) other than the MLA and Chicago style guides!

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Global 18th Cenury

II. COURSE CODE : ENG 636

III. COURSE CREDITS (L:T:P): 4:0:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4:0:0

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY): None

VII. SCHOOL/ DEPARTMENT: English; SHSS

VIII. COURSE CONTENT & SYLLABUS:

It is impossible to understand 18th Century Europe without understanding 18th century as a global phenomenon. This course will be interdisciplinary and will track various strands through literary analysis, cultural studies and history. Decades of long eighteenth century are remarkable for the prose output by essayists, diarists and pamphleteers, writers of conduct books and travelogues. Rise of political parties; mushrooming of clubs and coffee houses; and the new publishing houses gave huge impetus to prose writings. This course will also track that particular moment of European history where common public started asking uncomfortable questions about 'imperialism'. From geo-political perspective, this course will resonate deeply with 21st century political realities.

Syllabus:

Unit I (5 weeks) :
Primary Text-- A Tale of A Tub -- Jonathan Swift
Secondary Text--- What is Enlightenment? --- Immanuel Kant
Swift as Intellectual --- Edward W Said

Unit 2 (5 weeks) :
Primary Text: Turkish Embassy Letters - Mary Wortley Montagu
Secondary Text: Vindication of the Rights of Women--- Mary Wollstonecraft
What is Third Estate ---- Emmanuel Joseph Sieyes

Unit 3 (4 weeks):

Primary Text-- Essays By Swift, Addison, Steele

Secondary Text-- History of Periodicals and their Impact on Europe

IX. EVALUATION SCHEME:

Mid-Term Exam - 40%

Class Presentation- 20%

Final Term Paper- 40%

Total - 100%

X. RECOMMENDED READING(S):

- **Text, "Text", and Swift's "A Tale of a Tub", Marcus Walsh, The Modern Language Review, Vol. 85, No. 2 (Apr., 1990), pp. 290-303, Published by: Modern Humanities Research Association, Article DOI: 10.2307/3731810, Stable URL: http://www.jstor.org/stable/3731810, Page Count: 14**

- **The Design of A Tale of a Tub (with a Digression on a Mad Modern Critic), Jay Arnold Levine, ELH, Vol. 33, No. 2 (Jun., 1966), pp. 198-227, Published by: The Johns Hopkins University Press, Article DOI: 10.2307/2872390, Stable URL: http://www.jstor.org/stable/2872390, Page Count: 30**

- **Lady Mary Wortley Montagu in the Hammam: Masquerade, Womanliness, and Levantinization, Srinivas Aravamudan, ELH, Vol. 62, No. 1 (Spring, 1995), pp. 69-104, Published by: The Johns Hopkins University Press, Stable URL: http://www.jstor.org/stable/30030261, Page Count: 36**

- **Richard Steele and the "Pattern of Genteel Comedy", Shirley Strum Kenny, Modern Philology, Vol. 70, No. 1 (Aug., 1972), pp. 22-37, Published by: The University of Chicago Press, Stable URL: http://www.jstor.org/stable/436501, Page Count: 16**

- **Addison and the Birth of Eighteenth-Century Aesthetics, William H. Youngren, Modern Philology, Vol. 79, No. 3 (Feb., 1982), pp. 267-283, Published by: The University of Chicago Press, Stable URL: http://www.jstor.org/stable/437151, Page Count: 17**

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: The Novel in 19th Century Europe

II. COURSE CODE: Eng 637

III. COURSE CREDITS (L:T:P): 4

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:1:0

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY): Graduate Course

VII. SCHOOL/ DEPARTMENT: English, SHSS

VIII. COURSE CONTENT & SYLLABUS:

The three European nations that play a crucial role in the evolution of the novel in Europe in the nineteenth century are Britain, France and Russia. In this course we will investigate how the novel evolved in these countries with a view towards locating the points of convergence and divergence. As part of this investigation we will also study what two influential critics have to say about the novels in question as well as the 19th-century European novel in general. The novels that will be studied are

Unit 1

Jane Austen, *Mansfield Park* . Lecture format 5 weeks

Unit 2 Stendhal *The Red and the Black* . Lecture format 5 weeks

Unit 3. Fyodor Dostoyevsky, *Crime and Punishment*. Seminar format . 5 weeks.

IX. EVALUATION SCHEME: Sit down open book examinations for Units 1 and 2. 3000 words research paper for unit 3.

X. RECOMMENDED READING(S):

Georgy Lukacs ,"Balzac and Stendhal'' in Studies in European Realism
Mikhail Bakhtin, excerpts from "Forms of Time and of the Chronotope in the Novel" from The
Dialogical Imagination
Joseph Frank, Dostoevsky
Joseph Frank, "Spatial Form"
Marshall Berman, All That is Solid Melts in the Air.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: 19th Century Poetry

II. COURSE CODE: Eng 649

III. COURSE CREDITS (L:T:P): 4:0:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4:0:0

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY): None

VII. SCHOOL/ DEPARTMENT: HSSS/English

VIII. COURSE CONTENT & SYLLABUS:

This course acquaints the student with some key moments in the poetry of nineteenth-century Europe and America. We begin with the English romantics, exploring the romantic engagement with nature, the self, and the tantalizing promise of political revolution. Next, we encounter some distinctively American poetic strains such as the transcendentalist and the gothic. Finally, we return to Europe, to Browning's dramatic monologue and the French Symbolists, where we witness the early stirrings of the twentieth-century preoccupation with the craft of poetry.

IX. EVALUATION SCHEME:

Three assignments, one on each unit (2500 words each)
Class participation

X. RECOMMENDED READING(S):

Unit 1: The Romantics: Nature and the Imagination

Primary Texts:
William Wordsworth: "The Daffodils", "Lines Composed a Few Miles above Tintern Abbey"
S. T. Coleridge:"Kubla Khan", "The Ancient Mariner"
Secondary Texts:
William Wordsworth, "Preface to Lyrical Ballads"

4 weeks

The Romantics: The Age of Enlightenment

Primary Texts:

William Blake: London, Tyger

P. B. Shelley: Ode to the West Wind

Secondary Texts:

Thomas Paine: "The Rights of Man"

3 weeks

Unit 2: Nineteenth Century American Poetry

Primary Texts:

Walt Whitman: "Crossing Brooklyn Ferry"

Emily Dickinson: "I heard a Fly buzz - when I died", "Because I could not stop for Death", "The Soul selects her own society", and other selections from *Complete Poems*

Secondary Texts:

Henry David Thoreau, Conclusion of *Walden*

Emily Dickinson, *Letters of Emily Dickinson*

4 weeks

Unit 3: Precursors to Modernist Poetry

Primary Texts:

Robert Browning: "My Last Duchess", "The Bishop Orders His Tomb"

Charles Baudelaire: "To a Passerby", "Le Crépuscule du soir [Evening Twilight]", (from *The Flowers of Evil* translated by William Aggeler)

Secondary Texts:

"The Flaneur" from *The Writer of Modern Life* by Walter Benjamin

3 weeks

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: American Literature

II. COURSE CODE : Eng 650

III. COURSE CREDITS (L:T:P): 4:0:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4:0:0

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY): None

VII. SCHOOL/ DEPARTMENT: HSSS/English

VIII. COURSE CONTENT & SYLLABUS:

This course is meant to be an indicative survey of 20th century American literature. The genres include novels, memoirs and poetry, and major issues explored in this course are crisis of American self-identity in the long 20th century, race and the afterlife of slavery, colonialism and neo-colonialism, and experimentation of genre within American literature.

IX. EVALUATION SCHEME:

Class Participation
Mid-term assignment (1500 words)
Final assignment (2500 words)

X. RECOMMENDED READING(S):

Unit I

F. Scott. Fitzgerald, *The Great Gatsby* 4 weeks

Alice Walker, *The Colour Purple* 4 weeks

Unit 2: Nonfiction

Sherman Alexie, *The Absolutely True Diary of a Part-Time Indian* 2 weeks

Unit 3: Poetry

Allen Ginsberg, 'Howl', 'A Supermarket in California', 'America'

Elizabeth Bishop, 'Arrival at Santos', 'Crusoe in England', 'One Art', 'Questions of Travel' 3 weeks

Unit 4: Short Stories

Junot Diaz, ‘How to date a browngirl (black girl, white girl or halfie)’
Raymond Carver, ‘A small, good thing’
Ernest Hemingway, ‘A clean, well-lighted place’ 1 week

Background Readings
Zora Neale Hurston, ‘How It Feels To Be Coloured Me’
James Baldwin, ‘Notes of a Native Son’
Joan Didion, "Slouching Towards Bethlehem"
Vine Deloria, ‘Indian Humor’

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Analyzing Culture

II. COURSE CODE: Eng 651

III. COURSE CREDITS (L:T:P): 4:0:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4:0:0

V. COURSE TYPE (Core/Elective):Core

VI. PREREQUISITE/S (IF ANY):None

VII. SCHOOL/ DEPARTMENT: HSSS/English

VIII. COURSE CONTENT & SYLLABUS:

This course seeks to equip students from the humanities and especially the social sciences with methods which they might fruitfully deploy when engaging with problems related to culture. The course is made up of four units. The first comprises a set of readings that engage with one of the central problems in the analysis of modern culture: the deeply ambiguous role of technology in the production of culture. The second unit will address another cultural effect of modern capitalism – its capacity to produce desire. The third and fourth sections focus on recent methodological breakthroughs that have unfolded in the key domains of women's and post-colonial studies.

IX. EVALUATION SCHEME:

Evaluation in this course will be continuous and conducted throughout the semester. The object of evaluation will be to test a student's knowledge of the material taught through the course and the development of her analytical, critical and writing abilities. A final grade will be awarded on the basis of written presentations in seminars, participation in seminars and a 2,000 words term paper to be submitted at the end of the course. The course instructor may also set a short written examination to test the student's knowledge of the texts taught.

X. Recommended Readings

Unit 1: Culture and Industrial Capitalism

Theodor Adorno, 'Culture Industry Reconsidered' in *The Culture Industry – selected essays on mass culture*. Edited and with an introduction by J. M. Bernstein, London, Routledge, 1991, pp. 98-106.

Walter Benjamin, “The Work of Art in the Age of its Technological Reproducibility ” in Walter Benjamin, *Selected Writing 1935- 1938* , Harvard University Press, 2002,pp 101-134.

3 weeks

Unit 2: Desire of the insubstantial

Marx, “On the fetishism of commodities” From *Capital* Vol. 1, Part 1, Chapter 1, Section 4.

Freud ,“Fetishism” from the *Complete Psychological Works of Sigmund Freud* . J. Strachey tras. Hogarth Press, pp 147-57

Jean Baudrillard,*The System of Objects* Verso, 1966 4 weeks

Unit 3: Gendering Cultural Studies

Donna Haraway, “A Cyborg Manifesto: Science, Technology, and Socialist Feminism in the Late Twentieth Century” in *Simians, Cyborgs and Women: The Reinvention of Nature*. Routledge: New York, 1991, 149-181.

Gloria Anzaldua, "How To Tame a Wild Tongue." in *Borderlands/La Frontera: The New Mestiza*. Aunt Lute Books: San Francisco. 1999, 75-86.

bell hooks, “Gangsta culture" in *We Real Cool: Black Men and Masculinity.* Routledge: New York, 2004, 15-31.

Supplementary Readings

Linda Zerelli, "We Feel Our Freedom': Imagination and Judgment in the Thought of Hannah Arendt" Political Theory 33, No. 2 (April 2005): 158-188.

Moira Weigel" Further Materials Towards A Theory of The Man Child" The New Inquiry. July 9, 2013.

Wendy Brown, "Freedom and the Plastic Cage." in *States of Injury: Power and Freedom in Late Modernity.* Princeton University Press; New York. 1995, 3-29. 4 weeks

Unit 4: Post-colonial Cultural Studies

Gayatri Chakraborty Spivak, "Moving Devi" in *Other Asias*. Blackwell Publishing: Oxford, 2003, 178-208.

Rajeswari Sunderajan, “The Ameena Case” in *The Scandal Of The State*: Women: *Law and Citizenship in the Postcolonial State.* Duke University Press; Durham, 2003, 45-71.

Supplementary Readings

Dipesh Chakraborty, “Of Garbage, Modernity and the Citizen's Gaze." in *Habitations of Modernity: Essays in The Wake of Subaltern Studies.* University of Chicago Press: Chicago, 2002, 65-79.

Bill Ashcroft, “Sugar and slavery” in MSF Dias ed. *Legacies of Slavery: Comparative Perspectives*. Cambridge Scholars Publishing: Newcastle, UK, 2008, 108-125. 3 weeks

XI. RECOMMENDED READING(S):

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: Art and Technology**

II. **COURSE CODE: ENG658**

III. **COURSE CREDITS (L:T:P): 4:0:0**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4:0:0**

V. **COURSE TYPE (Core/Elective): Elective**

VI. **PREREQUISITE/S (IF ANY): None**

VII. **SCHOOL/ DEPARTMENT: SHSS/ENGLISH**

VIII. **COURSE CONTENT & SYLLABUS:**

The course will discuss, mainly, the relation between art and technology, where 'technology' is understood not only as the various techniques of production, fabrication and fabulation that are available at specific moments of production; but also as a condition which makes some techniques possible or impossible.

While taking a few examples from painting and sculpting and literary writing, the discussion will mainly focus on how we understand the relation between art and technology, often seen as opposites of each other.

Unit 1 12 hrs

A theoretical consideration of what technology means and does in contemporary society.

Reading:

Gilbert Simondon, 'Technical Mentality'

Walter Benjamin, 'The Work of Art in the Age of Technological Reproducibility'

Stanislaw Lem, excerpts from *Summa Technologica*.

Unit 2 12 hrs

A discussion of selected stories by Walter Miller Jr., and of positive and negative evaluations of 'technology', with a focus on Section One of 'A Canticle for Leibowitz'

A discussion of Ursula Le Guin's 'The World for the World is Forest'

Unit 3 13 hrs

A return to the theoretical discussion of 'technology', along with a discussion of visual material from recommended readings.

Donna Harraway, 'The Cyborg Manifesto'

Martin Heidegger, 'The Questsion Concerning Technology'

Compulsory Readings:

Gilbert Simondon, 'Technical Mentality'

Martin Heidegger, 'The Question Concerning Technology'

Donna Haraway, 'The Cyborg Manifesto'

Stanislaw Lem, excerpts *Summa Technologica*

Walter Benjamin, 'The Work of Art in the Age of Technological Reprducibility'

IX. **EVALUATION SCHEME:**
Mid term assignment: 50 %
End term assignment: 50 %

X. RECOMMENDED READING(S):

Philosophy
Bernard Stiegler, *Technics and Time* vol. 1
Fiction:
Selections from fiction by Walter Miller Jr.
'Big Joe and the Nth Generation'
'Conditionally Human'
Section One of *A Canticle for Leibowitz*
Ursula Le Guin, 'The Word for the World is Forest'
Visual Material:
Documentaries:
BBC 'Life: Primates', the Chimpanzee Section
BBC 'Life: Birds'
Movies
Terminator 1-3
Solaris (Tarkovsky, 1972)
9 (animation)

Ghost in the Shell 1-2 (anime)

Graphic
H R Giger

Performance Art
Stellarc
Stefanie Trojan
Marina Abramovic

Ted Talks

https://www.ted.com/talks/neil_harbisson_i_listen_to_color?language=en

https://www.ted.com/talks/hugh_herr_the_new_bionics_that_let_us_run_climb_and_dance

https://www.youtube.com/watch?v=TqtiM1hK6lU

Methods in the Analysis of Narrative

Prof Sambudha Sen

The course seeks to familiarize students with the most influential thinking that has developed around the problem of narrative during the twentieth century, Specially, it seeks to uncover the lines of continuity and divergence between various forms of narrative forms myths and novels to advertising clips and to analyses the ways in which each of these forms achieves its most characteristic effects.

Evaluation will be based on three class presentation and 13000 words long term paper.

Texts that will be discussed in depth

1. Claude Levi- Strauss, “Myth and Meaning”
2. Mikhail Bakhtin, “Forms of Chronotopes in the Novel” from the Dialogical Imagination.
3. Fredric Jameson, “On Interpretation” from The Political Unconscious.
4. Roland Barthes, “ The Myth Today”
5. Jean Baudrillard, “ The System of Objects.

SHIV NADAR UNIVERSITY

Graduate Prospectus

Masters in Fine Arts

Department of Art Design and Performing Arts

School of Humanities and Social Sciences

Shiv Nadar University

Post office Shiv Nadar University
Gautam Buddha Nagar
UP-201314

Masters Programme in Fine Arts

Overview

In keeping with the University's emphasis on interdisciplinary research and situated experiential learning, the Department of Art, Design and Performing Arts nurtures rigorous and thoughtful praxis in these disciplines and their interface with society, culture and politics.
The Department is also committed to providing its students and members with several options for financial aid as well as research grants.

Admission to the programme is highly selective. The department conducts a review of the application forms which is followed by a personal interview for the shortlisted candidates.

Eligibility Conditions

The focus of the programme will be on research, experimentation and cultivating innovative art practices with expert artistic, theoretical and technical support. Individuals with a disposition towards deepening and broadening the scope of their practice along these lines will make for suitable candidates.
The minimum entry qualifications for the MFA program are BFA degree or an equivalent qualification.If an applicant has completed an undergraduate diploma course, which would mean that she/he will not have the equivalent credits of an undergraduate degree course, she/he will have to complete in the first semester an additional 12 credits (over and above the required number of 48 Credits for the MFA.) in History of Art and Aesthetics to become eligible for a Master's Programme. If the student can't cope with the additional 12 credits, she/he will have to complete the Masters Programme by taking an additional (5^{th}) semester.

Applicants must also have a portfolio of work demonstrating the necessary skills and aptitude. Applications from international students with relevant qualifications are welcome.
Candidates from related fields such as Communication/ Design/ Applied Art, etc. will be considered on the basis of their portfolio, aptitude, approach and performance during the interview.

Course structure

A student must complete a minimum of 28 credit hours in residence at the Department. In the case of students participating in exchange programmes with accredited institutions in the country or abroad, a transfer of up to 15 credits is permissible.

Total minimum credits for completing MFA is 48.

Core Courses – 40 credits	**Elective Courses- 8 credits** Two courses to be taken from other disciplines such as Economics/Sociology/Literature/History/ Mechanical, Electrical, Electronic Engineering/ Natural Sciences/ Mathematics etc.
Studio 24 credits.	Course-1 4 credits
Theory 16 credits	Course-2 4 credits

Total 40 credits	Total 8 credits

The students must complete 8 core studio, 4 core theory courses and 2 elective courses in 4 semesters. A minimum of one core theory and one core studio course has to be taken per semester. (each course is 4 credits)

Studio Courses
Guidance in the practical aspects of art-making will be offered in the individual studios and the workshops. The central strategy is studio-based teaching and learning with emphasis on personal contact with faculty and peers. Studio spaces are meant primarily for experimentation, execution and finishing of artworks and informal peer-assisted learning.

Studio courses offered are

- Painting & Drawing/Cross Media Projects,
- Sculpture, Installation,
- The Photographic Image,
- Video,
- New Media,
- The Moving Image-Form and Function,
- The Artist's Body,
- Art in the Public Domain,
- Aesthetics and Politics.
- Independent study*

** Independent study prioritizes individual research; students are expected to concentrate on their individual specialization, deepen their interrogations and consolidate the learning and experimentation of the first year under the supervision of the mentor.*

Theory Courses
These involve student or faculty led presentations followed by discussions. They provide opportunities for formal and informal dialogue, direct communication skills and critical thinking towards developing a discursive approach to art making. Students are required to present their work within the context of the seminar to a group of peers, faculty as well as invited faculty of relevant departments.

A tentative list of theory courses to be offered are

- Visual Anthropology,
- Art History /Visual Studies,
- Critical Theory, etc.

Induction Courses
Courses to acquaint students with various media (hardware and software) will be conducted by the respective technicians of the wood, metal and digital media workshops and occasionally by the faculty. Students who wish to acquire or explore specific skills will be given the necessary guidance. Induction courses have no credits

Theory is taught mostly in English; applicants lacking an adequate knowledge of the language will have to take a course in Reading, Writing and Comprehension, offered by the English Department.

Project Spaces
Two spaces within the university and two in the city of Delhi, with distinctly different dimensions and character, will function as project spaces. Working in project spaces allows the student to negotiate unconventional spaces for conceptualizing and displaying site-specific works. In the second and third semester it will be mandatory for students to present the project undertaken during their chosen courses at one of the *project spaces*[2]. These projects will be executed during the last month of each of the semesters. Each project will be on display for one week.

The allocation of spaces would be decided following group critique by faculty and peers from proposals submitted individually/collaboratively.

Fine Art Graduate Thesis Exhibition
In the fourth semester, the students complete their Master's project with a solo presentation of their work in the *Fine Art Graduate Thesis Exhibition*.

Mentorship
Each student will be assigned a primary mentor and two other mentors in accordance with the thrust and nuances of their individual practice, to help chart a course of study in keeping with their individual methods, media, and work preferences. In exceptional cases, a request for a change of mentor/s would be considered in consultation with the core faculty. However, the mentors who facilitate the research and work of the student till the final Exhibition/Thesis would be designated as the Mentor Team no later than the end of second semester.
The mentor team will comprise:

a. Primary Mentor (Studio Practice)
b. Mentor (Studio Practice)
c. Mentor (Art Theoretician) (mandatory)

Assessment
Performance will be assessed on the basis of separate projects that will be submitted as a body of work at the end of the course, when it will be given a summative grade.
Work done during the courses will also be reviewed through individual as well as collective critiques.

Critiques help develop an individual vocabulary while exploring the processes, materials and ideas that a student wishes to address. Students will present their work, or some part of their work, in a pre-designated room/space for a collective critique.
In cases where transportation of the work is difficult due to fragility/size/weight etc., the mentor may conduct the collective/individual critique at the student's studio.

1. At least one individual critique a month is mandatory per course per semester.
2. There will be a minimum of 4 collective critiques per semester.

Assessment of seminar courses is on the basis of presentations and assignments submitted. They are appraised on the basis of the understanding and distillation of theoretical concepts and contemporary discourse. The requirements for the award of the MFA degree include a portfolio of work done during the four semesters and a Fine Art Graduate Thesis Exhibition. The latter involves presenting a substantial body of original work in an exhibition space or at an appropriate site. Students are also required to appear for a *viva voce* to defend their work to faculty other than their mentor team.

Theoretical assessments are based on assignments submitted and the level of participation in seminars. Attendance through the four semesters will also be considered, as personal contact and peer learning are fundamental to the teaching and learning methodology. In addition, students will be required to maintain a log (in the form preferred by the student and acceptable to the mentor) as evidence of the research carried out for the Masters project/ the Fine Art Graduate Thesis Exhibition.

Hostel Facilities
All academic programs at SNU are fully residential.

Faculty

Core Team- The faculty impacts the arts regionally, nationally and internationally. Their work is widely exhibited in India and abroad. They maintain and will facilitate a worldwide network of partnerships and collaborations to benefit the students.
The core faculty includes

- Sumantra Sengupta (Head of Department)
- Atul Bhalla
- Sharmila Samant
- Tushar Joag
- Vasudha Thozhur

Visiting Faculty/Advisors - Distinguished art practitioners and cultural theorists will be invited from India and abroad to interact with the students and enhance their knowledge of contemporary art practices.

The Visiting Faculty/Advisors from India may include any of the following: Amar Kanwar , Anandjit Ray, Anand Patwardhan, Anita Dube, Annapurna Garimella, Anju Dodiya, Anshuman Dasgupta, Archana Hande, Ashish Rajadhyaksha, Asim Waqif , Atul Dodiya, Ayesha Abraham, B.V. Suresh, Camp (Ashok Sukumar, Shaina Anand), Desire Machine Collective (Sonal Jain, Mriganka Madhukaillya), Gayatri Sinha, Geeta Kapur, Ghulam Sheikh, Gigi Scaria, Indra Pramit Roy, Jitish Kallat, Justin Ponmany, Kausik Mukhopadyay, Manisha Parekh, Mithu Sen, Nalini Malani, Nikhil Chopra, Nilima Sheikh, N.S Harsha, N.Pushpamala, Prajakta Potnis, Ram Rehman, Ranbir Kaleka, Raqs Media Collective, Ravi Agarwal, Sanchayan Ghosh, Shakuntala Kulkarni, Shilpa Gupta, Shukla Sawant, Sonia Khurana, Surabhi Sharma, Valsan Kolleri, Vasudevan Akkitham, Vidya Shivadas, Vivan Sundaram, among others.

Facilities

Individual studios - Each student will be allotted an individual studio which is naturally and artificially lit with easy access to workshops and faculty studios.

Workshops - Each course may be linked to the various workshops that the Department of Art will offer.

1. Photography
2. Video
3. Sound
4. Ceramics
5. Wood
6. Metal

Library - Apart from the University library, the Department of Art, Design and Performing Arts will have a separate, regularly updated library with videos, journals and books for easy reference.

Interdisciplinary collaborations

Interdisciplinary collaborations in affiliation with students/ faculty of other departments or schools within or outside the University will be encouraged.

SHIV NADAR UNIVERSITY
MFA COURSE

I. BODY COURSE TITLE: THE ARTIST'S BODY
II. COURSE CODE: ART 660
III. COURSE CREDITS (L:T:P): 0:0:4
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 0:0:8
V. COURSE TYPE (CORE/ELECTIVE): CORE
VI. PREREQUISITE/S (IF ANY): NONE
VII. COURSE COORDINATOR /INSTRUCTOR: ATUL BHALLA
VIII. SCHOOL/ DEPARTMENT: HUMANITIES & SOCIAL SCIENCES/ ADT
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART.
X. NUMBER OF STUDENTS: 15
XI. COURSE CONTENT: THE ARTIST'S 01

Happenings, performance, body-art, interventions, the artist has been using his body as subject and as actual material. The artist's body has throughout history been the subject of art -- primarily through painted self-portraiture. From the western post-war period, however, artists began using their bodies as the subject and the actual material of the artwork.

We shall be looking at how the artist's body is/has been an important tool for intervention in contemporary Indian and world art. Students in this course are introduced to various aspects of the "performative", the body and related art practices, exploring the historical background, and current issues within contemporary art.

Technical expansiveness, theoretical development and the role of the body as medium will be explored through individual and collaborative projects and research.

XII. SKILL SETS ACQUIRED:

They will have the ability to make work of a high professional standard, with in-depth application of their bodies as a direct/indirect medium of communication. A grasp and perception of their specialization and with an advanced level of individual responsibility towards creative, technical and organizational skills.

XII. RECOMMENDED BOOKS:

1.The Artists Body
(Phaidon Press)
2.Performance Art
By Roselee GoldberG

XIII. ASSESSMENT SCHEME:

Performance will be assessed on the basis of 2 small projects and a final larger body of work that will be submitted for final assessment at the end of the course for which summative grades will be given. Work done during the courses will also be reviewed through individual as well as collective critiques.

SHIV NADAR UNIVERSITY
MFA COURSE

I. COURSE TITLE: THE PHOTOGRAPHIC IMAGE
II. COURSE CODE: ART 632
III. COURSE CREDITS (L:T:P): 0:0:4
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 0:0:8
V. COURSE TYPE (CORE/ELECTIVE): CORE
VI. PREREQUISITE/S (IF ANY): NONE
VII. COURSE COORDINATOR /INSTRUCTOR: ATUL BHALLA
VIII. SCHOOL/ DEPARTMENT: HUMANITIES & SOCIAL SCIENCES/ ADT
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART.
X. NUMBER OF STUDENTS: 15
XI. COURSE CONTENT:

This course explores historical, expressive, critical, representational, formal, conceptual and technical aspects of this very varied, fluid, and pervasive medium through experimentation and research within the student's own practice as a means of personal expression. An aesthetically based medium, photography, will be explored and discussed along with reading into the practice and work of other artists who use photography directly or as an take off point. Some potential subjects discussed include problematic words as they appearing in todays art discourse and writing such as authentic, truth, quality, transcendence, etc.Also discussed will be some of the following: the problems of making judgments and issues of quality; the content of art and photography; the shifts in the definitions of 'mainstream,' 'outsider,' and 'other'

XI. RECOMMENDED BOOKS:

1.Art and Photography
Edited by David Campany
(Phaidon Press)
2. Vitamin PH: New Perspectives in Photography
Edited by Tracey Warr, with a survey by Amelia Jones
3.Camera Lucida
By Roland Barthes
4.On Photography
By Susan Sontag
5.Illuminations
By Walter Benjamin

XII. SKILL SETS ACQUIRED:

They will have the ability to make work of a high professional standard, with in-depth application and understanding of the photographic image or its reproduction in any medium.

XIII. ASSESSMENT SCHEME:

Performance will be assessed on the basis of 2 small projects
In different media and a final larger body of work that will be submitted for final assessment at the end of the course for which summative grades will be given. Work done during the courses will also be reviewed through individual as well as collective critiques.

SHIV NADAR UNIVERSITY

MFA COURSE

I. COURSE TITLE: Painting and Drawing/Cross-Media Project I
II. COURSE CODE: 609
III. COURSE CREDITS (L:T:P): 0:0:4
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 0:0:8
V. COURSE TYPE (CORE/ELECTIVE): Core
VI. PREREQUISITE/S (IF ANY): BFA in Fine Art. A Bachelor's in related, practice-based disciplines (Design, Architecture, other) would be considered on submission of a comprehensive portfolio as proof of proficiency.
VII. COURSE INSTRUCTOR(S): Vasudha Thozhur
VIII. SCHOOL/ DEPARTMENT: Humanities & Social Sciences/ ADT
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: Fine Art
X. NUMBER OF STUDENTS: Approximately 15.
XI. COURSE CONTENT: As below.

Painting

Painting and Drawing are explored as language and disciplinary framework, and in addition re-defined in terms of their changing function within different contexts and times, and in relationship to other art forms. Further, they would provide a basis for explorations in other media, or could be incorporated into other forms of practice.

Through active engagement with the medium in all its aspects, a combination of perspectives unique to each student would emerge during the first semester, which would enhance not only their knowledge of the visual world but also their capacity to interpret and comprehend it. Short, intensive workshops based on folk, classical and street/popular/traditions would also be organized in addition to interactions with contemporary artists. Apart from the learning experience that this entails, it would build an understanding between different kinds of practitioners, extending beyond art into community.

The studio component of the course would be complemented by adequate theoretical support. Talks, relevant reading, consultations with other faculty etc. would form an intrinsic part of the instruction. In addition, the course would offer occasional refresher sessions in Life Studies, Portraiture, Landscape and Still Life; both faculty and students could avail of the facility.

Drawing

To widen an understanding of Drawing today, in addition to the formal sessions mentioned above, an attempt will be made to compile the different methods and applications that have come into being over time. Short modules that would explore forms of drawing which find extensive application outside of its hitherto prescribed realm would be invaluable. Experienced visiting faculty from the disciplines of architecture, engineering, botany, the digital media, etc. could conduct short modules on ways in which drawing supports most forms of research. At the end of

every year, the course material would be put together as a growing body of knowledge that spreads beyond the boundaries of its specific disciplines, and which would in turn create a new curriculum for Drawing.

Students would gain perceptions to do with space, scale and dimension as seen from varying perspectives, and could put it to good use in creating their own propositions. It needs to be said that this is as yet an uncharted area of research and that our department would be one of the very few, if not the only, that might offer such possibilities.

Cross-Media Project

Equally important is the fact of being located within a landscape and among communities; to find ways of building networks through projects, investigations, and friendships. It would involve field trips related to local histories/sites, or any subject of the student's choice, carried out with a range of investigative visual media. It is believed that these explorations could, apart from exposing and sensitizing students to the multiple realities that surround them, create practices that would go beyond the homogeneity of an exclusive 'art school' language. It further creates a genuinely engaged viewership – with a breadth of scope and agency that would continue to grow with each exchange, beyond the currently prescribed boundaries of what constitutes art. Students would be encouraged to re-imagine cultural and economic frameworks for practice, either collectively, individually or through institutional/organizational affiliations; there is a need at the present time to re-create and extend contexts for art and its supporting structures.

The course is seen as complementing the core area of Drawing and Painting and is experimental and process-based. The notion of Praxis is central to the module, and the emphasis is on finding a grammar that binds medium (explored in the earlier module), concept and subject-matter in an integrated approach to the excavation of meaning. Theoretical support that could expand and enrich the field of inquiry would be provided by core/visiting faculty and by other departments.

It will be expected that the students would produce a dissertation pertaining to their choice of project, or to reflections on their own practice. Articulation through speaking and writing about one's work and related concerns would be encouraged throughout the course. Students would present their work to an audience at the end of each year.

XII. RECOMMENDED BOOK(S):

1. Painting (Documents of Contemporary Art) Terry Myers(editor) 2011
2. Vitamin P2: New Perspectives in Painting/Phaidon 2011
3. Contemporary Painting in Context (The Novo Nordisk Art History Project) Ann Ring Petersen/Mikkel Bogh/Hans Dam Christensen/Peter Norgaard Larsen 2010
4. Naked Emporers: Criticisms of English Contemporary Art/Brian Sewell

5. "Art and Visual Perception: A Psychology of the Creative Eye," /Rudolf Arnheim /'Visual Thinking'
6. "Anatomy: A Complete Guide for Artists" by Joseph Sheppard, Dover Publications
7. "Camera Lucida" by Roland Barthes, Farrar Straus and Giroux and Hill and Wang (MacMillan)
8. "Flow: The Psychology of Optimal Experience" by Mihaly Csikszentmihalyi, Harper Collins
9. "History of Beauty" and "On Ugliness" by Umberto Eco, Rizzoli New York
10. "Orientalism" by Edward Said, Penguin
11. "Seeing is Forgetting the Name of the Thing One Sees: Over Thirty Years of Conversations with Robert Irwin" by Lawrence Weschler, University of California Press
12. "Seven Days in the Art World" by Sarah Thornton, W. W. Norton & Company
13. "The Art Museum" Edited by Phaidon
14. "The Continental Aesthetics Reader, 2nd Edition" Edited by Clive Cazeaux, Routledge
15. "The Lives of the Artists" Giorgio Vasari, Oxford University Press
16. "Ways of Seeing" by John Berger, Viking (Pengiun Group)
17. "Why Art Cannot Be Taught: A Handbook for Art Students" by James Elkins, University of Illinois Press
18. "A Life of Picasso: The Cubist Rebel, 1907-1916" by John Richardson, Random House
19. "Art History: 4th Edition" by Marilyn Stokstad and Michael W. Cothren, Pearson
20. "The Pink Glass Swan" by Lucy Lippard, the New Press

XIV. SKILL SETS ACQUIRED:

1. Facility with visual language, conceptual and technical skills, a sound theoretical background to further research in the Fine Arts.
2. Painting and Drawing could provide a basis for other forms of practice such as installation, video, or any other, as students would gain an extended experience of the basics of form, composition and colour.
3. Students would be ready to apply for the numerous grants and scholarships that are increasingly available in the arts, or could continue their studies abroad. They would have the qualifications and skills necessary to find employment in related professions such as theatre /film/set design, etc.

XV. ASSESSMENT SCHEME:

As specified in the document of the Master of Fine Arts Program.

SHIV NADAR UNIVERSITY
MFA COURSE

I. COURSE TITLE: Painting and Drawing/Cross-Media Project II
II. COURSE CODE: 610
III. COURSE CREDITS (L:T:P): 0:0:4
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 0:0:8
V. COURSE TYPE (CORE/ELECTIVE): Core
VI. PREREQUISITE/S (IF ANY): BFA in Fine Art. A Bachelor's in related, practice-based disciplines (Design, Architecture, other) would be considered on submission of a comprehensive portfolio as proof of proficiency.
VII. COURSE INSTRUCTOR(S): Vasudha Thozhur
VIII. SCHOOL/ DEPARTMENT: Humanities & Social Sciences/ ADT
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: Fine Art
X. NUMBER OF STUDENTS: Approximately 15.
XI. COURSE CONTENT: As below.

Painting

Painting and Drawing are explored as language and disciplinary framework, and in addition re-defined in terms of their changing function within different contexts and times, and in relationship to other art forms. Further, they would provide a basis for explorations in other media, or could be incorporated into other forms of practice.

Through active engagement with the medium in all its aspects, a combination of perspectives unique to each student would emerge during the first semester, which would enhance not only their knowledge of the visual world but also their capacity to interpret and comprehend it. Short, intensive workshops based on folk, classical and street/popular/traditions would also be organized in addition to interactions with contemporary artists. Apart from the learning experience that this entails, it would build an understanding between different kinds of practitioners, extending beyond art into community.

The studio component of the course would be complemented by adequate theoretical support. Talks, relevant reading, consultations with other faculty etc. would form an intrinsic part of the instruction. In addition, the course would offer occasional refresher sessions in Life Studies, Portraiture, Landscape and Still Life; both faculty and students could avail of the facility.

Drawing

To widen an understanding of Drawing today, in addition to the formal sessions mentioned above, an attempt will be made to compile the different methods and applications that have come into being over time. Short modules that would explore forms of drawing which find extensive application outside of its hitherto prescribed realm would be invaluable. Experienced visiting faculty from the disciplines of architecture, engineering, botany, the digital media, etc. could conduct short

modules on ways in which drawing supports most forms of research. At the end of every year, the course material would be put together as a growing body of knowledge that spreads beyond the boundaries of its specific disciplines, and which would in turn create a new curriculum for Drawing.

Students would gain perceptions to do with space, scale and dimension as seen from varying perspectives, and could put it to good use in creating their own propositions. It needs to be said that this is as yet an uncharted area of research and that our department would be one of the very few, if not the only, that might offer such possibilities.

Cross-Media Project

Equally important is the fact of being located within a landscape and among communities; to find ways of building networks through projects, investigations, and friendships. It would involve field trips related to local histories/sites, or any subject of the student's choice, carried out with a range of investigative visual media. It is believed that these explorations could, apart from exposing and sensitizing students to the multiple realities that surround them, create practices that would go beyond the homogeneity of an exclusive 'art school' language. It further creates a genuinely engaged viewership – with a breadth of scope and agency that would continue to grow with each exchange, beyond the currently prescribed boundaries of what constitutes art. Students would be encouraged to re-imagine cultural and economic frameworks for practice, either collectively, individually or through institutional/organizational affiliations; there is a need at the present time to re-create and extend contexts for art and its supporting structures.

The course is seen as complementing the core area of Drawing and Painting and is experimental and process-based. The notion of Praxis is central to the module, and the emphasis is on finding a grammar that binds medium (explored in the earlier module), concept and subject-matter in an integrated approach to the excavation of meaning. Theoretical support that could expand and enrich the field of inquiry would be provided by core/visiting faculty and by other departments.

It will be expected that the students would produce a dissertation pertaining to their choice of project, or to reflections on their own practice. Articulation through speaking and writing about one's work and related concerns would be encouraged throughout the course. Students would present their work to an audience at the end of each year.

XII. RECOMMENDED BOOK(S): Same as CROSS MEDIA PROJECT-I

XII. SKILL SETS ACQUIRED:

1. Facility with visual language, conceptual and technical skills, a sound theoretical background to further research in the Fine Arts.
2. Painting and Drawing could provide a basis for other forms of practice such as installation, video, or any other, as students would gain an extended experience of the basics of form, composition and colour.
3. Students would be ready to apply for the numerous grants and scholarships that are increasingly available in the arts, or could continue their studies abroad. They would have the qualifications and skills necessary to find employment in related professions such as theatre /film/set design, etc.

XIII. ASSESSMENT SCHEME:

As specified in the document of the Master of Fine Arts Programme.

SHIV NADAR UNIVERSITY
MFA COURSE

I. COURSE TITLE: -SCULPTURE AND INSTALLATION
II. COURSE CODE: ART 621
III. COURSE CREDITS (L:T:P): 0 : 0 : 4
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 0 : 0 : 8
V. COURSE TYPE (CORE/ELECTIVE): CORE
VI. PREREQUISITE/S (IF ANY): NONE
VII. COURSE COORDINATOR /INSTRUCTOR(S): SHARMILA SAMANT
VIII. SCHOOL/ DEPARTMENT: HUMANITIES & SOCIAL SCIENCES/ ADT
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART.
X. NUMBER OF STUDENTS: 15
XI. COURSE CONTENT:

The course lays emphasis on the advancement of individual students concerns and engagements. Students will work in three dimensional space integrating sound/ mechanics/ new media etc. They will deal with making objects by carving/ assembling/ ready-mades. The students develop their practice benefiting from one on one critiques with the mentors as well as joint student critiques. Intra and inter school cross-disciplinary collaborations will be encouraged. Visit to museums, galleries and artist studios and analyzing works.

XII. RECOMMENDED BOOK(S):

1. Wim Delvoye: Cloaca - New & Improved by Dan Cameron (Editor), Gerardo Mosquera, Dieter
2. Roelstraete, Salvador DalíPublished February 2nd 2002 by Rectapublishers
3. Over Here: International Perspectives on Art and Culture by Gerardo Mosquera Art Since 1900:
4. Modernism, Antimodernism, Postmodernism Book by Hal FosterThames and Hudson
5. The Return of the Real: The Avante-Garde at the End of the Century by Hal Foster
6. The Anti-Aesthetic: Essays on Postmodern Culture by Hal Foster
7. Recodings: Art, Spectacle, Cultural Politics by Hal Foster
8. Prosthetic Gods (October Books) by Hal Foster
9. The First Pop Age: Painting and Subjectivity in the Art of Hamilton, Lichtenstein, Warhol, Richter, and Ruscha... by Hal Foster
10. The Art-Architecture Complex by Hal Foster
11. Compulsive Beauty (October Books) by Hal Foster
12. Design and Crime (And Other Diatribes) (Radical Thinkers) by Hal Foster
13. The Art- Architecture Complex by Hal Foster
14. Perpetual Inventory by Rosalind Krauss MIT press
15. The Optical Unconscious by Rosalind Krauss October Books, MIT press

16. The Originality of the Avant-Garde and Other Modernist Myths by Rosalind Krauss, MIT press
17. Art Since 1900: Modernism, Antimodernism, Postmodernism Book by Hal FosterThames and Hudson
18. The Return of the Real: The Avante-Garde at the End of the Century by Hal Foster
19. The Anti-Aesthetic: Essays on Postmodern Culture by Hal Foster

XVI. SKILL SETS ACQUIRED:

They will have the ability to make work of a high professional standard, with in-depth application, grasp and perception of their specialization and an advanced level of individual responsibility towards creative, technical and organizational skills. The students will have the intellectual capacity to research, plan, design, fabricate, and complete work utilizing a variety of processes in a variety of settings for a variety of purposes.

XVII. ASSESSMENT SCHEME:

Performance will be assessed on the basis of projects that will be submitted for final assessment at the end of the course for which a summative grade will be given. Work done during the courses will also be reviewed through individual as well as collective critiques

SHIV NADAR UNIVERSITY
MFA COURSE

I. COURSE TITLE: The Moving Image-Form and Function
II. COURSE CODE: 652
III. COURSE CREDITS (L:T:P): 0:0:4
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 0:0:8
V. COURSE TYPE (CORE/ ELECTIVE): CORE
VI. PREREQUISITE/S (IF ANY): NONE
VII. COURSE INSTRUCTOR(S): SHARMILA SAMANT
VIII. SCHOOL/ DEPARTMENT: HUMANITIES & SOCIAL SCIENCES/ ADT
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART
X. NUMBER OF STUDENTS: 12-15
XI. COURSE CONTENT:

This course introduces students to the moving image working with film and video for developing creative ideas. The focus will be on the fundamentals of the moving image and time-based media towards developing an informed perspective that is abstract/ conceptual/ narrative/ personal/ political. Technical demonstrations and lectures along with viewing and discussions of a range of films and video works by other artists and projects made by the students will be included. The course includes developing concepts for moving image work-making storyboards/ narrative structure, capturing and importing video, editing-working with effects and transitions, sound. The discussion will be furthered by an analysis of video, moving media installation art, and works researched by students. Field Trip: Video Lounge India Art Fair and other exhibitions as are put up- Delhi

XII. RECOMMENDED BOOK(S):

1. Bruce Nauman: Mapping the Studio by Peter Plagens
2. A History of Video Art: The Development of Form and Function by Chris Meigh- Andrews
3. Illuminating Video: An Essential Guide To Video Art (English version)Doug Hall (Editor), Sally Jo Fifer(Editor), David Bolt (Preface), David Ross (Foreword)
4. Video: The Reflexive Medium (Leonardo Book Series) By Yvonne Spielmann by the MIT press
5. Rush, M., 2007. *Video Art*. London: Thames and Hudson.
6. Figgis, M., 2007. *Digital Film-making*. London: Faber and Faber.
7. Newton, D., 2007. *Digital filmmaking 101: an essential guide to producing low-budget movies.* Studio City, CA: Michael Wiese Productions.Elwes, C., 2005. *Video Art: A Guided Tour*. London; New York: I.B. Tauris.

XIII . SKILL SETS ACQUIRED:

Analysis of existing video and media installation art from the past. Students will learn the basics of digital video production- how to shoot, the fundamentals of editing image and sound. Each student's personal video work will unravel and discover what each student's vocabulary, intention, and formulation are, as currently being activated through their work.

XIV. ASSESSMENT SCHEME:

1. Making of storyboard/ narrative structure, capturing images (still/moving),editing finished film

2. Making a 2-3 min video. Required (technician in sound and video editing)

SHIV NADAR UNIVERSITY
MFA COURSE

I. COURSE TITLE: STUDIO PRACTICE-SCULPTURE AND INSTALLATION
II. COURSE CODE: 620
III. COURSE CREDITS (L:T:P): 0:0:4
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 0:0:8
V. COURSE TYPE (CORE/ ELECTIVE): CORE
VI. PREREQUISITE/S (IF ANY): NONE
VII. COURSE INSTRUCTOR(S): TUSHAR JOAG
VIII. SCHOOL/ DEPARTMENT: HUMANITIES & SOCIAL SCIENCES/ ADT
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART
X. NUMBER OF STUDENTS: 15
XI. COURSE CONTENT:
XII. COURSE TITLE: COURSE CODE: ART 620

The course lays emphasis on the advancement of individual students concerns and engagements. Students will work in three dimensional space integrating sound/ mechanics/ new media etc. They will deal with making objects by carving/ assembling/ readymades. The students develop their practice benefiting from one on one critiques with the mentors as well as joint student critiques. Intra and inter school cross-disciplinary collaborations will be encouraged. Visits to museums, galleries and artist studios and analyzing works.

XIII. RECOMMENDED BOOK(S):

1. Wim Delvoye: Cloaca - New & Improved by Dan Cameron (Editor), Gerardo Mosquera, Dieter
2. Roelstraete, Salvador DalíPublished February 2nd 2002 by Rectapublishers
3. Over Here: International Perspectives on Art and Culture by Gerardo Mosquera Art Since 1900:
4. Modernism, Antimodernism, Postmodernism Book by Hal FosterThames and Hudson
5. The Return of the Real: The Avante-Garde at the End of the Century by Hal Foster
6. The Anti-Aesthetic: Essays on Postmodern Culture by Hal Foster
7. Recodings: Art, Spectacle, Cultural Politics by Hal Foster
8. Prosthetic Gods (October Books) by Hal Foster
9. The First Pop Age: Painting and Subjectivity in the Art of Hamilton, Lichtenstein, Warhol, Richter, and Ruscha... by Hal Foster
10. The Art-Architecture Complex by Hal Foster
11. Compulsive Beauty (October Books) by Hal Foster
12. Design and Crime (And Other Diatribes) (Radical Thinkers) by Hal Foster
13. The Art- Architecture Complex by Hal Foster
14. Perpetual Inventory by Rosalind Krauss MIT press

15. The Optical Unconscious by Rosalind Krauss October Books, MIT press
16. The Originality of the Avant-Garde and Other Modernist Myths by Rosalind Krauss, MIT press
17. Art Since 1900: Modernism, Antimodernism, Postmodernism Book by Hal FosterThames and Hudson
18. The Return of the Real: The Avante-Garde at the End of the Century by Hal Foster
19. The Anti-Aesthetic: Essays on Postmodern Culture by Hal Foster

XIV. SKILL SETS ACQUIRED:

They will have the ability to make work of a high professional standard, with in-depth application, grasp and perception of their specialization and an advanced level of individual responsibility towards creative, technical and organizational skills. The students will have the intellectual capacity to research, plan, design, fabricate, and complete work utilizing a variety of processes in a variety of settings for a variety of purposes.

XV. ASSESSMENT SCHEME:

Performance will be assessed on the basis of projects that will be submitted for final assessment at the end of the course for which a summative grade will be given. Work done during the courses will also be reviewed through individual as well as collective critiques.

SHIV NADAR UNIVERSITY
MFA COURSE

I. COURSE TITLE: STUDIO PRACTICE-SCULPTURE AND INSTALLATION
II. COURSE CODE: 620
III. COURSE CREDITS (L:T:P): 0 : 0 : 4
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 0 : 0 : 8
V. COURSE TYPE (CORE/ELECTIVE): CORE
VI. PREREQUISITE/S (IF ANY): NONE
VII. COURSE COORDINATOR(S)/INSTRUCTOR(S): TUSHAR JOAG
VIII. SCHOOL/ DEPARTMENT: HUMANITIES & SOCIAL SCIENCES/ DEPARTMENT OF ART DESIGN AND THEATRE.
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART.
X. NUMBER OF STUDENTS: 15
XI. COURSE CONTENT:
The course is conducted every semester and lays emphasis on the advancement of individual students concerns and engagements. The students develop their practice benefiting from one on one critiques with the mentors as well as joint student critiques. Intra and inter school cross-disciplinary collaborations will be encouraged.

XII. RECOMMENDED BOOK(S):

20. Wim Delvoye: Cloaca - New & Improved by Dan Cameron (Editor), Gerardo Mosquera, Dieter
21. Roelstraete, Salvador DalíPublished February 2nd 2002 by Rectapublishers
22. Over Here: International Perspectives on Art and Culture by Gerardo Mosquera Art Since 1900:
23. Modernism, Antimodernism, Postmodernism Book by Hal FosterThames and Hudson
24. The Return of the Real: The Avante-Garde at the End of the Century by Hal Foster
25. The Anti-Aesthetic: Essays on Postmodern Culture by Hal Foster
26. Recodings: Art, Spectacle, Cultural Politics by Hal Foster
27. Prosthetic Gods (October Books) by Hal Foster
28. The First Pop Age: Painting and Subjectivity in the Art of Hamilton, Lichtenstein, Warhol, Richter, and Ruscha... by Hal Foster
29. The Art-Architecture Complex by Hal Foster
30. Compulsive Beauty (October Books) by Hal Foster
31. Design and Crime (And Other Diatribes) (Radical Thinkers) by Hal Foster
32. The Art- Architecture Complex by Hal Foster
33. Perpetual Inventory by Rosalind Krauss MIT press
34. The Optical Unconscious by Rosalind Krauss October Books, MIT press
35. The Originality of the Avant-Garde and Other Modernist Myths by Rosalind Krauss, MIT press

36. Art Since 1900: Modernism, Antimodernism, Postmodernism Book by Hal FosterThames and Hudson
37. The Return of the Real: The Avante-Garde at the End of the Century by Hal Foster
38. The Anti-Aesthetic: Essays on Postmodern Culture by Hal Foster

XIII. **SKILL SETS ACQUIRED:** They will have the ability to make work of a high professional standard, with in-depth application, grasp and perception of their specialization and an advanced level of individual responsibility towards creative, technical and organizational skills. The students will have the intellectual capacity to research, plan, design, fabricate, and complete work utilizing a variety of processes in a variety of settings for a variety of purposes.

XIV. **ASSESSMENT SCHEME:** Performance will be assessed on the basis of projects that will be submitted for final assessment at the end of the course for which a summative grade will be given. Work done during the courses will also be reviewed through individual as well as collective critiques.

SHIV NADAR UNIVERSITY
MFA COURSE

I. COURSE TITLE: ART IN PUBLIC DOMAIN-INTERVENTION AND ACTION
II. COURSE CODE: ART 671
III. COURSE CREDITS (L:T:P): 0 : 0 : 4
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 0 : 0 : 8
V. COURSE TYPE (CORE/ELECTIVE): CORE
VI. PREREQUISITE/S (IF ANY): NONE
VII. COURSE COORDINATOR(S)/INSTRUCTOR(S): TUSHAR JOAG
VIII. SCHOOL/ DEPARTMENT: HUMANITIES & SOCIAL SCIENCES/ DEPARTMENT OF ART DESIGN AND THEATRE.
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART.
X. NUMBER OF STUDENTS: 15

XI. COURSE CONTENT**:**

The course lays emphasis on the advancement of individual students concerns and engagements.
Question of responsibility and sensitivity, methods and medium, poetics and politics while working outside the secure space of a gallery will be deliberated.
It could involve travelling to realize in-situ projects.
The students develop their practice benefiting from one on one critiques with the mentors as well as joint student critiques. Intra and inter school cross-disciplinary collaborations will be encouraged.

XII. RECOMMENDED BOOK(S):

1. Wim Delvoye: Cloaca - New & Improved by Dan Cameron (Editor), Gerardo Mosquera, Dieter
2. Roelstraete, Salvador DalíPublished February 2nd 2002 by Rectapublishers
3. Over Here: International Perspectives on Art and Culture by Gerardo Mosquera Art Since 1900:
4. Modernism, Antimodernism, Postmodernism Book by Hal FosterThames and Hudson
5. The Return of the Real: The Avante-Garde at the End of the Century by Hal Foster
6. The Anti-Aesthetic: Essays on Postmodern Culture by Hal Foster
7. Recodings: Art, Spectacle, Cultural Politics by Hal Foster
8. Prosthetic Gods (October Books) by Hal Foster
9. The First Pop Age: Painting and Subjectivity in the Art of Hamilton, Lichtenstein, Warhol, Richter, and Ruscha... by Hal Foster
10. The Art-Architecture Complex by Hal Foster
11. Compulsive Beauty (October Books) by Hal Foster
12. Design and Crime (And Other Diatribes) (Radical Thinkers) by Hal Foster
13. The Art- Architecture Complex by Hal Foster
14. Perpetual Inventory by Rosalind Krauss MIT press
15. The Optical Unconscious by Rosalind Krauss October Books, MIT press

16. The Originality of the Avant-Garde and Other Modernist Myths by Rosalind Krauss, MIT press
17. Art Since 1900: Modernism, Antimodernism, Postmodernism Book by Hal FosterThames and Hudson
18. The Return of the Real: The Avante-Garde at the End of the Century by Hal Foster
19. The Anti-Aesthetic: Essays on Postmodern Culture by Hal Foster

XI. SKILL SETS ACQUIRED:

They will have the ability to make work of a high professional standard, with in-depth application, grasp and perception of their specialization and an advanced level of individual responsibility towards creative, technical and organizational skills. The students will have the intellectual capacity to research, plan, design, fabricate, and complete work utilizing a variety of
processes in a variety of settings for a variety of purposes.

XII. **ASSESSMENT SCHEME:** Performance will be assessed on the basis of projects that will be submitted for final assessment at the end of the course for which a summative grade will be given. Work done during the courses will also be reviewed through individual as well as collective critiques.

SHIV NADAR UNIVERSITY
MFA COURSE

I. COURSE TITLE: AESTHETICS AND POLITICS
II. COURSE CODE: ART 672
III. COURSE CREDITS (L:T:P): 0 : 0 : 4
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 0 : 0 : 8
V. COURSE TYPE (CORE/ELECTIVE): CORE
VI. PREREQUISITE/S (IF ANY): NONE
VII. COURSE COORDINATOR(S)/INSTRUCTOR(S): TUSHAR JOAG
VIII. SCHOOL/ DEPARTMENT: HUMANITIES & SOCIAL SCIENCES/ DEPARTMENT OF ART DESIGN AND THEATRE.
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART.
X. NUMBER OF STUDENTS: 15
XI. COURSE CONTENT:

The course lays emphasis on the advancement of individual students concerns and engagements.

The course will attempt to examine the social relevance of art and the role of the artist. The successes and failures of Art and activism and the use of art as a tool for social and political change will be discussed following assigned readings and by examining relevant art works and projects. It could involve travelling to realize in situ projects.The students develop their practice benefiting from one on one critiques with the mentors as well as joint student critiques. Intra and inter school cross-disciplinary collaborations will be encouraged.

XII. RECOMMENDED BOOK(S):

1. Wim Delvoye: Cloaca - New & Improved by Dan Cameron (Editor), Gerardo Mosquera, Dieter
2. Roelstraete, Salvador DalíPublished February 2nd 2002 by Rectapublishers
3. Over Here: International Perspectives on Art and Culture by Gerardo Mosquera Art Since 1900:
4. Modernism, Antimodernism, Postmodernism Book by Hal FosterThames and Hudson
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6. The Anti-Aesthetic: Essays on Postmodern Culture by Hal Foster
7. Recodings: Art, Spectacle, Cultural Politics by Hal Foster
8. Prosthetic Gods (October Books) by Hal Foster
9. The First Pop Age: Painting and Subjectivity in the Art of Hamilton, Lichtenstein, Warhol, Richter, and Ruscha... by Hal Foster
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16. The Originality of the Avant-Garde and Other Modernist Myths by Rosalind Krauss, MIT press
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19. The Anti-Aesthetic: Essays on Postmodern Culture by Hal Foster

XIII. SKILL SETS ACQUIRED: They will have the ability to make work of a high professional standard, with in-depth application, grasp and perception of their specialization and an advanced level of individual responsibility towards creative, technical and organizational skills. The students will have the intellectual capacity to research, plan, design, fabricate, and complete work utilizing a variety of processes in a variety of settings for a variety of purposes.

XIV. ASSESSMENT SCHEME:

Performance will be assessed on the basis of projects that will be submitted for final assessment at the end of the course for which a summative grade will be given. Work done during the courses will also be reviewed through individual as well as collective critiques.

THEORY COURSES: MASTER OF FINE ART PROGRAM

SEMESTER I

SHIV NADAR UNIVERSITY
MFA COURSE

I. COURSE TITLE: **Approaches to Art: Themes and Theories**
II. COURSE CODE: ART 602
III. COURSE CREDITS (L:T:P): 3 : 1 : 0
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 3: 1 : 0
V. COURSE TYPE (CORE/ELECTIVE): CORE
VI. PREREQUISITE/S (IF ANY): NONE
VII. COURSE COORDINATOR(S)/INSTRUCTOR(S): JOHN XAVIERS
VIII. SCHOOL/ DEPARTMENT: HUMANITIES & SOCIAL SCIENCES/ DEPARTMENT OF ART DESIGN AND PERFORMANCE
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART.
X. NUMBER OF STUDENTS: 15
XI. COURSE CONTENT:

This introductory course combines a brief recapitulation of pre-twentieth century visual art with an initiation into cultural theory. Divided into two parts, the course will begin with a survey module that frames art from around the world in terms of significant art historical themes that highlight the varied functions and contexts of art-making and reception across cultures, and expose students to diverse approaches to interpreting art works. Topics covered will include the politics of representation, the changing status of the artist, scopic regimes of visuality and the concept of facture. This will lay the ground for the theory module - a focused exploration of key theoretical concepts that have informed the analysis and understanding of artistic and cultural phenomena in the recent decades. The students will engage with a selection of writings on art by Marxist, feminist, poststructuralist and post-colonialist theorists.

The first module is lecture-based and visual-intensive; it will include visits to museums and art historical sites. The second module involves the reading and analysis of relevant texts, classroom discussions and assignments. While there are no specific prerequisites for this course, some familiarity with art historical landmarks would be helpful.

SEMESTER II

SHIV NADAR UNIVERSITY
MFA COURSE

I. COURSE TITLE: **Modernity / Modernization/ Modernisms**
II. COURSE CODE: ART 603
III. COURSE CREDITS (L:T:P): 3 : 1 : 0
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 3: 1 : 0
V. COURSE TYPE (CORE/ELECTIVE): CORE
VI. PREREQUISITE/S (IF ANY): NONE
VII. COURSE COORDINATOR(S)/INSTRUCTOR(S): JOHN XAVIERS
VIII. SCHOOL/ DEPARTMENT: HUMANITIES & SOCIAL SCIENCES/ DEPARTMENT OF ART DESIGN AND PERFORMANCE
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART.
X. NUMBER OF STUDENTS: 15
XI. COURSE CONTENT:

This course offers a critical introduction to the concepts of modernity, modernization and modernism. It explores the emergence of modern subjectivities and multiple manifestations of modernism in various parts of the world. Considering the extent to which all modernisms can be viewed as part of a network of alternatives to tradition, realism, representation, mass culture, and even each other, this course will introduce recent theories and approaches for studying modernisms. Part I of the course traces the origins of modernism in Western society, examining some seminal texts and artist manifestoes that shaped this discourse and surveying the major 'isms' and defining moments between the late 19th Century and the mid-20th Century.

Initially rooted in specific socio-historical contexts, modernity was transferred to other parts of the globe through commerce, colonization and monetized economy, and transformed by local experiences of nationalism, globalization, urbanization, large-scale industrialization and migration. Part II of the course contests the still- dominant notion of a normative, univocal Western modernism to take a closer look at *alternative* modernisms in non-Western contexts. This module will investigate how modernist artistic expression variously developed in the new economic, social and political environment of the emerging industrialised world, through specific case studies from Latin America, Africa and Asia, with a special emphasis on modernism in Indian Art.

Visual-intensive class lectures will anchor the course. Classroom interactions equip students with tools to analyze mediums, styles, technologies and techniques, as well as relevant art historical and interpretative texts. Students will be required to select topics for class presentation based on their specific interests. Credit will be awarded on the basis of class participation, presentations and two written assignments.

SHIV NADAR UNIVERSITY
MFA COURSE

I. COURSE TITLE: **Interactive Art**
II. COURSE CODE: ART 649/659
III. COURSE CREDITS (L:T:P): 2: 0 : 2
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 3: 1 : 0
V. COURSE TYPE (CORE/ELECTIVE): CORE
VI. PREREQUISITE/S (IF ANY): NONE
VII. COURSE COORDINATOR(S)/INSTRUCTOR(S): AMITESH GROVER
VIII. SCHOOL/ DEPARTMENT: HUMANITIES & SOCIAL SCIENCES/ DEPARTMENT OF ART DESIGN AND PERFORMANCE
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART.
X. NUMBER OF STUDENTS: 15
XI. COURSE CONTENT:

Change-Paintings, Kinetic Sculptures, Gaming, Responsive Environments, Digital Cultures - This budding new genre of art is continuing to grow and evolve in a rapid manner. Interactive Art is a hybrid discipline that transcends the barriers of traditional disciplines like Visual & Performing Arts. It engages the spectator through various modes of interactivity, allowing for navigation, assembly, and contribution to an artwork that goes far beyond the purely psychological activity.

We will investigate how interactivity in Interactive Art produces meaning. Students will be introduced to relevant topics including the purpose and language of interactive art, creative practices, the appropriation of new technologies, social relevance, common artistic themes, and the response and involvement of audiences. Students will be provided hands-on experience with electronics, circuits, sensors, & programming to gain understanding of the general usages of equipments involved in building interactive systems. Finally, students will be guided to develop a work of Interactive Art, as part of a performance, on a virtual platform or in a public setting.

SHIV NADAR UNIVERSITY
MFA COURSE

I. COURSE TITLE: **Art after World War II**
II. COURSE CODE: ART 604
III. COURSE CREDITS (L:T:P): 3 : 1 : 0
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 3: 1 : 0
V. COURSE TYPE (CORE/ELECTIVE): CORE
VI. PREREQUISITE/S (IF ANY): NONE
VII. COURSE COORDINATOR(S)/INSTRUCTOR(S): JOHN XAVIERS
VIII. SCHOOL/ DEPARTMENT: HUMANITIES & SOCIAL SCIENCES/ DEPARTMENT OF ART DESIGN AND PERFORMANCE
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART.
X. NUMBER OF STUDENTS: 15
XI. COURSE CONTENT:

This course charts important developments in art practice and theory after the end of World War II. Proceeding from the background of early 20th century art, which will be covered in second semester, the focus of this course will be on how the paradigms of modernism were challenged by radical political and social changes that occurred in Europe, North America, and Latin-America. Important art movements such as Pop-Art, Conceptual Art, Feminist interventions, and Anthropophagia will be discussed in detail along with the multifaceted experiments in performance art, public art, and lens-based practices, continuing into the 21st century. The course will draw as much from exhibition histories as from manifestos and writings by artists, and will contextualize these within broader theoretical debates.

A prior knowledge of art history is required, along with credits obtained for the second semester theory course - *Modernity, Modernization and Modernisms*. In addition to lectures, the course includes class presentations by students to discuss readings and images.

SHIV NADAR UNIVERSITY
MFA COURSE

I. COURSE TITLE: **Indian Art after Independence**
II. COURSE CODE: ART 605
III. COURSE CREDITS (L:T:P): 3 : 1 : 0
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 3: 1 : 0
V. COURSE TYPE (CORE/ELECTIVE): CORE
VI. PREREQUISITE/S (IF ANY): NONE
VII. COURSE COORDINATOR(S)/INSTRUCTOR(S): JOHN XAVIERS
VIII. SCHOOL/ DEPARTMENT: HUMANITIES & SOCIAL SCIENCES/ DEPARTMENT OF ART DESIGN AND PERFORMANCE
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART.
X. NUMBER OF STUDENTS: 15
XI. COURSE CONTENT:

By examining the works of selected artists and artistic developments in post-Independence India, this course will introduce Indian art to students in terms of the wider context of the 'art world' – a network in which art is mediated by institutions, exhibitions, markets, collectors, and publics. This course will also study 'folk', 'tribal', 'popular' art and 'craft' practices within the broader framework of contemporaneity. Central to this framing would be historical and contemporary debates around modernity and tradition, the art and craft divide, and the various modalities of referencing, appropriation, and collaboration in art. Taking cognizance of the proliferation of media and sites of art throughout the second half of 20th century, *Art After Independence* will be an advanced theory course aimed at analyzing and critiquing the boundaries that are produced between different visual cultural practices.

A prior knowledge of art history is required, along with credits obtained for the second semester theory course - *Modernity, Modernization and Modernisms*. In addition to lectures, the course includes assignments by students on a topic of their choice, and class presentations to exchange ideas with peers. This course will include visits to local museums, galleries, exhibitions and artist studios.

SHIV NADAR UNIVERSITY
MFA COURSE

I. COURSE TITLE: PERFORMANCE –RESISTANCE
II. COURSE CODE: ART 662
III. COURSE CREDITS (L:T:P): 1:0:3
IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 1:0:6
V. COURSE TYPE (CORE/ELECTIVE): CORE
VI. PREREQUISITE/S (IF ANY): NONE
VII. COURSE COORDINATOR /INSTRUCTOR: TUSHAR JOAG
VIII. SCHOOL/ DEPARTMENT: SHSS/ADAP
IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART/ any interested students from other streams.
X. NUMBER OF STUDENTS: 12
XI. COURSE CONTENT:

The course lays emphasis on the advancement of individual students concerns and engagements. Students will develop performance pieces using their own selves or agents /agencies, if necessary integrating props /mechanics/ new media etc.
The students will be expected to execute various pieces through the duration of the course. They will develop these benefiting from one on one critiques with the mentors as well as joint student critiques.

If 'Performing 'can be described as a structured behavior, in which is implied a politics of embodiment then it can be applied as a concept to analyze how our ideas of 'being' are created as well as challenged. Performance encompasses normative protocols as well as resistance to them.

The course employs the idea of 'Performance' as a means to investigate enactments in daily life of gender/ sexuality/ ethnic identity etc. it also involves taking a close look at and analysing acts of protest and resistance that are performative.

Activisms various forms many a times expose the relationship between politics and aesthetics. Acts of protest are performances that involve audio, visual, and choreography.
The course will also involve taking a close look at and analyzing acts of protest and resistance that are performative.
Lectures, readings and discussions will include topics (some in brief some in depth) like the Circus, theatre, ritual, protest, happenings, sport, attire and decoration , reality shows, Dada, Fluxus, Situationists, Feminism, Conceptual art, etc.
Intra and inter school cross-disciplinary collaborations will be encouraged.
SKILL SETS ACQUIRED:
Students will have the ability to make work of a high professional standard, with in-depth application, grasp and perception of their specialization and an advanced level of individual responsibility towards creative, technical and organizational skills. The students will have the

intellectual capacity to research,
plan, design, fabricate, and complete work utilizing a variety of
processes in a variety of settings for a variety of purposes.

ASSESSMENT SCHEME:

Performance will be assessed on the basis of projects that will be submitted for final assessment at the end of the course for which a summative grade will be given. Work done during the courses will also be reviewed through individual as well as collective critiques

SHIV NADAR UNIVERSITY
MFA COURSE

COURSE TITLE: STUDIO PRACTICE-SCULPTURE AND INSTALLATION
COURSE CODE: 720
COURSE CREDITS (L:T:P): 1:0:3
TOTAL CONTACT HOURS/ WEEK (L:T:P): 2:0:6
COURSE TYPE (CORE/ ELECTIVE): CORE
PREREQUISITE/S (IF ANY): NONE
COURSE INSTRUCTOR(S): TUSHAR JOAG
SCHOOL/ DEPARTMENT: HUMANITIES & SOCIAL SCIENCES/ DEPARTMENT OF ART DESIGN AND PERFORMIMG ARTS
DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: ART
NUMBER OF STUDENTS: 12
COURSE CONTENT:

The course lays emphasis on the advancement of individual students concerns and engagements. Students work in three-dimensional space integrating sound/ mechanics/ new media etc. The students engage in creating objects through carving/ appropriating/ assembling/ using ready-mades etc. to generate new systems of meanings. Students are guided in and explore activation of spaces as immersive, interactive, site-specific and site- responsiveness. The course considers: unpacking of found objects and politics of object making; understanding objects as receptacles of narratives; and aspects of society or history and how social, political, and poetic meaning is bound up in materiality.

The students develop their practice benefiting from one on one critiques with the mentors as well as joint student critiques. Intra and inter school cross-disciplinary collaborations will be encouraged. Visits to museums, galleries and artist studios and analyzing works.

SHIV NADAR UNIVERSITY

MASTER OF DESIGN (M DES) PROGRAM
DEPARTMENT OF DESIGN
SCHOOL OF HUMANITIES AND SOCIAL SCIENCES

1. Department of Design

Department of Design (DoD) was set-up with the mission of nurturing creative minds into outstanding design leaders, with a passion for creating a difference in society. It is grounded in the philosophy of Liberal Education and intends to offer programs that provide students with holistic interdisciplinary education along with specialisation in their specific areas of interest. Through its multidisciplinary, research-centric, innovation-driven, practice-oriented design curriculum, the Department aspires to become a centre of excellence in Design Education, Research, and Practice.

Design as an activity is considered fundamental to human beings. Every human being designs and everyone is a designer. However, as a professional field of study, it evolved since 1920s by transforming knowledge from various disciplines including art, craft, architecture, engineering, humanities, and social sciences etc. It is often considered an applied art, and science of using the design process in conceiving products, systems, services that are innovative, sustainable and satisfies users' need in specific and society at large.

Design is envisaged to play a critical role in elucidating many complex and multifaceted problems of the 21st Century. Taking cognizance of this fact, DoD offers programs which prepare students for the problems, needs, and applications relevant to 21st Century. Currently, the Department offers Master of Design (M. Des.) and Design Minor programs. In the near future, the department plans to introduce Undergraduate (B. Des.) and doctoral (PhD) Programs in Design.

2. Master of Design Program

M. Des. at DoD is a two-year, full-time, practice-intensive program. In line with the philosophy of liberal education in design, the program is open to candidates from various disciplines. The program offers experiential-based learning in a liberal, multi-disciplinary, research-centric environment. It intends to provide students with holistic as well as in-depth knowledge of their specific areas of interest.

As the M. Des. program at SNU is expected to attract creative minds from various disciplines, first year of the program provide students with an overview of design, focusing on developing their basic skills, and knowledge essential for designing. The semester-long project in the 2nd semester helps in applying the learnt knowledge, and skills on a practical problem. Also, the 8-week long mandatory internship helps in understanding the practice of design in industry.

The second year of the program offers a year-long design research project and a set of 4 electives which is to be chosen from a pool of electives covering different specialisations. A student may choose to be a specialist or a generalist designer based on the selection of electives from the same or different specialisations. The maximum intake capacity for M.Des. program is 20 per year.

3. Mode of Study

M. Des. is a full-time program. Students admitted to a full-time program have to register for full-time course load according to the program. The students have to devote their entire duration of working hours for the studies and research work as determined by the program. A full-time student shall not take up any full-time or part-time job outside the campus and shall not attend any other full-time program. This excludes the teaching assistantships offered by the university.

Residence requirements for MDes students may be waived in the case of exchange programs with accredited institutions for a maximum of one academic semester.

4. Features of the Proposed Program

The important features of the program are highlighted in the following sub-sections.

4.1. Duration

The minimum and maximum duration allowed to complete all the requirements of MDes program is four semesters (2 years) and six semesters (3 years) respectively (refer University Regulation for Master's Program).

4.2. Credit Requirement

For MDes, minimum credit requirement is 62, to be earned from the core and elective courses along with two research projects. The first research project (referred as semester research project) will be of one-semester duration. The second research project (referred as master's research project) will be a year-long project to be carried out in two phases. For successful completion of both the project a student need to present his work in front of a review committee along with a report. Committee will review the work and award them grades as per university grading scheme. In the case of exchange programs, a transfer of up to 16 credits is permissible with accredited institutions in India and abroad.

1. Core Courses – minimum 26 credits (8 courses)
2. Elective Courses – minimum 20 credits (5 courses)
3. Semester Research Project – 4 credits (duration – 1 semester)
4. Master's Research Project – 12 credits (duration – 2 semesters)

It should be noted here that core courses are mandatory for all MDes students irrespective of their disciplinary background. The syllabus for core courses is revised every five years. However, the individual instructor has the flexibility of modifying maximum 30% of the recommended core course syllabus.

Elective courses can be chosen by the students depending on his/her area of interest. These courses can be offered by any faculty member/members from any discipline across SNU (including design). Such courses should be customized for design in alignment with the program's objectives.

For example, the discipline of Performing Arts can suggest a set of 2-3 elective courses in Performance Design. These elective courses may be of interest to students who have a performing arts background at the undergraduate level. Similarly, Big Data Analytics Centre along with Computer Science and Engineering can offer a set of courses related to web analytics and HCI (Human Computer Interaction Design). This may interest students who want to explore User Experience Design/Interaction Design.

4.3. Appointment of Research Advisors/Mentors

A research advisor/mentor will be appointed to each student for the research/creative projects. The research advisor/mentor will guide and facilitate the research/creative projects, till its completion. Maximum of two research advisor/mentor can be assigned to a student for any research/creative project, however, at least one of the research advisor/mentor should be from department of design at SNU. The second research advisor/mentor (co-guide) can be from any discipline at SNU or accredited institutions in India and abroad. For research/creative projects in collaboration with industry, the second research advisor/mentor (co-guide) can be from industry in India and abroad.

In exceptional cases, a request for change of research advisor/mentor would be considered in consultation with the core faculty. However, this is only allowed for Master's Research/Creative Projects and should be within two months from the date of initiation in the third semester.

4.4. Structure of the Proposed Program

All the courses of MDes Program have been structured into modules depending upon the area of specialization. This gives flexibility for teaching a single course by more than one design faculty members from different specialized domains. Hands-on exercises, studio based activities, seminars, etc. are built into most of the courses to facilitate experiential and practice-based learning. Following paragraphs presents the course structure semester wise along with justification in reference to objectives of the design program.

Semester 1: In the first semester, a student needs to take five mandatory core courses of 17 credits. Since, the MDes Program is allowing students from various disciplines, it is necessary to expose them to the fundamentals of design. Following five courses intended to build the fundamental understanding of design.

- *DES501: Introduction to Creative Design (2-0-1):* The course intends to introduce design as a field of study, its philosophy, characteristics, relationship with art, craft architecture, engineering, etc. It also introduces historical evolution, current and future trends, broad

domains, and various career paths. The course also provides a hands-on exercises, with various tools, workshops, machines and material.

- *DES502: Elements and Principles of Design (1-0-3):* This course introduces the elements of design and various principles governing them (applicable to both 2D and 3D products). The studio-based component of the course trains students in illustration techniques and tools used for conceptualization and communication using various media (including software). This course heavily borrows knowledge from art and craft.
- *DES503: Creative Design – Morphology and Methods (2-0-2):* The course elaborates on the morphology of creative design and various methods of divergence, transformation, and convergence. The first module introduces methodologies in design, design attributes, and core competency of a designer. Second module elaborates on different methods of analysis, synthesis, and evaluation. Last module of the course is application of methods and methodologies in solving a design problem..
- *DES504: Human Factors Engineering (2-0-2):* This course aims at acquainting students with human factors involved in the process of designing. The course draws knowledge from Physiology, Psychology, Biomechanics, Anthropometry, Cognitive Science, etc. The course aims at acquainting students with human factors, its significance in the process of designing and how it could be applied to make the work safer, faster, easier and comfortable.
- *DES505: Electronics and Softwares for Designers (0-0-2):* Since many students are expected to be from a not technical background. This course introduces them to the fundamental understanding of electronics and software. Introduction to basic electronics, small group assignments on making simple electronic artifacts with Arduino/Raspberry kits. Introduction to 2D and 3D software packages for graphic design, animation, and 3D modeling.

Semester 2: In the second semester the students need to take three mandatory core courses, one elective course and semester research/creative project as presented below.

- *DES506: Art & Craft Culture of India (2-0-1):* This core course intends to sensitize students towards the art & craft culture of the Indian society. It presents an introduction to various art and crafts related to Soft Materials (like textile, leather, paper and natural fibre), Hard Material (like wood, metal, and stone), and Fired Material (like ceramics, Earthenware, Stoneware, Terracotta, and Porcelain).
- *DES507: Visual Communication Design (1-0-3):* This course is focused on the application of elements and principles in designing communication using various visual mediums (like

print, digital, photography, animation, multimedia, etc.). It imports knowledge from disciplines like semantics, semiotics, psychology, etc.

Table 1: Structure of Msater of Design (MDes) Program

Code	Course Title (L-T-P)	Type	Credits	Distribution of Credit hours
Semester 1				
DES 501	Introduction to Creative Design (2-0-1)	Core	3 credits	Lecture – 2 (1hr. each) Studio – 1 (2 hrs. each)
DES 502	Elements and Principles of Design (1-0-3)	Core	4 credits	Lecture – 1 (1 hr. each) Studio – 3 (2 hrs. each)
DES 503	Creative Design Morphology and Methods (2-0-2)	Core	4 credits	Lecture – 2 (1 hr. each) Studio – 2 (2 hrs. each)
DES 504	Human Factors Engineering (2-0-2)	Core	4 credits	Lecture – 2 (1 hrs. each) Studio – 2 (2 hrs. each)
DES 505	Electronics and Software for Designers	Core	2 credits	Studio – 2 (2 hrs. each)
			17 credits	**Total – 27 hrs. per week**
Semester 2				
DES 506	Art and Craft Culture of India (2-0-2)	Core	3 credits	Lecture – 2 (1 hr. each) Studio – 1 (2 hrs. each)
DES 507	Visual Communication Design (1-0-3)	Core	4 credits	Lecture – 2 (1 hr. each) Studio – 2 (2 hrs. each)
DES 508	Semester Research Project	Mandatory	4 credits	As recommended by Supervisor/s
DES 509	Technical Writing and Creative Communication	Core	2 credits	Lecture – 1 (1 hrs.) Studio – 1 (2 hrs.)
DES XXX	Elective 1	Elective	4 credits	As per course structure framed by individual instructor
			17 credits	**Maximum 30 hrs. per week**
Industry Exposure/Internship in India or abroad for a minimum of 8 weeks (It is mandatory for the student to present a seminar and submit a report to the department after completion of internship) *In case of extension of internship period, flexibility in terms of semester registration may be provided*				
Semester 3				
DES XXX	Elective 2	Elective	4 credits	As per course structure framed by individual instructor
DES XXX	Elective 3	Elective	4 credits	As per course structure framed by individual instructor
DES XXX	Elective 4	Elective	4 credits	As per course structure framed by individual instructor
MTP – I	Master's Research/Creative Project - Phase 1	Mandatory	4 credits	As recommended by Supervisor/s
			16 credits	**21 hrs. per week plus MP-I**
Semester 4				
DES XXX	Elective 5	Elective	4 credits	As per course structure
MTP – II	Master's Research/Creative Project - Phase 2	Mandatory	8 credits	As recommended by Supervisor/s
			12 credits	**7 hrs. per week plus MP-II**
Total Credits requirement for completion of M. Des.			**62 credit points**	

- *DES 508: Semester Research Project (as per research advisor/mentor):* This is a semester-long research/creative projects that can be chosen by students based on their area of interest from any discipline/domains across SNU. The research/creative project must be carried out under the supervision of research advisor/mentor. More than one research advisor/mentor can be assigned to a student. However, at least one of them should be from design discipline.
- *DES509: Technical Writing and Creative Communication (1-0-1):* This course intends at developing the creative writing and communication skills of students helping them to articulate their ideas and views in an effective way. This aims at developing verbal communication as well writing and presentation skills.
- *XXX000: Electives (1 to 5):* Electives can be chosen by the students' depending upon their area of interest. The course can be offered by any faculty member/members from any discipline across SNU (including design) as per conditions discussed in Section 5.2. Table 3a and 3b illustrates the probable list of electives courses that can be offered by the existing faculty members.

Semester 3: The third semester consists of three elective courses of total 12 credits and the first phase of Masters' research/creative project of 4 credits. For research project maximum of 2 research advisor/mentor will be allotted as per regulation elaborated Section 5.3. Two progress seminars need to be presented, during mid and end semester respectively.

Semester 4: The fourth semester will consist of one elective course and the second phase of the Master's research/creative project. For the research/creative project, the student must present their research/creative project in front of a review committee along with a project report. The committee will review the research/creative project and award grades as per university grading scheme. Table 1 shows semester wise structure of the M Des program along with courses and credit details.

5. Teaching Methodology Adopted

Most of the design courses have the following two components.

1. **Theory/Lecture/Classroom Component:** This component primarily deals with the theoretical base of any course and is imparted through a series of lectures. It also incorporates small quizzes and assignments to be prepared/ presented/ submitted by the students depending upon the discretion of the faculty members.
2. **Practical Component:** In line with the experiential based learning objective of the design program, the practical component of any course focuses on the application of theoretical

learning in practical situations. It may be through a small hands-on exercise in studios, or through small projects and assignments.

Apart from the courses, Guest Lecture/Workshops, and Industrial Visits/Internship are other components of MDes program.

1. **Guest Lectures/Workshops** will be organized at regular intervals (thrice in a semester) to expose students to the most recent skills and knowledge relevant for 21st Century designers. It will also expose and sensitize students towards the trends in Industry, problems, needs and issues relevant to 21st Century Indian society.

2. **Industrial Visits/Internships** would expose students with design as practiced in real life situations. It is expected to assist them in discovering their area of interest and where they fit best for employment. Industrial visits will encourage students to work on live projects. An internship of minimum eight weeks at the end of the second semester is mandatory for every student. The student must present a seminar and submit a report to the department after completion of the internship. In the case of extension of the internship period, flexibility in semester registration may be provided on the recommendation of departmental head.

The industrial visit will be organized by the department whereas students have to seek individually for an internship. The student will be provided financial assistance regarding TA/DA (applicable as per University norms) if the company does not provide the same.

6. Assessment

The mode of assessment will be largely based on assignments, theory, and practical exam in studios/workshops with a weight of each component to be decided by the respective faculty.

To be eligible for the award of MDes degree following requirements must be met.

1. Completion of minimum 62 credits of course-work (as defined in University Regulation for Master's Program)
2. Fulfillment of the requirements for internship
3. Completion of Master's Research/Creative Project along with a report.
4. Retention of minimum passing CGPA requirement (≥ 6.0).

7. Learning Outcomes

The curriculum of MDes is envisaged in such a way that after completion of the program, students gain knowledge and skills that would help them in becoming successful design researchers and practitioners. The program prepares them for applying design thinking to various areas (depending on their interest) in solving problems/issues through innovative solutions.

7.1. Knowledge and Understating

The core courses offer the fundamental knowledge and understanding of design as a field of study and its scope of application in varied knowledge domains. The elective courses are chosen by students (depending on his/her area of interest) that equip them with the knowledge of specific domains where they can comfortably apply design thinking and knowledge.

7.2. Practical Skills

The experiential based learning will equip students with practical skills on how design thinking and knowledge can be applied to solving practical problems in real life situations. An exposure of various design related industries through industrial visits and internship will help them gain insights into the skills required by the society and where they can fit themselves.

7.3. Research Capabilities

The research focused MDes program structure (with semester and master's research/creative projects) enables students in conducting research/creative work independently as well as within groups in a multidisciplinary environment.

7.4. Design Management and Communication Skills

The interdisciplinary and collaborative nature of design enables students in management and communication skills. In design, the students have to articulate their ideas as well as suggest the material and processes to achieve it. These help them develop their communication and management skills.

8. Careers and Employment

Design being a multidisciplinary field of study presents a large number of career options and employment possibilities. A student, depending on his/her area of interest can choose their own career paths. Apart from the traditional career options like Industrial Design, Visual Communication Design, Animation, Automobile Design, etc. the MDes program also prepares students for the evolving areas of design like user experience design, sustainable design, social design, design for the bottom of pyramid, universal design, etc.. The interdisciplinary, creative and innovative nature of design enables the graduate to come up with novel patentable solutions and even step into the world of entrepreneurship.

9. Fees and Scholarships

Meritorious students will get a monthly teaching assistantship of 12,000 rupees (*maximum upto 50% of the class*) for 20 months (amount revisable as per University Norms).

10. Tentative List Elective Courses

Table 3a and 3b presents the tentative list of Elective Courses that can be offered depending upon the student's interest.

Table 3a: Tentative List of Elective Courses

Course Code	Course Title (L-T-P)
Elective Courses in the Generic Areas of Design	
DES xxx	Creativity, Innovation, and Design Management
DES xxx	Research Methods in Design
DES xxx	Traditional and Modern Design – A Comparative Study
DES xxx	Design for Sustainability – Concepts and Approaches
DES xxx	Usability Engineering
DES xxx	Design Semantics and Communication Theory
DES xxx	Social Science in Design
DES xxx	Universal Design

Table 3b: Tentative List of Elective Courses

Course Code	Course Title (L-T-P)
Elective courses in the area of Art and Craft Design	
DES xxx	Craft, Creativity, and Post-Modernism
DES xxx	Traditional Design – Material, Techniques and Manufacturing Processes
DES xxx	Tribal Art and Socio-anthropometrical Relevance in Design
DES xxx	Craft Design with Soft Materials
DES xxx	Craft Design with Hard Materials
DES xxx	Craft Design with Fired Materials
DES xxx	Art and Craft in Design
Elective courses in the area of Product Design	
DES xxx	Manufacturing Processes
DES xxx	Advanced Ergonomics
DES xxx	Product Detailing
DES xxx	Packaging Design
DES xxx	Product Design using Indigenous Materials
DES xxx	Toy Design for Indian Context
DES xxx	CAD/CAM in Design
DES xxx	Design for bottom of the Pyramid
Elective courses in the area of Visual Communication Design	
DES xxx	Animation Fundamentals and its History
DES xxx	Animation Design and Theory
DES xxx	Animation Scripting and Methods
DES xxx	New Media Studies
Elective courses in the area of Interaction Design (ID/UX/HCI)	
DES xxx	Introduction to Interaction Design

DES xxx	User Experience Design
DES xxx	System Analysis and Information Design

11. Faculty Details

Core faculty members: At present, the design discipline is employing four faculty member (one professor and three assistant professors). In the case of lack of required faculty members and domain experts, visiting faculty can be invited.

Prof Amit Ray

Research Interests: Curriculum Development, Emotion in Design, Colour & Emotion, Art & Design, Environmental Design, Design and Aesthetics, Product Design, Environmental Research & Product Development

Dr Prakash Kumar

Research Interests: Work tool/ equipment design for small scale industries/ cottage industries like equipment design for small fruit processing units. Ergonomic study of issues related to workers in small, unorganized industries and design of context specific solutions, Design for people at the Bottom of Pyramid Design and development of low cost innovations (Grass-root innovations)

Dr Vikash Kumar

Research Interests: Products, systems and service design for sustainability; pedagogical approaches for learning sustainable design; methods and tool for sustainable design; innovation through sustainable design; culture as a tool for sustainability.

Mr Subhajit Chandra

Research Interests: Cognitive aspect of Visual Design, Psychological Studies in Design, Information Design, Typography & Type Design, and Reading Psychology.

Visiting faculty members: Guest lectures will be organised by pool of visiting faculty members from various specializations (Shilpa Ranade, Satayaki Roy, U A Athavankar, V P Bapat, Balan Sudesh, B K Chakravarthy, Girish Dalvi, Alka Hingorani, Anirudha Joshi, Purba Joshi, K Ramachandran, Raja Mohanty, K Munshi, Ravi Poovaiah, Mandar Rane, Sumant M Rao, A G Rao, G G Ray, Venkatesh Rajamanickam, N Sadhu, Nina Sabnani, R Sandesh, G V Sreekumar, Kirti Trivedi, Tetali Phani, Avinash Shinde, D. Udaya Kumar, Debkumar Chakrabarti, Pankaj Upadhyay, Sougata Karmakar, Pradeep Y, Lalit Kumar Das, Anil Kumar Gupta, Anuj Kuma, etc.) Visiting faculty members from outside India (exchange programs proposal is in progress): Charles Sturt University, Waga Waga Campus, Australia.

SHIV NADAR UNIVERSITY

Department of Design

School of Humanities and Social Sciences

Graduate Course

I. **COURSE TITLE:** Introduction to Creative Design

II. COURSE CODE : DES501 (to be allotted)

III. COURSE CREDITS (L:T:P): 3 (2:0:1)

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 4 (2:0:2)

V. COURSE TYPE (Core/Elective): Core

VI. **PREREQUISITE/S (IF ANY):** None

VII. SCHOOL/ DEPARTMENT: SHSS/Department of Design

VIII. **COURSE CONTENT & SYLLABUS:** The course intends to introduce design as a field of study, its philosophy, characteristics, relationship with art, craft architecture, engineering, etc. It also introduces historical evolution, current and future trends, broad domains, and various career paths.

The course also provides a hands-on exercises, with various tools, workshops, machines and material.

IX. **EVALUATION SCHEME:**

Theory: 20%
Term Paper: 20%
Studio: 60%

X. RECOMMENDED READING(S):

- Lindbeck, J, & Wygnt, R, Product Design and Manufacturing, Pub. Prentice Hall, New Delhi 1994.
- R.G. Collingwood, The Principles of Art, Oxford University Press, New York 1958 (reprint 1998)
- Wendy Richmond, Design & Technology Erasing the Boundaries, Van Nostrand Reinhold, NY 1990
- R. Birmingham, G. Cleland, etc., Understanding Engineering Design, Prentice-Hall, N. Delhi 1998.

SHIV NADAR UNIVERSITY

Department of Design

School of Humanities and Social Sciences

Graduate Course

I. **COURSE TITLE:** Elements and Principles of Design

II. COURSE CODE : DES502 (to be allotted)

III. COURSE CREDITS (L:T:P): 4 (1:0:3)

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 7(1:0:6)

V. COURSE TYPE (Core/Elective): Core

VI. **PREREQUISITE/S (IF ANY):** None

VII. SCHOOL/ DEPARTMENT: SHSS/Department of Design

VIII. **COURSE CONTENT & SYLLABUS:** The course intends to develop the following areas-
Elements of Design- value, color, form, shape, line, and texture. Each element is to be examined theoretically along with studio exercises and evaluated through consumer products (2D & 3D).

Principles of Design would evaluate contrast, rhythm, unity, emphasis, pattern, movement, and balance on the basis of Design Elements. The course proposes to develop thorough understanding of the elements and principles of design and their co-relationship.

The course intends in developing understanding on the above issues and executes projects to examine elements and principles of design. Students are expected to develop knowledge and practical skill through theoretical and practical training. Students are required to develop products, give seminars and submit research paper on chosen topics. It is the foundation course in Industrial Design that would help in understanding Product Design and Visual Communication.

IX. **EVALUATION SCHEME:** Theory: 25%
Project Execution: 75%

X. RECOMMENDED READING(S):

- Ching, Francis D.K. Architecture: Form, Space, and Order, N.Y. Van Nostrand Reinhold, 1996
- Collier, Graham. Form, Space, and Vision, NJ: Prentice-Hall, 1972
- Grillo, Paul J. From, Function & Design, NY: Dover Publication, 1960

- John A. Loomis, Revolution of Forms, Princeton Architectural Press, N.Y.1999
- R.G. Collingwood, The Principles of Art, Oxford University Press, New York 1958 (reprint 1998).

SHIV NADAR UNIVERSITY

Department of Design

School of Humanities and Social Sciences

Graduate Course

I. **COURSE TITLE:** Creative Design – Morphology and Methods

II. COURSE CODE : DES503 (to be allotted)

III. COURSE CREDITS (L:T:P): 4 (2:0:2)

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 6 (2:0:4)

V. COURSE TYPE (Core/Elective): Core

VI. **PREREQUISITE/S (IF ANY):** None

VII. SCHOOL/ DEPARTMENT: SHSS/Department of Design

VIII. **COURSE CONTENT & SYLLABUS:** The course elaborates on the morphology of creative design and various methods of divergence, transformation, and convergence. The first module introduces methodologies in design, design attributes, and core competency of a designer. Second module elaborates on different methods of analysis, synthesis, and evaluation. Last module of the course is application of methods and methodologies in solving a design problem.

Introduction to Methodologies and Methods in Design: Introduction to methods and methodologies, its significance for design and designer; Different design methodologies in problem solving - prescriptive, descriptive; Design problems - perception of the problem, wicked problems and its characteristics; Core competencies of designers – creativity, invention and innovation; Introduction to design attributes – aesthetics, ergonomics, function, engineering and scientific considerations. Thinking types – understanding creative thinking.

Methods of Design: Design phases – Analysis-synthesis-evaluation; divergence-transformation-convergence.

Methods of Divergence (Analysis): Methods of Exploring Design situations; Literature Searching, Interviewing users, Questionnaires, Investigating User Behavior, Data Assimilation.

Methods of Transformation (Synthesis): Methods of exploring problem structure; Interaction Matrix, System Transformation, Innovation by Boundary Shifting, Functional Innovation.

Methods of Convergence (Evaluation): Methods of Evaluation; Checklists, Selecting Criteria, Ranking and Weighing, Specification writing, documentation.

Application of methods and methodologies: Case studies of methods and methodologies used in design of simple products, Assignment for hands-on exercise on analytical techniques; synthesis and idea generation techniques; their development into tangible design solutions and communication

IX. **EVALUATION SCHEME:** Theory: 40%
Studio: 60%

X. RECOMMENDED READING(S):

- Jones, J.C, Design methods: Seeds of human futures, Wiley inter-science, 1992.
- N. Cross, Engineering Design Methods Strategies for Product Design, Third Edition, 2005.
- Ulrich, Karl T., Steven D., Product Design and Development, McGraw-Hill, 2004
- David Bramston, Basic Product Design – Idea Searching, AVA Publishing SA, 2009
- Susan Weinschenk, 100 Things Every Designer Needs to Know About People, New Riders, 2011.
- Vijay Kumar, 101 Design Methods A Structured Approach for Driving Innovation in your Organization, John Wiley & Sons, Inc., 2013

SHIV NADAR UNIVERSITY

Department of Design

School of Humanities and Social Sciences

Graduate Course

I. **COURSE TITLE:** Human Factors Engineering

II. COURSE CODE : DES504 (to be allotted)

III. COURSE CREDITS (L:T:P): 4 (2:0:2)

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 6 (2:0:4)

V. COURSE TYPE (Core/Elective): Core

VI. **PREREQUISITE/S (IF ANY):** None

VII. SCHOOL/ DEPARTMENT: SHSS/Department of Design

VIII. COURSE CONTENT & SYLLABUS: The course aims at acquainting students with human factors, its significance in the process of designing and how it could be applied to make the work safer, faster, easier and comfortable. It has three modules

Module-1 Definition, History, Human Factors and Design, Human factors Engineering, Process-Identification of human factors issues, analysis and addressing of issues and application to the design process, Classifications- physical, cognitive and organizational.

Module-2 Physical aspect- Human body related dimensions, physical strengths and limitations associated with work in terms of anthropometry, biomechanics and physiology. Cognitive aspect- understanding the mental processes associated with work from behavioral and psychological perspective. Organizational ergonomics for work related productivity.

Module-3 Fields of Application- All industrial and domestic products and appliances, Design of Display- control Panel, Hand held tools and equipment, furniture, workstation, common areas, kitchen and toilets. Design for special needs of elderly, disabled population, etc.

Theory input follows relevant case studies, demonstrations, assignments and projects.

IX. **EVALUATION SCHEME:** Theory: 50%
Studio: 50%

X. RECOMMENDED READING(S):

- R. S. Bridger, Introduction to Ergonomics, McGraw-Hill, Inc., 1995.
- M. S. Sanders and E. J. McCormick, Human Factors in Engineering and Design, McGraw-Hill, Inc., 1993.

- D. Chakrabarti, Indian Anthropometric Dimensions for Ergonomic Design Practice, National Institute of Design, Ahmedabad, 1997.

SHIV NADAR UNIVERSITY

Department of Design

School of Humanities and Social Sciences

Graduate Course

I. **COURSE TITLE:** Electronics and Software for Designers

II. COURSE CODE : DES505 (to be allotted)

III. COURSE CREDITS (L:T:P): 2 (0:0:2)

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 4 (0:0:4)

V. COURSE TYPE (Core/Elective): Core

VI. **PREREQUISITE/S (IF ANY):** None

VII. SCHOOL/ DEPARTMENT: SHSS/Department of Design

VIII. **COURSE CONTENT & SYLLABUS:** Introduction to basic electronics, small group assignments on making simple electronic artifacts with Arduino/Raspberry kits. Introduction to 2D and 3D software packages for graphic design, animation, and 3D modeling.

Basic Electronics: Introduction to basic electronics, small group assignments on making simple electronic artifacts with Arduino/Raspberry kits.

2D Software: Introduction and exploration of Adobe Illustrator, Photoshop, and MAYA LT through small practice sessions.

3D Software: Introduction to the 3D modeling and simulation software and exploration of Rhino through practice sessions.

IX. **EVALUATION SCHEME:** Theory: 20%
Studio: 80%

X. RECOMMENDED READING(S):

- Software training manuals available with the software.

SHIV NADAR UNIVERSITY

Department of Design

School of Humanities and Social Sciences

Graduate Course

I. **COURSE TITLE:** Art and Craft Culture of India

II. COURSE CODE : DES506 (to be allotted)

III. COURSE CREDITS (L:T:P): 3 (2:0:1)

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 4 (2:0:2)

V. COURSE TYPE (Core/Elective): Core

VI. **PREREQUISITE/S (IF ANY):** No

VII. SCHOOL/ DEPARTMENT: SHSS/Department of Design

VIII. **COURSE CONTENT & SYLLABUS:** This core course intends to sensitize students towards the art & craft culture of the Indian society. It presents an introduction to various art and crafts related to Soft Materials (like textile, leather, paper and natural fibre), Hard Material (like wood, metal, and stone), and Fired Material (like ceramics, Earthenware, Stoneware, Terracotta, and Porcelain).

IX. **EVALUATION SCHEME:** Theory: 40%
Studio/Field Visit: 60%

X. RECOMMENDED READING(S):

- Ranjan Aditi, *Handmade in India: Crafts of India*, ISBN-10: 8188204579, ISBN-13: 978-8188204571, Mapin Publishing Pvt.Ltd., 1 January 2009.
- Jaya Jaitly, Crafts Atlas of India, NIYOGI BOOKS; Slp edition (5 March 2012), ISBN-10: 8189738372, ISBN-13: 978-8189738372
- Aditi Ranjan (Editor), M. P. Ranjan (Editor), Handmade in India: A Geographic Encyclopedia of India Handicrafts, Abbeville Press Inc.,U.S.; 1 edition (5 November 2009), ISBN-10: 9780789210470, ISBN-13: 978-0789210470.

SHIV NADAR UNIVERSITY

Department of Design

School of Humanities and Social Sciences

Graduate Course

I. **COURSE TITLE:** Visual Communication Design

II. COURSE CODE : DES507 (to be allotted)

III. COURSE CREDITS (L:T:P): 4 (1:0:3)

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 7(1:0:6)

V. COURSE TYPE (Core/Elective): Core

VI. **PREREQUISITE/S (IF ANY):** DES502: Elements and Principles of Design

VII. SCHOOL/ DEPARTMENT: SHSS/Department of Design

VIII. **COURSE CONTENT & SYLLABUS:** This course is focused on the application of elements and principles in designing communication using various visual mediums (like print, digital, photography, animation, multimedia, etc.). It imports knowledge from disciplines like semantics, semiotics, psychology, etc.).

Module 1: Fundamentals of Visual Communication Design
Introduction to Visual Communication Design; History of visual communication design (evolution throughout time) - tribal culture, symbolism, Indian Culture, Communication and meaning making in visual design, semantics and semiotics in visual design; human factors and usability in the context of visual communication in design; Role of technology in visual communication design; Process of visual communication design – analysis, problem definition, ideation, conceptualization, detailing, prototyping, testing and evaluation, implementation, documentation; Software packages for visual communication design.

Module 2: Identity and Print Design
Introduction to Visual graphic design; Grids system; Introduction to branding; Identity design – logo, trademark, stationary, visiting card, envelope, letterhead; label for product packaging; design for print media – printing processes, gravure, screen, offset and digital printing; presentation and documentation.

Module 3: Infographics and Animation
Infographics – an introduction; why infographics; elements of infographics; introduction to online tools for infographic design, examples and case studies of effective infographic design, introduction to information design, data and data analysis; hands-on exercise on infographics.
Animation – principle and types of animation; History of animation – traditional animation and its significance in contemporary animation; Range/Types/Styles of animation; Process of animation – scriptwriting, character design, production, post-production, editing, sound, light.

IX. **EVALUATION SCHEME:** Theory: 30%
Studio: 70%

X. RECOMMENDED READING(S):

- L.Holtzschue, Understanding Colour: An Introduction for Designer, 2nd Edition, John Wiley and Sons, 2002.
- Miller, G; Information and memory :In perception Mechanisms and models, ed. R. Held and W. Richards, W.H. Freeman and Co., San Francisco, 1972
- Harm J. G. Zwaga, Theo Boersema, Henriette C.M. Hoonhout; Visual information for everyday use - Design and research perspectives Taylor & Francis, 1999
- H.G Greet and R. Kostellow, Elements of Design and the Structure of Visual Relationships, Architectural Press, New York, 2002.
- B. Gordon and M. Gordon, Complete Guide to Digital Graphic Design, Thames and Hudson, 2002.
- P. B. Meggs, Type and Image: The Language of Graphic Design, VNR, 1992.
- R. Carter and P. B. Meggs, Typographic Design: Form and Communication, John Wiley and Sons, 2000.
- Ruegg, Ruedi & Frohlich, Godi: Basic Typography, ABC edition, Zurich.1972

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SHIV NADAR UNIVERSITY

Department of Design

School of Humanities and Social Sciences

Graduate Course

I. **COURSE TITLE:** Semester Research Project

II. COURSE CODE : DES508 (to be allotted)

III. COURSE CREDITS (L:T:P): 4 (0:0:4)

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 8 (0:0:8)

V. COURSE TYPE (Core/Elective): Core

VI. **PREREQUISITE/S (IF ANY):** None

VII. SCHOOL/ DEPARTMENT: SHSS/Department of Design

VIII. **COURSE CONTENT & SYLLABUS:** This is a semester-long research projects that can be chosen by students based on their area of interest from any discipline/domains of Design as a field of study. The students are expected to learn how to conduct Design Research in specialized domain of their interests. It prepares them for the Master's Thesis Research which will start in the final year of their degree program.

This project would be based on application of the Designing knowledge which they gained through various core courses. The emphasis of the project is on individually planned design projects that involve considerations of interactions with product / communication system, wide range of requirements of different users and scope for visual, formal and structural innovations. The project is supported by theoretical information and assignments in the complementary nature of systematic and creative thinking in the various stages of the design process and visual, structural and functional analysis of design system. The outcome of the project will be in the form of innovative and conceptual design proposal that reflect the students understanding of the design process. These will be developed and presented in the form of appropriate and tangible design solutions including models, graphic solutions etc.

IX. **EVALUATION SCHEME:** Theory: 20%
Studio: 80%

X. RECOMMENDED READING(S):

- Jones, J.C, Design methods: Seeds of human futures, Wiley inter-science, 1992.
- N. Cross, Engineering Design Methods Strategies for Product Design, Third Edition, 2005.
- Ulrich, Karl T., Steven D., Product Design and Development, McGraw-Hill, 2004
- David Bramston, Basic Product Design – Idea Searching, AVA Publishing SA, 2009

- Susan Weinschenk, 100 Things Every Designer Needs to Know About People, New Riders, 2011.
- Vijay Kumar, 101 Design Methods A Structured Approach for Driving Innovation in your Organization, John Wiley & Sons, Inc., 2013

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SHIV NADAR UNIVERSITY

Department of Design

School of Humanities and Social Sciences

Graduate Course

I. **COURSE TITLE:** Technical Writing and Creative Communication

II. COURSE CODE : DES509 (to be allotted)

III. COURSE CREDITS (L:T:P): 2 (1:0:1)

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 3 (1:0:2)

V. COURSE TYPE (Core/Elective): Core

VI. **PREREQUISITE/S (IF ANY):** None

VII. SCHOOL/ DEPARTMENT: SHSS/Department of Design

VIII. **COURSE CONTENT & SYLLABUS:** This course intends at developing the technical writing and communication skills of students helping them to articulate their ideas and views in an effective way. This aims at developing verbal communication as well writing and presentation skills.

The course consists of research paper writing, report writing, presentation skills (verbal and non-verbal), Design Communication etc.

IX. **EVALUATION SCHEME:**

Theory: 20%
Seminar: 20%
Practice: 80%

X. RECOMMENDED READING(S):

- Rajesh J B, Technical Writing and Communication Skills for Professional Students, LAP Lambert Academic Publishing (31 January 2014).

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SHIV NADAR UNIVERSITY

Department of Design

School of Humanities and Social Sciences

Graduate Course

I. **COURSE TITLE:** Design Thinking

II. COURSE CODE : DES510 (to be allotted)

III. COURSE CREDITS (L:T:P): 4 (2:0:2)

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 6 (2:0:4)

V. COURSE TYPE (Core/Elective): Elective

VI. **PREREQUISITE/S (IF ANY):** None

VII. SCHOOL/ DEPARTMENT: SHSS/Department of Design

VIII. **COURSE CONTENT & SYLLABUS:** Designing for Simplicity in a Complex world – Social Innovations and the world around us, Learning to See – Empathy & Problem Finding , Understanding incremental innovation and radical innovation Design Thinking Process – History of DT to Adaptations of the model across companies Desirability – What Users Want and need – Understanding user behavior (psychology), System Designs Feasibility – Exploring Technology and Human Centered Design in Services, Design for Social Impact.
Viability – What are the strategies businesses use for better implementation of Design Thinking within organizations. Presentations and a conclusion to the Future with Design Thinking.

IX. **EVALUATION SCHEME:**

Classroom participation & Discussions: 15%
Pre-reading Assignments: 20%
Post Class Short Assignments: 20%
Attendance: 10%
Final Case Assignment: 35%

X. RECOMMENDED READING(S):

- Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation (by Tim Brown)
- Designing for Growth: A Design Thinking Tool Kit for Managers (by Jeanne Liedtka)
- Creative Confidence: Unleashing the Creative Potential Within Us All (by Tom Kelley & David Kelley)
- The Achievement Habit: Stop Wishing, Start Doing, and Take Command of Your Life (by Bernard Roth)
- The Design of Business: Why Design Thinking is the Next Competitive Advantage | Roger Martin

- The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm | Tom Kelley, Jonathan Littman
- Design for the Real World: Human Ecology and Social Change | Victor Papanek
- Living with Complexity | Donald Norman
- Design Thinking: Understanding How Designers Think and Work | Nigel Cross
- 100 Things Every Designer Needs to Know About People | Susan Weinschenk
- Thinking in Systems: A Primer Donella H. Meadows

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SHIV NADAR UNIVERSITY

Department of Economics
School of Humanities and Social Sciences

Graduate Prospectus
M.Sc. in Economics

Overview

The Department of Economics at Shiv Nadar University is a premier economics department in India. Established in 2012, it has quickly established its reputation as one of the leading centres of economics education and research. The department offers a two year Masters program in Economics.

The two year masters program in economics is a top tier post-graduate programs in economics in India. The students admitted will receive training within a healthy research environment, supported by faculty members who are working at the forefront of research in their respective fields. Areas of research for current faculty members include Development Economics, Environmental Economics, Macroeconomics, Labour Economics, Economic Growth, Public Economics, Game Theory, Network Theory, Industrial Organization and Political Economy. The curriculum imparts a theoretical foundation with strong emphasis on applications and hence a solid grounding in quantitative methods and econometrics. The admitted students receive rigorous training in tools of economics analysis that enable them to contribute creatively to academia, the corporate sector, the social sector and policy making.

Eligibility Conditions

Minimum qualification for admission to M.Sc. program is an undergraduate degree (in any discipline) with 55% in aggregate. Knowledge of Mathematics at an undergraduate level is useful though not necessary. Selection to the Masters is based purely on the performance in the admission test.

Note: Please note that not all candidates meeting the minimum eligibility criteria may be shortlisted.

Course Structure:

The Masters program involves a successful completion of 16 courses (10 compulsory and 6 optional). Additionally students have to complete a non-credit course on Programming Language offered in the first semester. In addition all the university requirements should be met. For details please refer to the SNU website: www.snu.edu.in

The first year course work consists of 8 compulsory courses and one non-credit course:

Semester I (Monsoon Semester)	Semester II (Spring Semester)
Microeconomics I	Microeconomics II
Macroeconomics I	Macroeconomics II
Mathematical Methods	Computational Economics
Statistics	Econometrics I
Programming Language (non-credit)	

The second year (Semester III and Semester IV) involves the students 2 compulsory courses in Semester III

Semester III (Monsoon Semester)	Semester IV (Spring Semester)
Econometrics II	Elective III
Game Theory	Elective IV
Elective I	Elective V
Elective II	Elective VI

The following is the list of *possible optional courses* offered by the department:

Advanced Mathematical Economics	Financial Economics
Industrial Organisation	Corporate Finance
Public Economics	International Finance
International Trade	Time Series Analysis
Environmental Economics	Development Economics
Growth and Business Cycle	Social Choice Theory
Machine Learning in Economics	Labour Economics
Health Economics	Mechanism Design

In semester III and IV, students can also opt for a project course in lieu of a taught course, spread over two semesters, where they work under the supervision of a faculty to develop a masters thesis.

Note: The course structure is subject to change with approval from the academic council of the university. Students will be informed about the changes (if any) prior to the commencement of the program.

Programme outcomes:

The programme is designed to provide the students with a rigorous and thorough understanding of the foundational aspects of economics and to bring them upto the frontiers of current research in economics. At the **end of the first year**, students will be able to:

- understand various frameworks to study choice and decision-making, especially under situations of uncertainty;
- analyse strategic situations (such as bargaining and auctions) through game theoretic tools;
- identify and explaining theories related to market structures, governments and institutions, and qualitatively and quantitatively explaining past and predicting future economic events and analysing consequences of the actions (such as policy) for individuals and the society at large;
- develop a deep understanding of causation, using data sets to estimate relationships between the variables of interest using tools of statistical inference;
- possess the necessary mathematical skill set to formally model microeconomics and macroeconomic questions of interest;
- understand the dynamic nature of the economy and analyze issues like economic growth, asset pricing and business cycle.

The students can then build on these basic skills by studying the optional courses offered in the second year. Depending on the optional courses chosen by the student, **at the end of the second year**, she should be able to:

- analyse how markets function, and how the market structure influences the behaviour of the market participants (such as firms and consumers, or the government through its policies) and how that in turn affects market structure;
- understand the rationale behind design and implementation of policies, and recommend public policies by evaluating a situation through the lens of welfare and general equilibrium;

- estimate cost and benefits of non-market goods such as environmental resources, understanding current pressing environmental issues through welfare economics, understanding how human interaction with the environment may cause sub-optimal outcomes, and analysing the possibility of collective action;
- possess the requisite knowledge to understand the theoretical underpinnings of trade and relate the formal models and empirical studies to current trade issues;
- assimilate and comprehend the challenges faced by renewable and non-renewable energy producers, and how those challenges relate to market structures and competition; understand the usefulness of energy futures, energy forwards, energy options, swaps and other financial instruments and hedging tools which are used in national and international trade of energy products and commodities, either over the counter or at designated exchanges;
- undertake credible time series analysis for different economic, financial, agricultural, weather data so as to generate reliable medium to short term forecasts.

Placements:

Shiv Nadar University hosts a Career Development Centre (CDC) that manages the placement of the masters students to the corporate and non-profit sector. In the past few years, students have been placed in organizations like Bank of America, CBRE, Dell, Delloite, IIP, Nagarro, and Trivitron.

Students from earlier batches of the M.Sc. program have been successful in getting offers in Ph.D. programs in reputed universities and institutes like Pittsburgh, Georgia State University, Tulane University, Bocconi University, Stony Brook University, Cornell University and Deakin University. Students can also choose to do a Ph.D. at Shiv Nadar University subject to meeting qualification requirement and clearing admissions tests and interviews as published during the year of admission to the Ph.D. program

Departmental Faculty[1]

- **Subhra K. Bhattacharya** (Assistant Professor)
  Ph.D. (Iowa State University)
  Specialization: Public Economics, Development Economics, Game Theory, Finance.

- **Trishita Ray Barman** (Assistant Professor)
  Ph.D. (Indian Statistical Institute)
  Specialization: Growth Theory, Public Economics

- **Shampa Bhattacharjee** (Assistant Professor)
  Ph.D. (University of British Columbia)
  Specialization: Development Economics, Health Economics, Political Economy

- **Partha Chatterjee** (Associate Professor & Head of the Department)
  Ph.D. (University of Minnesota)
  Specialization: Macroeconomics, International Economics.

- **Ashokankur Datta** (Assistant Professor)
  Ph.D. (Indian Statistical Institute)
  Specialization: Environmental Economics, Development Economics

- **Abhimanyu Khan** (Assistant Professor)
  Ph.D. (Maastricht University)
  Specialization: Applied Microeconomic Theory

- **Anup Pramanik** (Assistant Professor)
  Ph.D. (Indian Statistical Institute)
  Specialization: Game Theory, Mechanism Design

- **Suchishmita Tarafdar** (Assistant Professor)
  Ph.D. (Arizona State University)
  Specialization: Macroeconomics, Theory of Optimization.

[1] For detailed faculty profile refer to departmental webpage: ttps://economics.snu.edu.in/people/faculty

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Macroeconomics I

II. COURSE CODE : ECO 502

III. COURSE CREDITS (L:T:P): 3:1:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:1:0

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY):

VII. SCHOOL/ DEPARTMENT: Humanities and Social Sciences/Economics

VIII. COURSE CONTENT & SYLLABUS:

This course will develop the theoretical framework used in Macroeconomic analysis. This is first of the two macroeconomics class you will take in the first year. In this part we will focus on developing and understanding macroeconomics as an application of dynamic general equilibrium theory. You will also learn quantitative tools like calibration which will allow you to analyse macroeconomic data using the theories developed in class. In data analysis and discussions, special attention will be paid to emerging economies like India.

SYLLABUS

- Introduction to Dynamic General Equilibrium
- Arrow-Debreu and Sequential Markets Equilibrium
- Welfare theorems
- Uncertainty and Consumption Based Asset Pricing
- Production
- Calibration of a Neoclassical Growth model
- Overlapping Generations Model
- Budget deficits and fiscal policy Ricardian equivalence

- Monetary policy and inflation Dynamic inconsistency problem
- Asset pricing theory
- Optimal control theory

IX. EVALUATION SCHEME:

Assignments - 25%
Midterm - 35%
Final - 35%

X. RECOMMENDED READING(S):

- L. Ljungqvist and T. J. Sargent, Recursive Macroeconomic Theory. Second edition. The MIT Press, 2004.
- N. L. Stokey and R. E. Lucas with E. C. Prescott, Recursive Methods in Economic Dynamics. Harvard University Press, 1989.
- Several other readings will be given in class.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Readings in International Economics

II. COURSE CODE : ECO 769

III. COURSE CREDITS (L:T:P): 3:0:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:0:0

V. COURSE TYPE (Core/Elective): Elective

VI. PREREQUISITE/S (IF ANY):

VII. SCHOOL/ DEPARTMENT: Humanities and Social Sciences/Economics

VIII. COURSE CONTENT & SYLLABUS:

a. This course will cover theoretical as well as empirical issues on international trade. It will cover topics on core models, firms in international trade, growth and trade and trade policy. The course will be in the seminar style - students will have to read assigned papers in advance of the class and present them in class.

b. SYLLABUS

Two sector models of trade
Heckscher-Ohlin model and extensions
Ricardian Models and recent developments
Firms in trade and firm heterogenity
Trade and increasing returns
Political economy of trade policy

IX. EVALUATION SCHEME:

a. Class presentation and discussion - 60%
b. Report - 15%
c. Assignment – 25%

X. RECOMMENDED READING(S):

- L. Ljungqvist and T. J. Sargent, Recursive Macroeconomic Theory. Second edition. The MIT Press, 2004.
- N. L. Stokey and R. E. Lucas with E. C. Prescott, Recursive Methods in Economic Dynamics. Harvard University Press, 1989.
- Several other readings will be given in class.

SHIV NADAR UNIVERSITY
GRADUATE COURSE

I. **COURSE TITLE:** Econometrics II

II. **COURSE CODE :** ECO 513

III. **COURSE CREDITS (L:T:P):** 3:1:0

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 3:1:0

V. **COURSE TYPE (Core/Elective):**Core

VI. **PREREQUISITE/S (IF ANY):** Econometrics I (ECO 521)

VII. **SCHOOL/ DEPARTMENT:** School of Humanities and Social Sciences

VIII. COURSE CONTENT

This is a rigorous course on the theory and practice of econometrics. Students are assumed to be familiar with the basic concepts of linear algebra, calculus and statistics.The recommended statistical packages for this course is Stata. It is available at the Economics computer lab. The teaching assistant for the course will briefly go over Stata in tutorials.

DETAILED SYLLABUS:

i) Linear regression model (Review)

ii) Partitioned Regression

iii) Endogeneity and Instrumental Variable Estimation

iv) Generalized Method of Moments

v) Simultaneous Equations

vi) Maximum Likelihood Estimation

vii) Discrete choice models

viii) Limited Dependent Variables—Truncation, Censoring

ix) Models for Panel Data

IX. EVALUATION SCHEME:

Component	Weightage
Assignment	**20**
Class Tests	**10**
Mid-semester examination	**25**
End-semester examination	**45**

X. RECOMMENDED READING(S):

I will give class notes for most of the topics. However, you might find the following books useful:

Greene, William H. Econometric analysis. Pearson Education India.

Wooldridge, Jeffrey M. Econometric analysis of cross section and panel data. MIT press.

Angrist, Joshua D., and Jörn -Steffen Pischke. Mostly harmless econometrics. Princeton university press.

SHIV NADAR UNIVERSITY
GRADUATE COURSE

I. **COURSE TITLE:** Labour Economics

II. **COURSE CODE :** ECO 665

III. **COURSE CREDITS (L:T:P):** 3:0:0

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 3:0:0

V. **COURSE TYPE (Core/Elective):** Elective

VI. **PREREQUISITE/S (IF ANY):** Microeconomics I (ECO 511), Econometrics I (ECO 521), Econometrics II (ECO 513)

VII. **SCHOOL/ DEPARTMENT:** School of Humanities and Social Sciences

VIII. **COURSE CONTENT & SYLLABUS:**

COURSE CONTENT

This course will focus on the core topics in labour economics and the empirical methods used for analysis in labour economics and applied microeconomics in general. The purpose is to inform students of topics like labour supply, labour demand, labour market institutions and public policies affecting labour markets, immigration, returns to human capital investment, labour market discrimination and empirical analysis of wage and earning gaps. Since there is no single textbook which covers all the material, I will mostly teach from academic papers. However for the empirical methods covered in class an useful reference will be:
Angrist, Joshua D. and J¨orn-Steffen Pischke (2009) Mostly Harmless Econometrics. Princeton University Press.

DETAILED SYLLABUS

i) Introduction to Labour Economics and Empirical Methods of Causal Inference

ii)ˆ Labour Supply: Consumption leisure tradeoff models, female labour supply, empirical aspects of labour supply like endogeneity, self-selection and measurement errors, female labour supply and rural labour supply

iii)ˆ Labour Demand

iv)ˆ Immigration
ˆ

v) Institutions and labour market: Effect of Unionization, Minimum Wages, Labour Regulations and Trade Reforms

ˆvi) Human Capital Investment and Returns to Human Capital Investment

vii) Labour Market Discrimination: Taste based and statistical discrimination, caste based discrimination, gender based discrimination and discrimination along racial lines

ˆviii) Wage and Earning Gaps: Decomposition methods for analysis of wage/earning gap: Oaxaca-Blinder, quantile decompositionˆ Inequality and skill-biased technological change

IX. EVALUATION SCHEME:

Component	Weightage
Referee Report	5
Class Tests	5
Midterm	25
Presentation	10
Replication	15
Final Exam	40

X. RECOMMENDED READING(S):

Empirical methods

Angrist, Joshua D., and Jörn -Steffen Pischke. Mostly harmless econometrics. Princeton university press.

Labour Supply

Killingsworth, M. and J. Heckman. (1986) “Female Labor Supply: A Survey,” Chap. 2 in Ashenfelter, O.C. and R. Layard, editors, Handbook of Labor Economics, Vo.1, North-Holland (1986), 103-204.

Evers, Michiel, Ruud De Mooij, and Daniel Van Vuuren. “The wage elasticity of labour supply: a synthesis of empirical estimates.” De Economist 156.1 (2008): 25-43.

Behrman, Jere R. “Labor markets in developing countries.” Handbook of labor economics 3 (1999): 2859-2939.

Carranza, Eliana. “Soil Endowments, Female Labor Force Participation, and the Demographic Deficit of Women in India.” American Economic Journal: Applied Economics 6.4 (2014): 197-225.

Skoufias, Emmanuel. “Intertemporal substitution in labor supply: Micro evidence from rural India.” Journal of Development Economics 51.2 (1996): 217-237.

Rose, Elaina. “Ex ante and ex post labor supply response to risk in a low-income area.” Journal of Development Economics 64.2 (2001): 371-388.

Rose, Elaina. “Gender bias, credit constraints and time allocation in rural India.” The Economic Journal 110.465 (2000): 738-758.

Labour Demand

Hamermesh, Daniel S. “The demand for labor in the long run.” Handbook of labor economics 1 (1986): 429-471.
Clark, K. and R. Freeman. “How Elastic is the Demand for Labor?” Review of Economics and Statistics, Vol. 62 (Nov. 1980) 509-20.

Hamermesh, D.S. and S.J. Trejo, “The Demand for Hours of Labor: Direct Evidence from California,” Review of Economics & Statistics, Vol.82 (Feb. 2000) 38-47.

Immigration

Card, D., “The Impact of the Mariel Boatlift on the Miami Labor Market”, Industrial and Labor Relations Review, Vol. 43 (January 1990) 245-257.

Friedberg, Rachel M. “The impact of mass migration on the Israeli labor market.” Quarterly Journal of Economics (2001): 1373-1408.

Borjas, George J. “The Labor Demand Curve Is Downward Sloping: Reexamining the Impact of Immigration on the Labor Market.” The Quarterly Journal of Economics 118.4 (2003): 1335-1374.

Institutions and Labour Market

Dinardo, John, and David S. Lee. “Economic Impacts of New Unionization On Private Sector Employers: 19842001.” Quarterly Journal of Economics 119.4 (2004).

Card, David and A. B. Krueger, “Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania,” American Economic Review, Vol. 84 (September 1994) 772-793.

Besley, Timothy, and Robin Burgess. “Can Labor Regulation Hinder Economic Performance? Evidence from India.” The Quarterly Journal of Economics (2004): 91-134.

Imbert, Clment, and John Papp. 2015. “Labor Market Effects of Social Programs: Evidence from India’s Employment Guarantee.” American Economic Journal: Applied Economics, 7(2): 233-63.

Hasan, Rana, Devashish Mitra, and Krishnarajapet V. Ramaswamy. “Trade reforms, labor regulations, and labor-demand elasticities: Empirical evidence from India.” The Review of Economics and Statistics 89.3 (2007): 466-481.

Human Capital Investment

Angrist, Joshua D., and Alan B. Krueger. “Does Compulsory School Attendance Affect Schooling and Earnings?.” Quarterly Journal of Economics 106.4 (1991): 979-1014.

Lang, Kevin, and David Kropp. "Human capital versus sorting: the effects of compulsory attendance laws." The Quarterly Journal of Economics (1986): 609-624.
Bedard, Kelly. "Human capital versus signaling models: university access and high school dropouts." Journal of Political Economy 109.4 (2001): 749-775.

Tyler, John H., Richard J. Murnane, and John B. Willett. "Estimating the labor market signaling value of the GED." Quarterly Journal of Economics(2000): 431-468.

Labour Market Discrimination

Goldin, Claudia, and Cecilia Rouse. "Orchestrating Impartiality: The Impact of" Blind" Auditions on Female Musicians." *The American Economic Review.* 90.4 (2000): 715-741.

Bertrand, Marianne, and Sendhil Mullainathan. 2004. “Are Emily and Greg More Employable Than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination.” American Economic Review, 94(4): 991-1013.
Goldin, G. , “The Quiet Revolution that Transformed Women’s Employment, Education and Family,” American Economic Review, Vol. 96 (May 2006) 1-21.

Siddique, Zahra. “Evidence on Caste Based Discrimination.” Labour Economics 18 (2011): S146-S159.

Banerjee, Abhijit, Marianne Bertrand, Saugato Datta, and Sendhil Mullainathan. “Labor market discrimination in Delhi: Evidence from a field experiment.” Journal of Comparative Economics 37, no. 1 (2009): 14-27.

Neal, D. and W. Johnson, “The Role of Premarket Factors in BlackWhite Wage Differences,” Journal of Political Economy Vol. 104 (October 1996), 869-95.

Wage and Earning Gap

Fortin, N.M., T. Lemieux and S. Firpo, “Decomposition Methods,” chap. 1. in O. Ashenfelter and D. Card (eds.) Handbook of Labor Economics, Vol. 4A, North-Holland (2011) 1-102.

Lemieux, Thomas. “Decomposing changes in wage distributions: a unified approach.” Canadian Journal of Economics/Revue canadienne d’conomique 35.4 (2002): 646-688.

Hnatkovska, Viktoria V., Amartya Lahiri, and Sourabh Paul. “Castes and Labor Mobility.” American Economic Journal: Applied Economics 4.2 (2012): 274-307.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Microeconomics II

II. COURSE CODE : ECO 511

III. COURSE CREDITS (L:T:P): 3:1:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:1:0

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY): Microeconomics I: ECO 501

VII. SCHOOL/ DEPARTMENT: SHSS, Economics

VIII. COURSE CONTENT & SYLLABUS:

Overview

We will study static and dynamic games of complete and incomplete information. The basic concepts of Nash Equilibrium in Pure and Mixed Strategies, Correlated equilibrium, Dominance and Rationalizability, Subgame perfection and Bayesian Equilibrium will be discussed. Practical applications of these concepts will be studied in the context of repeated games, bargaining and auction problems, signaling and cheap talk games.

Detailed Syllabus

Normal and Extensive form representation of Games

Dominant strategies

Best Responses: Pure and Mixed strategies: the role of beliefs (Some applications: Cournot duopoly market, Final Offer Arbitration, Problem of Commons, etc.)

Rationalizability

Theory of Backward Induction (Applications: Stackelberg model of Duopoly, Wages and Employment in Trade Unions, Bank Runs, Tournaments, etc.)

Repeated Games (Finitely repeated games, Infinitely repeated games):

Subgames

Subgame-perfect equilibrium in the context of repeated games

Trigger Strategy: Can collusion be sustained?

Sequential Bargaining/Rubinstein model of alternate period offers

Friedman's Theorem

Threats and Promises: Credibility and its relation with NE and SPNE

Time-consistent Monetary policy model

Games of Complete but Imperfect Information

Information sets: Defining Subgames

Subgame – perfect equilibrium for games of complete but imperfect information

Static games of incomplete information

Bayes-Nash Equilibrium

General Equivalence of Mixed strategy equilibria in complete information games to games with incomplete information

Applications of Bayes Nash equilibrium: First price Auction, Double Price Auction

Perfect Bayesian Equilibrium

Applications of Perfect Bayesian Equilibrium in the context of signaling and screening markets (both discrete and continuous versions), Model of Cheap talk.

Correlated equilibrium

Core

Shapley Value

IX. EVALUATION SCHEME: Mid-term (40%) and Final Examination (60%)

X. RECOMMENDED READING(S):

1. “A Primer in Game Theory”, Robert Gibbons, Pearson Publishers.
2. “Microeconomic Theory”, Mas-Colell, Whinston, and Green. Cambridge University.
3. “A Course in Game Theory”, Osborne and Rubinstein.
4. “Game Theory”, Fudenberg, and Tirole.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Econometrics

II. COURSE CODE :

III. COURSE CREDITS (L:T:P): (3:1:0)

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): (3:1:0)

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY): None

VII. SCHOOL/ DEPARTMENT: SHSS/Economics

VIII. COURSE CONTENT & SYLLABUS:

IX. EVALUATION SCHEME: Assignments/ Class Tests, Mid Semester Exam and Final Exam.

X. RECOMMENDED READING(S):

Attached.

REFERENCES:

- William Greene. Econometric Analysis. 5th Edition. Pearson. (WG)
- Angrist, J.D. and J.S Pischke. Mostly Harmless Econometrics. (MHE)
- David Gale. 1960. The Theory of Linear Economic Models (DG)
- Simon, C. P and L. Blume. Mathematics for Economists. (SB)
- Wooldridge, J. Econometric Analysis of Cross Section and Panel Data (JW1)
- Wooldridge, J. Introductory Econometrics. A Modern Approach (JW2)
- Miller, I and M. Miller: Freund's Mathematical Statistics (MM)

SYLLABUS

LINEAR ALGEBRA:

1. **VECTORS:**

   Vector Spaces, Operations on Vectors.
   Linear Independence and Linear Dependence.
   Fundamental Theorem on Vector Spaces.
   Rank and Basis. Basis Theorem.
   Norm and Inner Product.

   (DG and SB)

2. **MATRICES**

   What is a matrix? Matrix Operations. Transpose of a Matrix. Some special matrices and their properties: Null, Symmetric Diagonal, Identity, Idempotent.
   Rank of a Matrix. Rank Theorem. Singular Matrices.
   Inverse of a Matrix.
   Relationship between non-singularity and invertibility of a matrix.
   Partitioned Matrices. Determinants and Inverses of Partitioned Matrices.

   (DG and SB)

3. **SIMULTANEOUS LINEAR EQUATIONS**

   Existence and Uniqueness of solutions to a system of Linear Equations.
   Determinants. Properties of Determinants.
   Inversion of Matrices. Calculating solutions of a system of Linear Equations: Cramers Rule

   (DG and SB)

4. **CHARACTERISTIC VALUE PROBLEM:**
   The Characteristic Value Problem. Eigen Values and Eigen Vectors.
   Characteristics Value, Trace and Determinant of a Matrix.
   Characteristic Value and Vectors of a Symmetric Matric.

Spectral Decomposition of Symmetric Matrices
Quadratic Forms. Definiteness of Quadratic Forms. Characterization of Quadratic Forms. Idempotent Quadratic Forms.
(DG and SB)

ECONOMETRICS

1. QUESTIONS ABOUT QUESTIONS:

Four Questions that define a research agenda: the relationship of interest, the ideal experiment, the identification strategy, and the mode of inference.

(MHE. Chapter 1)

2. THE EXPERIMENTAL IDEAL

The Selection Problem. The Role of Randomization as a solution to the problem.
(MHE, Chapter 2)

3. CONDITIONAL EXPECTATION FUNCTION

Economic Relationships and the Conditional Expectation Function.
Law of Iterated Expectations. CEF-Decomposition Property. CEF-Prediction Property. ANOVA Theorem.
CEF and Linear Regression Function.
Regression Anatomy: Relation between Regression Coefficients and Partial Correlation.
Alternative Interpretations of a Population Regression Function.

(MHE, Section 3.1.1 and 3.1.2)

4. ORDINARY LEAST SQUARES

Estimating regression coefficients using Ordinary Least Squares.
The importance of Full Rank and Zero Conditional Mean Assumption.
Algebraic Properties of Least Square Estimates.
Frish-Waugh-Lovell Theorem
Goodness of Fit: R^2 and Adjusted R^2
Regression through origin.

(WG, Chapter 3)

5. SOME FINITE SAMPLE PROPERTIES OF OLS ESTIMATORS.

Unbiasedness. Variance of OLS estimator under assumptions of Homoskedasticity. Efficiency. Best Linear Unbiased Estimator. Gauss-Markov Theorem. Estimating the variance of OLS estimator.

(WG, Chapter 4)

6. SOME SAMPLING DISTRIBUTIONS:

Moment Generating Functions of a Distribution. Properties of Moment Generating Functions.
Normal Distribution. Gamma Function and Gamma Distribution. Chi Square Distribution. Students' *t* Distribution. *F* Distribution.

Multivariate Normal Distribution. Connection between Multivariate Normal Distribution and Univariate Normal Distribution. Marginal and Conditional Normal Distribution.

Linear Functions of a Normal Vector. Quadratic Forms in Standard Normal Vector. Independence of Quadratic Forms in Standard Normal Vector. Independence of a Linear and Quadratic Form in a Standard Normal Vector.

(WG, Section B9, B10 and B11; MM Chapter 6, 7 and 8)

7. HYPOTHESIS TESTING FOR FINITE SAMPLES

Distribution of OLS estimator under the assumptions of multivariate normality of the error vector. Testing Hypothesis about a coefficient. Relationship between t-statistic and p-value of tests on a single regression coefficient. Confidence intervals for parameters. Testing hypotheses about single linear combination of parameters. Testing multiple linear restrictions.

(WG, Chapter 6)

8. LARGE SAMPLE PROPERTIES

The concept of probability limit and convergence in distribution. Law of Large Numbers. Central Limit Theorem.

Consistency of OLS estimator. Asymptotic Normality of OLS estimator.

(WG, Chapter 5; JF1, Chapter 3 and 4)

9. BINARY INDEPENDENT VARIABLES

Using dummy variables to describe qualitative information. Dummy Variable. Using dummy variables for multiple categories. Interactions involving dummy variables. Interpreting coefficients of dummy variables and their interactions. (JW2, Chapter 7)

10. SPECIFICATION ANALYSIS

Omission of relevant variables. Inclusion of irrelevant variables. Measurement error: Error in dependent variable. Error in explanatory variables. Classical Error in Variables.

(WG, Section 8.2 and Section 5.6.1)

11. NON SPHERICAL DISTURBANCES

The concept of heteroskedasticity. Asymptotic Normality and White's heteroskedaticity robust standard errors.
Tests for heteroskedasticity: Breush Pagan Test, White Test.
Generalized Least Squares and Feasible GLS

(WG, Chapter 11)

12. INSTRUMENTAL VARIABLE ESTIMATION *

Endogenous Regressors. Example of Omitted Variable Bias. Motivation for using instruments. Multiple Instruments and Two Stage Least Squares. Consistency and Asymptotic normality of 2SLS estimators. Hypothesis Testing with 2SLS.

(JW1, Chapter 5)

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Econometrics

II. COURSE CODE :

III. COURSE CREDITS (L:T:P): (3:1:0)

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): (3:1:0)

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY): None

VII. SCHOOL/ DEPARTMENT: SHSS/Economics

VIII. COURSE CONTENT & SYLLABUS:

IX. EVALUATION SCHEME: Assignments/ Class Tests, Mid Semester Exam and Final Exam.

X. RECOMMENDED READING(S):

Attached.

REFERENCES:

- William Greene. Econometric Analysis. 5th Edition. Pearson. (WG)
- Angrist, J.D. and J.S Pischke. Mostly Harmless Econometrics. (MHE)
- David Gale. 1960. The Theory of Linear Economic Models (DG)
- Simon, C. P and L. Blume. Mathematics for Economists. (SB)
- Wooldridge, J. Econometric Analysis of Cross Section and Panel Data (JW1)
- Wooldridge, J. Introductory Econometrics. A Modern Approach (JW2)
- Miller, I and M. Miller: Freund's Mathematical Statistics (MM)

SYLLABUS

LINEAR ALGEBRA:

5. **VECTORS:**
   Vector Spaces, Operations on Vectors.
   Linear Independence and Linear Dependence.
   Fundamental Theorem on Vector Spaces.
   Rank and Basis. Basis Theorem.
   Norm and Inner Product.

   (DG and SB)

6. **MATRICES**

   What is a matrix? Matrix Operations. Transpose of a Matrix. Some special matrices and their properties: Null, Symmetric Diagonal, Identity, Idempotent.
   Rank of a Matrix. Rank Theorem. Singular Matrices.
   Inverse of a Matrix.
   Relationship between non-singularity and invertibility of a matrix.
   Partitioned Matrices. Determinants and Inverses of Partitioned Matrices.

   (DG and SB)

7. **SIMULTANEOUS LINEAR EQUATIONS**

   Existence and Uniqueness of solutions to a system of Linear Equations.
   Determinants. Properties of Determinants.
   Inversion of Matrices. Calculating solutions of a system of Linear Equations: Cramers Rule

   (DG and SB)

8. **CHARACTERISTIC VALUE PROBLEM:**
   The Characteristic Value Problem. Eigen Values and Eigen Vectors.
   Characteristics Value, Trace and Determinant of a Matrix.
   Characteristic Value and Vectors of a Symmetric Matric.
   Spectral Decomposition of Symmetric Matrices
   Quadratic Forms. Definiteness of Quadratic Forms. Characterization of Quadratic Forms. Idempotent Quadratic Forms.

(DG and SB)

ECONOMETRICS

11. QUESTIONS ABOUT QUESTIONS:

Four Questions that define a research agenda: the relationship of interest, the ideal experiment, the identification strategy, and the mode of inference.

(MHE. Chapter 1)

12. THE EXPERIMENTAL IDEAL

The Selection Problem. The Role of Randomization as a solution to the problem.
(MHE, Chapter 2)

13. CONDITIONAL EXPECTATION FUNCTION

Economic Relationships and the Conditional Expectation Function.
Law of Iterated Expectations. CEF-Decomposition Property. CEF-Prediction Property. ANOVA Theorem.
CEF and Linear Regression Function.
Regression Anatomy: Relation between Regression Coefficients and Partial Correlation.
Alternative Interpretations of a Population Regression Function.

(MHE, Section 3.1.1 and 3.1.2)

14. ORDINARY LEAST SQUARES

Estimating regression coefficients using Ordinary Least Squares.
The importance of Full Rank and Zero Conditional Mean Assumption.
Algebraic Properties of Least Square Estimates.
Frish-Waugh-Lovell Theorem
Goodness of Fit: R^2 and Adjusted R^2
Regression through origin.

(WG, Chapter 3)

15. SOME FINITE SAMPLE PROPERTIES OF OLS ESTIMATORS.

Unbiasedness. Variance of OLS estimator under assumptions of Homoskedasticity. Efficiency. Best Linear Unbiased Estimator. Gauss-Markov Theorem. Estimating the variance of OLS estimator.

(WG, Chapter 4)

16. SOME SAMPLING DISTRIBUTIONS:

Moment Generating Functions of a Distribution. Properties of Moment Generating Functions.
Normal Distribution. Gamma Function and Gamma Distribution. Chi Square Distribution. Students' *t* Distribution. *F* Distribution.

Multivariate Normal Distribution. Connection between Multivariate Normal Distribution and Univariate Normal Distribution. Marginal and Conditional Normal Distribution.

Linear Functions of a Normal Vector. Quadratic Forms in Standard Normal Vector. Independence of Quadratic Forms in Standard Normal Vector. Independence of a Linear and Quadratic Form in a Standard Normal Vector.

(WG, Section B9, B10 and B11; MM Chapter 6, 7 and 8)

17. HYPOTHESIS TESTING FOR FINITE SAMPLES

Distribution of OLS estimator under the assumptions of multivariate normality of the error vector. Testing Hypothesis about a coefficient. Relationship between t-statistic and p-value of tests on a single regression coefficient. Confidence intervals for parameters. Testing hypotheses about single linear combination of parameters. Testing multiple linear restrictions.

(WG, Chapter 6)

18. LARGE SAMPLE PROPERTIES

The concept of probability limit and convergence in distribution. Law of Large Numbers. Central Limit Theorem.
Consistency of OLS estimator. Asymptotic Normality of OLS estimator.

(WG, Chapter 5; JF1, Chapter 3 and 4)

19. BINARY INDEPENDENT VARIABLES

Using dummy variables to describe qualitative information. Dummy Variable. Using dummy variables for multiple categories. Interactions involving dummy variables. Interpreting coefficients of dummy variables and their interactions.

(JW2, Chapter 7)

20. SPECIFICATION ANALYSIS

Omission of relevant variables. Inclusion of irrelevant variables. Measurement error: Error in dependent variable. Error in explanatory variables. Classical Error in Variables.

(WG, Section 8.2 and Section 5.6.1)

21. NON SPHERICAL DISTURBANCES

The concept of heteroskedasticity. Asymptotic Normality and White's heteroskedaticity robust standard errors.
Tests for heteroskedasticity: Breush Pagan Test, White Test.
Generalized Least Squares and Feasible GLS

(WG, Chapter 11)

22. INSTRUMENTAL VARIABLE ESTIMATION *

Endogenous Regressors. Example of Omitted Variable Bias. Motivation for using instruments. Multiple Instruments and Two Stage Least Squares. Consistency and Asymptotic normality of 2SLS estimators. Hypothesis Testing with 2SLS.

(JW1, Chapter 5)

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Environmental Economics

II. COURSE CODE : ECO585

III. COURSE CREDITS (L:T:P): (3:0:0)

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): (3:0:0)

V. COURSE TYPE (Core/Elective): Elective

VI. PREREQUISITE/S (IF ANY): All Core Courses of M.Sc. (Economics)

VII. SCHOOL/ DEPARTMENT: SHSS/Economics

VIII. COURSE CONTENT & SYLLABUS:

IX. EVALUATION SCHEME: Assignments, Short Term Paper and Final Exam.

X. RECOMMENDED READING(S):

REFERENCE BOOKS:

- Thomas Sterner and Jesica Correa. Policy Instruments for Environmental and Natural Resource Management. Second Edition. RFF Press. 2011
- Charles D Kolstad. Environmental Economics. Oxford University Press. 2006

READINGS:

1. **Introduction: Background Reading**

- J.R. McNeill. Something New Under the Sun: An Environmental History of the Twentieth-Century World. New York and London: W.W. Norton. 2000.

- Ramachandra Guha. Environmentalism: A Global History. Oxford University Press. 1999
- Charles Kolstad: What is Environmental Economics? [Chapter 1 in Environmental Economics. Pages 1-8]
- Pearce, David. (2002). An Intellectual History of Environmental Economics. Annual Review of Energy and the Environment. 27: 57-81

2. Policy Instruments for Environment

- Martin L. Weitzman (1974). Prices vs. Quantities. Review of Economic Studies, 41(4): 477-91
- Mascollel, Winston and Green. Microeconomic Theory. 1995. Chapter 11.
- Polinsky, A.M. (1979). Notes on the Symmetry of Taxes and Subsidies in Pollution Control. The Canadian Journal of Economics, 12(1): 75-83.
- Downing, P.B. and L. J. White (1986). Innovation in Pollution Control. Journal of Environmental Economics and Management 13: 18-29.
- Milliman, S. and R. Prince (1989): Firm Incentives to Promote Technological change in Pollution Control. Journal of Environmental Economics and Management, 17, 247-265.

3. Natural Resource Economics

- Gray, L. C. (1914): Rent under the assumption of Exhaustibility. Quarterly Journal of Economics 28 (3)
- *Hotelling, H. (1931). "The Economics of Exhaustible Resources".* Journal of Political Economy *39 (2): 137–175*
- *Sweeney, J. L. (1993) Economic Theory of Depletable Resources: An Introduction.* Handbook of Natural Resource and Energy Economics, vol. III, edited by A. K Kneese and J.L. Sweeney.
- Clark, C. W. (2010) Mathematical Bioeconomics: The Mathematics of Conservation, 3rd Edition. Chapter 1.
- Partha Dasgupta (1982). The Control of Resources. Chapter 6.
- Chiang A. C. Dynamic Optimization. Chapters on Optimal Control Theory
- Lecture Notes on Optimal Control Theory

4. Collective Action and the Tragedy of Commons:

- Sethi, R. and E. Somanathan (2006): *A Simple Model of Collective Action.* Economic Development and Cultural Change 54(3): 725-747
- Sethi, R. and E. Somanathan (1996): *The Evolution of Social Norms in Common Property Resource Use,* American Economic Review 86(4): 766-788

SHIV NADAR UNIVERSITY

I. **COURSE TITLE: Microeconomics II (Masters)**

II. **COURSE CODE: ECO 511**

III. **COURSE CREDITS (L:T:P):4:0:0**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3**

V. **NO. OF BATCHES: 1**

VI. **COURSE TYPE (MAJOR/UWE/CCC/REAL/VELS/IC), PLEASE MENTION ALL THAT APPLIES: Masters**

VII. **PREREQUISITE/S (IF ANY): ECO 501**

VIII. **COURSE COORDINATOR/INSTRUCTOR(S): Saptarshi P. Ghosh**

IX. **SCHOOL/ DEPARTMENT: SHSS, Economics**

X. **DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: Economics**

XI. **COURSE CONTENT:**

Overview

We will study static and dynamic games of complete and incomplete information. The basic concepts of Nash Equilibrium in Pure and Mixed Strategies, Correlated equilibrium, Dominance and Rationalizability, Subgame perfection and Bayesian Equilibrium will be discussed. Practical applications of these concepts will be studied in the context of repeated games, bargaining and auction problems, signaling and cheap talk games.

Detailed Syllabus

Normal and Extensive form representation of Games
Dominant strategies
Best Responses: Pure and Mixed strategies: the role of beliefs (Some applications: Cournot duopoly market, Final Offer Arbitration, Problem of Commons, etc.)
Rationalizability
Theory of Backward Induction (Applications: Stackelberg model of Duopoly, Wages and Employment in Trade Unions, Bank Runs, Tournaments, etc.)
Repeated Games (Finitely repeated games, Infinitely repeated games):
Subgames

Subgame-perfect equilibrium in the context of repeated games
Trigger Strategy: Can collusion be sustained?
Sequential Bargaining/Rubinstein model of alternate period offers
Friedman's Theorem
Threats and Promises: Credibility and its relation with NE and SPNE
Time-consistent Monetary policy model
Games of Complete but Imperfect Information
Information sets: Defining Subgames
Subgame – perfect equilibrium for games of complete but imperfect information
Static games of incomplete information
Bayes-Nash Equilibrium
General Equivalence of Mixed strategy equilibria in complete information games to games with incomplete information
Applications of Bayes Nash equilibrium: First price Auction, Double Price Auction
Perfect Bayesian Equilibrium
Applications of Perfect Bayesian Equilibrium in the context of signaling and screening markets (both discrete and continuous versions), Model of Cheap talk.
Correlated equilibrium
Core
Shapley Value

Recommended Books:

1. "A Primer in Game Theory", Robert Gibbons, Pearson Publishers.
2. "Microeconomic Theory", Mas-Colell, Whinston, and Green. Cambridge University.
3. "A Course in Game Theory", Osborne and Rubinstein.
4. "Game Theory", Fudenberg, and Tirole.

XII. **ASSESSMENT SCHEME:**

Mid-semester examination	**40**
End-semester examination	**60**

SHIV NADAR UNIVERSITY
GRADUATE COURSE

I. COURSE TITLE: Applied Research in Development Economics

II. COURSE CODE: Eco 685

III. COURSE CREDITS (L:T:P): 3:0:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:0:0

V. COURSE TYPE (Core/Elective): Elective

VI. PREREQUISITE/S (IF ANY): Graduate Level Econometrics

VII. SCHOOL/ DEPARTMENT: Economics

VIII. COURSE CONTENT & SYLLABUS:

The potential topics are:

- Poverty, inequality
- Gender and Family Economics, Labor
- Health and Nutrition
- Child Labor, and its relation to health, education, credit market
- Migration
- Financial Development, Credit Constraints, Joint Liability and Micro-Credit, Access to credit in Education
- Women and gender Roles in Education, Labor force participation

These are some preliminary selected areas; I may elaborate or brief it further as I develop the course. Some of the above topics will be studied along with the following applied knowledge. Therefore some of the readings will specifically focus on learning the following techniques in the context of development economics.

Program Evaluation

Evaluation of Policy intervention

A separate reading list will be distributed.

IX. **EVALUATION SCHEME:**

The course does not have any exam. The evaluation scheme includes two components:

1. Class participation, completion of assigned readings and series of in-class presentations (50% weight)

Throughout the semester, I will assign papers for readings. All of you are required to read all assigned papers before coming to the class, so that all of you get an opportunity to participate in the discussion sessions. This will be a major component of learning in this class. Each of you will be randomly asked to present one paper from that reading list (I will assign papers and sessions for each, and the remaining students need to be a part of that structured discussion session on the same day.) Based on the class size, I will announce the schedule of presentation, assign the individual papers in about two weeks advance before your scheduled presentation.

2. Second one is a term paper on any of the development topics of your interest: 50% weight

The components of the term paper that should be reported back to me on time include:

- Selecting a research problem and question
- Writing a Research proposal (including motivation, data, methodology)
- Final term paper using the proposal:

For each stage of submission, students should discuss the topic/submission with me in advance. Please adhere to all deadlines carefully. If you have any problem, you should discuss with me in advance (not after the deadline is over or just on that day), so that I can help you or guide you.
The entire work throughout the course should reflect his or her own work. They should approach me for help in the project, because it is their own responsibility to prove the originality of their work. It will be completely my discretion to penalize the student if found guilty of plagiarism. All references should be cited properly. In case students are not sure about the definition of plagiarism they can approach me in advance, but not after they are found guilty. In general, students won't be allowed to use any other project from other courses to meet the requirement for term paper, but if any student has a reason to do that, they should approach me individually. I can check the possibility on a case-by case basis, but taking my permission is important in that case.
For students taking this course for AUDIT, it's absolutely important to be present in all my classes, read all the assigned papers and participates in the discussion in class. Since, I am not evaluating them on the basis of the project; it is their responsibility to let me evaluate them on the basis of their class-participation.

X. **RECOMMENDED READING(S):**

The course may not have any required text book; however, I will circulate a list of required as well as optional readings on all the topics. Those will be journal articles.
Students are expected to attend and participate in the class regularly; else it will be difficult for me to meet the course objective. Students will need to start learning Stata during the course, if they haven't learnt it already. They will be expected to submit their assignments using that knowledge. Anyone not having the knowledge of Stata, should approach me at the beginning of semester, so that I can make necessary arrangements for faster learning.

Reference Text (Optional reading):

1. Banerjee, Benabou and Mookherjee, *Understanding Poverty* (Ed.)

2. John Strauss, "Human resources: empirical modeling of household and family decisions," in Handbook of Development Economics: Volume 3.

3. Handbook of Development Economics: Volume 4

4. Devraj Ray, Development Economics.

SHIV NADAR UNIVERSITY

Centre for Public Affairs and Critical Theory (C-PACT)
and
School of Humanities and Social Sciences (SHSS)

Post Graduate (M.Sc.) Programme on Water Science and Policy

The Centre for Public Affairs and Critical Theory (C-PACT) and SHSS is offering 2-year multi-disciplinary post-graduate (M.Sc.) programme on Water Science and Policy. C-PACT is committed to research and public dissemination of that research in an accessible form, on issues critically significant for the lives and livelihoods of millions, as also for the very future of India's much-coveted growth process: land, water, agriculture and health.

The 2-year multi-disciplinary post-graduate (M.Sc.) programme on Water Science and Policy at SNU aims to be a unique programme globally. The programme will be launched with effect from 1st August 2017. Few programmes across the world are able to incorporate the essential multi-disciplinary character of water. Fewer still deal with the urgent policy requirements of the sector. Our programme will seek to address both lacunae.

Faculty

SNU has constituted an Advisory Group comprising eminent water experts from across the country to design the programme. The Group is led by Dr. Mihir Shah, Distinguished Visiting Professor, SNU and includes, Prof. Rajiv Sinha, IIT Kanpur, Dr. Himanshu Kulkarni, Advanced Centre for Water Resource Development and Management (ACWADAM) and Shri PS Vijayshankar, Samaj Pragati Sahayog (SPS), who have designed the programme (and are now the

Adjunct Faculty), along with faculty from across departments in SHSS and SOES in SNU.

Guest Faculty for the programme (12) will come from all over the country and in some cases, as appropriate, from across the globe. Faculty from UNESCO-IHE Institute for Water Education, Delft, Netherlands, Centre for Water, Agroecology and Resilience, Coventry, UK, DTU Nutech, Technical University of Denmark, Risø, Denmark and ANU Crawford School of Public Policy, Canberra, Australia have already confirmed their participation in the programme.

Each semester has 12 credits as complying with UGC requirement for the masters programme.

Semester	Credits
Semester 1	12
Semester 2	12
Semester 3	12 (field study)
Semester 4	12 (dissertation)
Total	48

The Course Contents for the four semesters are as follows:

SEMESTER 1: BASIC CONCEPTS [12 CREDITS]

Multi-disciplinary introduction to the water cycle, organised around rivers, aquifers, watersheds, lakes & wetlands, ecosystem services and the historical, social, legal and institutional aspects of water

No	**Course Title**	**Weeks**	**Hours per Week**
1	Water Cycle	4	6
2	Rivers		6
3	Watersheds	4	6
4	Aquifers		6

5	Lakes & Wetlands	4	6
6	Ecosystem Services of Water		6
7	Historical, Social, Institutional and Legal Dimensions	4	6
8	Seminar Course	4	6
	TOTAL	**16**	**12**

SEMESTER 2: PROBLEMS AND APPLICATIONS [12 CREDITS]

A critical assessment of programmes and policies on water in India since Independence, covering large dams, groundwater extraction, watershed development, flood management, drinking water and sanitation, urban and industrial water, legal & institutional aspects of water in India, water conflicts, climate change and SDGs

No	**Course Title**	**Weeks**	**Hours per Week**
1	Experience of Large Dams since Independence	4	6
2	Seminar Course		6
3	India's Groundwater Resources & Problems	4	6
4	Seminar Course		6
5	Issues in India's Water Policy	4	6
6	Discrimination, Exclusion and Conflict		6
7	Urban and Industrial Water	4	6
8	Climate Change and SDGs		6
	TOTAL	**16**	**12**

SEMESTER 3: 21ST CENTURY SOLUTIONS IN WATER (FIELD-BASED) [12 CREDITS]

Students will move into the field to learn how India's best water practitioners have evolved innovative, sustainable and equitable approaches to managing water across the country. Students will be able to choose courses from a range of options, including traditional water harvesting & watershed management, participatory irrigation management, participatory groundwater management, rural drinking water & sanitation, sustainable non-chemical agriculture and water quality, nutrition & health.

No	Course Title	Sequential - Weeks
1	Watershed Management	4
2	Sustainable Groundwater Management	4
3	Participatory Irrigation Management	4
4	Sustainable Agriculture	4
	TOTAL	**16**

SEMESTER 4: DISSERTATION [12 CREDITS]

The dissertation will be a mandatory aspect of the two-year post-graduate programme. The dissertation will generally be field-based, with each student hosted at one of the field partners who are a part of the faculty. The subjects of Semester 3 will form the basis of selecting a dissertation topic

Modular Structure

The programme will have a modular structure, flexible enough to allow stakeholders from government, civil society and industry to opt for selective

courses from within the programme, leading to the award of certificates and diplomas.

The course offers an array of options, in terms of both topics and duration, so as to attract the widest variety of students from among the very diverse range of stakeholders in the water sector, including practitioners. As described in the table below, SNU will award:

- 2-year *MSc* in Water Science and Policy
- 1-year *Advanced Diploma* in Water Science and Policy (2 options)
- 16-week *Diploma* in Water Science and Policy (3 options)
- 8-week *Advanced Certificate* in Water Science and Policy (10 options)
- 4-week *Certificate* in Water Science and Policy (16 options)

AWARDS	Semester 1	Semester 2	Semester 3	Semester 4
M.SC. (2 years)	✓	✓	✓	✓
Advanced Diploma in Water Science and Policy (1 year)	✓	✓		
Advanced Diploma in Water Science and Policy (1 year)		✓	✓	
Diploma in Water Science and Policy (16 weeks)	✓			
Diploma in Water Science and Policy (16 weeks)		✓		
Diploma in Water Science and Policy (16 weeks)			✓	

Advanced Certificate in Water Science and Policy (8 weeks)	Semester 1A or Semester 1B			
Advanced Certificate in Water Science and Policy (8 weeks)		Semester 2A or Semester 2B		
Advanced Certificate in Water Science and Policy (8 weeks)			Any 2 of 4 courses in Semester 3	
Certificate in Water Science and Policy (4 weeks)	Water Cycle + Rivers OR Watersheds + Aquifers OR Lakes & Wetlands + Ecosystem Services of Water OR Social, Institutional and Legal Dimensions of Water			
Certificate in Water Science and Policy (4 weeks)		Experience of Large Dams OR		

		India's Groundwater Resources and Problems OR Urban and Industrial Water + Climate Change OR Issues in India's Water Policy + Discrimination, Exclusion and Conflict over Water		
Certificate in Water Science and Policy (4 weeks)			Any 1 of 4 courses in Semester 3	

Admissions to the M Sc programme will be based on an entrance examination and interview. Applicants seeking the one year Diploma or any of the Certificate Course options will indicate these in the application form and will not be required to take the entrance exam or interview. C-PACT expects the Diploma and Certificate programme students (mainly mid-career) to come with sponsorships from their parent Departments/Governments/NGOs/ industry.

Water Science and Policy Program - August 2017

Course Title	Course Code	Course Description* See below	Dates	Exam Dates	Course Credits	Graded
1. Water Cycle	WSP 501		Aug 1- Sep 1	Sep 1, 2017	1.5	Yes
2. Rivers	WSP 502		Aug 1- Sep 1	Sep 1, 2017	1.5	Yes
3. Watersheds	WSP 503		Sep 4 – Oct 5	Oct 5, 2017	1.5	Yes
4. Aquifers	WSP 504		Sep 4 – Oct 5	Oct 5, 2017	1.5	Yes
5. Lakes & Wetlands	WSP 505		Oct 6 - Nov 10	Nov 10, 2017	1.5	Yes
6. Ecosystem Services of Water	WSP 506		Oct 6 - Nov 10	Nov 10, 2017	1.5	Yes
7. Historical, Social, Institutional and Legal Dimensions I & II	WSP 507		Nov 13- Dec 15	Dec 15, 2017	3	Yes

Course Descriptions:

1. **Water Cycle**

This fundamental course will introduce the water cycle as an important component of the earth's system and will plain the various processes that run this machine. It will also discuss the methods and measurements for quantifying the different components. This course will expose the students to water use and demands for a modern society and the trade-offs that are important to understand for designing a sustainable water management strategy for any developing countries.

Course content:

The earth as an ecosystem; spheres of the environment; planet Earth's hydrosphere: its contents and diverse processes that fashion climate & ecology; Planet Earth's fresh water System in the context of the Hydrological Cycle, Balanced at all Scales; Interconnected sub-

components of water cycle – precipitation, runoff, evaporation/transpiration, soil water and groundwater; Observational systems and quantification of water cycle; field and laboratory methods; Water holding capacity of different components of water cycle, time scales, transport characteristics, quantification & variabilities; A river Basin as a balanced open system, detailed structure of its components and their Inter-dependent variabilities; Analysis of hydrological systems at various scales from Watershed to River Basins; hydrological systems in various eco-hydrological zones; Hydro-geochemistry and water quality; industrial, agricultural, ground water contamination, mapping and tracking, accountability; chemical transport and nutrient cycle; Water use and water cycle; consumptive and non-consumptive uses of water; elastic and inelastic demands of water, water pricing; tradeoffs between different components of the water cycle; Water cycle and society; public awareness about water use – quantity and quality; community water sharing.

2. **Rivers**

This course will focus on the science of rivers particularly on the geomorphic processes in river systems and their relationship with river ecology. The course will aim to develop awareness about rivers and their sustainable management through process-based understanding.

Course content:

Introduction to River Science, spatial and temporal considerations; Fundamental Principles; River form and connectivity; Rivers as a geomorphic system: creating channel and channel network; River processes, channel form and geometry, hydrology and sediment transport; River Ecology; Environmental flows, River health; River hazards – river dynamics bank erosion; River hazards – floods; Geological, geomorphological changes in river systems; Human impacts or river systems; Integrated river management; Silt management in rivers; Rivers and human civilization, river-culture hypothesis, case studies; River futures.

3. **Watersheds**

Water Science and Policy Program - August 2017

Over the last four decades, Watershed Development has emerged as a new approach to managing our water resources. The areas where rivers and streams "catch" their water are called their catchments or watersheds. Most villages in India receive enough rain to meet their own requirements. Why do we let this rain flow away into the big rivers, then dam the rivers and bring water back to our villages at such enormous social and economic cost? Why not trap the water where it falls and make it available for use in the village itself? This course attempts to introduce the students, at a conceptual level, to this simple idea behind watershed development. Although India receives on an average about 1000 mm of rainfall, the problem is that most of it is falls within a few hours of a few days during the monsoon. This water runs off so fast over the ground that it carries away valuable soil which, in turn, silts up dams and reduces their storage and life. Over the years, through the relentless process of deforestation, these catchments have got denuded. The aim of watershed development is to slow down the velocity of water at every point, to place several barriers in its path, which force it to walk rather than run, so that it remains available for use in each village for a longer period of time. Based on the *ridge to valley* principle, treatment begins from the highest point in the ridge and moves downwards to the valley: from the catchment of the smallest drainage line, to the drain itself, on to progressively larger streams, culminating in the main stream of the watershed.

The opening lectures of the course introduce the students to the objectives and principles of watershed development. Placing it against the overall national context, the course shows how watershed development is based on the principles of sustainability, equity and end-use efficiency of water. Along with that, a description of the key watershed interventions (physical and biological) is also provided. The course then elaborates the origin and history of the concept of watershed development in India and elsewhere and the emergence of participatory approaches to managing water as a common pool resource. In the relatively technical sections of the course, the students are made familiar with various types of maps, using maps to identify and demarcate watersheds and calculate areas and slopes. Making a reference to the Water Cycle course, this course will discuss the key factors determining the volume and velocity of surface runoff and ways of controlling and storing it. The overall emphasis of the course is that in countries like India with scarce water endowments, watershed development is not just an option but an imperative.

The course will enable the student to:

1. Understand the national significance of watershed development as an approach to management of water equitably, sustainably and efficiently;
2. Analyse the nature of water scarcity at the level of a small hydrological unit like watershed and ways of addressing this problem;
3. Examine ways of assessing the volume and velocity of surface runoff which can be effectively controlled and tapped for useful purposes;
4. Think in detail about participatory approaches which can increase the involvement of local communities in watershed development;
5. Evaluate how demand management of water is essential to achieve the goals of watershed development; and
6. Be sensitive to the ecosystem linkages of water and how the management practices of water have to be tuned to the embedded nature of water in the ecosystem.

This course is likely to be particularly useful to water practitioners who will actually be dealing with many practical issues related to implementation of participatory watershed development programmes. It would help them answer some of the basic questions related to social equity, participation of communities and efficient use of water. Equipped by the analytical tools provided during this course in the first semester, the students would approach a real-life watershed, where treatment with active participation of the local communities is actually being done. This practical exposure would help them understand the social, economic and gender aspects of the work, something to which water practitioners have to be intensively sensitive to.

4. Aquifers

The topic of groundwater in this course has been so chosen and structured as to highlight a subject that is quite relevant to the understanding of water resources across the world. The phenomenally high dependency of India's population on groundwater is often ignored both in practice and policy. Hence, even when some of the problems that stem from such high dependency are acknowledged and felt, groundwater remains the most poorly understand and therefore often ignored component of the water cycle. Groundwater

occurs in aquifers, a common-pool resource. The concept of an aquifer not just as a hydrogeological unit but also as an entity in social sciences is important.

The first semester focuses on the concept of aquifers, their global situation and significance in India's unique groundwater story. The common pool nature of aquifers, their properties and their relevance to social, economic and environmental aspects of aquifers forms the core piece of this module. The lectures while being structured on the basis of a demystified process of understanding earth systems, rock types and structure, will include basic concepts in socio-economic and ecologic sciences that relate to aquifers. Understanding aquifers in terms of their capacity to store and transmit water, groundwater quality along with their interrelationship with surface water and soil-water will be covered in this module. Mapping and management of aquifers will be discussed at length, providing examples from across diverse hydrogeological settings, providing specific examples from India. Students will get the opportunity to interact with international scholars during special lectures s on topics such as global groundwater resources and groundwater-energy-agriculture nexus.

What will the students take away from the module on aquifers?

1. The global, regional and national significance of groundwater including historical perspectives
2. Key fundamentals of groundwater science, including the concept of aquifers
3. A deep insight into the significance of the concept of aquifers and their relevance in hydrogeology, social science and environmental science
4. The process of mapping aquifers and key factors controlling the accumulation and movement of groundwater in an aquifer
5. The drivers of aquifer depletion and contamination including the relationship between availability, supply and demand
6. The nexus between groundwater, energy and agriculture
7. Groundwater and communities – the linkage to the module in "India's groundwater – problems and responses" – to be conducted in Semester 2

5. Lakes & Wetlands

This course will take a very important component of terrestrial water cycle – lakes and wetlands – and their environmental and ecological significance. These are perhaps the most threatened water systems keeping in view a sharp decrease in their numbers and severe deterioration in their environmental status across the world primarily due to population pressure and lack of awareness for their preservation. Focus will be on understanding the hydrological processes operating in lakes and wetlands with a view to design sustainable strategies for their management.

Course content:
Morphology of lakes and wetlands - Parameters, measurements, classification of lakes and wetlands – hydrological, geomorphological and ecological; Mapping and delineation of lakes and wetlands using hydro-geomorphic approaches; description of various geomorphic features; Water Budget - Basic principles, measurement techniques; Hydrology of lakes and wetlands – surface water-ground water interaction, water and sediment fluxes, hydrological connectivity; Lake sedimentation Processes, measurement of sedimentation rates - Conventional, Isotopic and Remote sensing techniques; Ecology of lakes and wetlands – hydrology-ecology relationships; ecological diversity; ecological indicators of lake/wetland health; Monitoring of lakes and wetlands – hydrological and biomonitoring; Uses of lakes and wetlands - recharge zones, natural shoreline protection, wetlands as water purification system, wetlands for buffering the flood risk; Lake and wetland management, sustainable use of lakes and wetlands, Wetlands vs waterlogging; Rehabilitation and restoration of lakes and wetlands – strategies, legislation and policies; role of stakeholder's engagement.

6. Ecosystem Services of Water

Course description:

As the future unfolds, the next generation of decision-makers will face several tough questions that stem fundamentally from the services that water provides for us human beings, our fellow beings and our planet. This course is meant to equip these future decision-makers with capacities to understand and question, as well as change the ways in which we value water and the ecosystem

services it provides. Students today, the decision-makers tomorrow in classrooms, in industry, on national and international negotiating tables, within communities and civil society organizations, have to reflect on the economic and ecological values of water, and understand how we, humans, conceptualise and estimate the ecosystem services of water.
This course gives students the lenses to see how water and its services are valued by the multiple purposes, conceptual tools, decision-makers and users, non-user living systems, and non-user life givers. Are economic and more crucially, monetary values good enough for all? The course provides a picture of the emergence of the concept of ecosystem services. How did ecosystem services evolve from a metaphor to an agenda-setting concept and now a framework for policy decisions? Water is the key element that will alter the earth and all its economic activities as we step into the era of climate variability and change; does it demand different valuations? Students in this course will get to work on what different valuations or estimates of ecosystem services mean for daily economic uses, in production systems, embedded in other services, as well as in climate resilience and complex adaptive systems. This includes ecosystem services estimation skills, and an understanding of alternative frameworks, methods and measures used to estimate these.

Course Design and Contents:

The course is included in Semester 1 (Basic Concepts) and is designed in four parts:

Part I: The **fundamental meanings of water in the economy, society, environment** – giving students a set of basic values (economic, social and ecological) and their relationships. The class begins with an exercise in valuation, using artefacts, pictures, and such to illustrate the mental models of valuation that we all carry. The meanings embedded in water for production (agriculture, irrigation technologies) or transport, water music and cultures, rainforests and herds, traditional knowledge systems, basic and applied sciences, industrial policy, and international trade are listed and classified. Water, as an economic good, as ecosystem(s), and as life, presents multiple and diverse, often contending values. Following this, we explore why and how the conceptual framework of ecosystem services evolved, and absorb the four types of ecosystem services of water - Supporting services, Provisioning services, Regulating services and Cultural services. (Lectures 1-4)

Part II: The "**Ecosystems Services" concept, methods and measures:** are presented, illustrating the value of water in different ecosystem typologies and the value of their services. Tracing the evolution through key readings, involving academic, activist and State led reports (starting with Costanza (1997), the Millennium Ecosystem Assessment report and the TEEB Report), the class

explores changes in the meanings and measures of ecosystems services. The class learns alternative methods, sources of data, time lines involved and measures of the value of ecosystem services; as discovered through water in the 10 MEA ecosystem typologies - (1) Marine, (2) Coastal, (3) Inland water, (4) Forests, (5) Drylands, (6) Islands, (7) Mountain, (8) Polar, (9) Cultivated, (10) Urban. In each typology, the focus will be on the conceptualization of water and ecosystem services (boundaries laid out or selective perceptions evident), methods and measures used. (Lectures 5-8)

Part III: Detailing **the two key aspects of ecosystem services – "eco" and "systems"**, this part gives students a different skill set to understand and question the frameworks used to estimate values of water. Using two framings seen in MEA (Millennium Ecosystem Assessment) and SES (Socio-Ecological Systems), the students are led to appreciate the complexity of water, especially the direct and indirect drivers of change (in the use value or instrumental value of water). The estimation, involving ecological variables and measures and systems relationships and the services, essentially demands an understanding of causal relationships and how the complex causalities enter different estimation frameworks and methods. When there are major concerns about the incompatibility, incomparability and incommensurability of values, how do governments or decision-makers make choices? The last lecture in this part, uses two cases ((i) the World Commission on Dams, and (ii) three specific dam systems– the Sardar Sarovar, Three Gorges and Inga 3) illustrating value dissonance. It gives students an exposure to cognitive justice – conceptualizations of the science/knowledge, fairness and harmony between water as economic good and water as life in planetary systems. (Lectures 9-12)

Part IV: Conceptualisation **of ecosystem services to support the resilience of ecosystems and to seek values beyond "uses" and "services"** constitutes the last part of this course. It begins with ecosystem valuations, especially the uses and the estimation of these uses and services evident in the Western Ghats and Thanneermukkam bund, highlighting certain relationships between science/knowledge and policy that are institutionalised or deeply embedded in social and political systems. The class learns of de-institutionalisation or the erasure of existing norms of decision making, and re-institutionalisation or the social creation of new rules and norms for valuing and making decisions about water; two illustrations of decentralized community involvement in decision making as in the Ecosystem Function Conservation Areas (China), and the Eco-restoration and Conservation by Foundation for Ecological Security and many other CSOs (India). The class learns about processes that value water beyond "users," "services" and instrumental valuation frameworks. Students explore the larger life giving supporting services of water: soil formation, nutrient cycling, primary production, and understand ecosystem services as part of larger wellbeing of humans and the planet. The students go

back to the first class, and do a re-valuation of water and its ecosystem services using the same artefacts, pictures and such. Have our mental models changed? (Lectures 13-16)

7. Historical, Social, Institutional and Legal Dimensions I & II

This course will look at historical, social, institutional and legal dimensions, including various sub-modules (each comprising 4 lectures of 1.5 hours) below:

WATER AND THE ANCIENT WORLD – Sudeshna Guha

This module shall explore some of the connected histories of water and early civilisations. Apart from sustaining the economies, ecologies and livelihoods of ancient societies, oceans, rivers and even lakes and ponds have acted as sites of confrontations and negotiations, contributed to processes of state formation, shaped the courses of polities and empires, created forms of governance and labour, and nurtured the arts and aesthetics of the pre-modern world. Through select histories of Ancient Egypt, Mesopotamia, India, China, Rome and the Aegean Civilization, this course shall draw upon the historical agencies of rivers such as the Nile, Euphrates, Indus, Amu Darya and Huang-He and seas and oceans, such as the Mediterranean and Indian Ocean, to illustrate the importance of an analytical historical scholarship of water for understanding and engaging with many political and cultural issues of the modern world.

KNOWING WATER: DISCIPLINES, ACTORS AND SYSTEMS – Rajeswari Raina

This module is about our knowledge of/on water. We know water through our formal organized scientific research efforts and through informal unorganized local and traditional knowledge systems. While there are specific disciplines and actors associated with the formal scientific research (we include the physical/natural and social sciences here) systems, there are specific actors and context specific causal relationships associated with the informal knowledge systems. The first two lectures present the contemporary nature and

organization (in S&T Councils, Universities, CSOs, etc.) of these water knowledge systems –formal and informal, in India. The next two lectures juxtapose the fundamental concepts, boundary conditions, inter-and trans-disciplinarity and systems thinking evident in these two (formal and informal) water knowledge systems. We trace their evolution (in India and globally) from individual scientific disciplines or water divination bodies, to complex adaptive systems dynamics. The students learn about the nature and organization of water knowledge, understand the importance of and the need to demystify science of and expertise in water, and develop skills to explore the relationships between different forms of water knowledge.

GENDER, INTERSECTIONALITY AND WATER - Deepa Joshi

International policy statements on the environment frequently make explicit reference to the crucial importance of women as users, guardians and managers of natural resources, particularly water. Development policies refer to women as the 'local experts' on water in a manner, similar to the popular portrayal of women as traditional users, providers and managers of water at home. Yet, most women "struggle" to access water for domestic use and it is not clear, if they appreciate this socially allocated role. Further, women have even fewer roles and rights in relation to the use, management and governance of water for agriculture and/or other productive uses. What do these contradictions mean? Would addressing gender, then mean focusing on women, bringing them on board as active actors in the management and governance of water? "Which" women need to be involved; "how" should they be involved, and is "bringing in" women going to address complex, contextual inequalities relating to water management and governance?

In this course, we will critically unravel the meaning of the terms 'gender' in relation to water and understand how it is never "pure" and never "absent". We will:

- Assess how gender intersects with class, caste, culture, ethnicity, age, disability, space etc. in relation to the use, access and control of water;
- Map and understand how these complex interrelations are uniquely contextual - shaped by differently evolving social, economic and political situations which in turn impact relations, livelihoods and ecological changes at scale – from the households, to communities and institutional arrangements of water governance;

- Compare and contrast these complex relations of intersectionality to normative assumptions made in underlying water (water, land, agriculture, ecosystems) policies, strategies and practices; and
- Critically examine different frameworks relating to gender and environment (eco-feminism; feminist ecology and feminist political ecology) for analysing gender and water linkages, inorder to understand that addressing the "genderedness" of water goes beyond simplisitic inclusions and/or recognition of women.

Participatory, interactive methods of teaching will enable students to critically:

- unpack and understand 'gender-water' interrelations
- review and assess gender and/or water policies, interventions, strategies and outcomes, and
- plan, design and develop frameworks to undertake research on society-water linkages on thematic case studies that will provide deeper insights into pressing, contemporary water challenges in different geographic, socio-economic and socio-cultural contexts.

MASCULINITIES IN THE WATER SECTOR - Margreet Zwarteveen

Water science and policymaking domains can be considered masculine:

(1) In that water rights and voice are predominantly vested in men;

(2) In the overwhelming predominance of (some) men in water professions

(3) In how knowledge is produced: the choice of metaphors and ontologies (languages/discourses) make it difficult to see women/gender – and epistemologies cherish a subject/object split

5 ways to research and question the 'genderedness' of science:

1. Gender inequities in education and scientific careers...
    - *Should women become just like men in order to gain entry?*

- *Do women want to participate in scientific projects that are sexist, racist etc. and have problematic outcomes?*
- *Will increasing the number of women in science change the practice and outcomes of scientific efforts?*

2. Are there linkages between science and social inequities/differentiation/oppression /discrimination?
    - Is there a 'good' science (or technology) that can be used or abused - or is science/technology itself 'wrong'? Or is wrong science/technology simply the product of larger 'faults' of society of which they are a product?
3. Is 'good' (pure, objective) science possible?
    - *Will not the selection and definition of problematics always bear the social fingerprints of the dominant groups in a culture? Can there be value-free research? Is feminist research more or less objective? And are all domains of science – or disciplines – equally 'infected' by the social, or is this less so for instance physics and chemistry?*
4. How are beliefs grounded in social experience, and what kind of experience grounds what we accept as scientific knowledge?
    - *What is the relation between knowing and being, between epistemology and metaphysics?*

<u>WATER: ANTHROPOLOGICAL PERSPECTIVES - Mekhala Krishnamurthy</u>

Lecture 1: Water: A Total Social Fact
The social lives of water. Magic. Science. Religion. Politics. Economy. Law. Ethnography. Water as a "field" site.

Lecture 2: The Habits of Water
The substance and sensibilities of water. The human and the non-human. Water as a bio-social being.

Lecture 3: People at the Well

Social and political experiences with water. Resources. Distribution. Differentiation. Water communities. Rural and agrarian ethnography.

Lecture 4: Leaky States
Water, bureaucracy, infrastructures, socio-technical arrangements; politics, urban ethnography

THE POLITICAL ECONOMY OF URBAN WATER AND WASTE - Kaveri Gill

Cities of the global South, especially of a rapidly urbanising India, face their own unique challenges in the provision of adequate water and waste services. These include, *inter alia,* issues of the quantity and quality of supply (as well as public health externalities of a lack thereof); highly differentiated and fragmented access, by class and colony; as well as informal modalities and self-provision dominating formal service delivery. This module commences with a complex and nuanced understanding of water and waste in the city, as a problem for some and as a possibility for others. It then lays out an institutional and political economy perspective, using the concepts of transactions costs, cooperative behaviour, power and so on, to illustrate certain equilibriums, failures and dynamics, in provision but also, the persistence of certain contracts and structures on the supply-side, for example, segmented labour markets in waste and sanitation. It concludes with a look at recent policies – Jawaharlal Nehru National Urban Renewal Mission (JNNURM), SBM (Swachh Bharat Mission) etc. – and policy reform, of a similar hue in water and waste, to study the superimposed, superficial idea of a smart city and its actual reach.

LEGAL ARCHITECTURE OF WATER GOVERNANCE - Philippe Cullet

This module examines the water law and policy framework that governs the water sector. It examines the various dimensions of the regulatory framework in the context of the broader global environmental change affecting the water cycle. It looks at water as a distinct and multifaceted area of law that has strong links, for instance, with land (rights of access and control over water), the environment

(protection and conservation) and agriculture (irrigation). It examines the policy context that has influenced the adoption of many new water laws since the 1990s, developments in water law (recognition of the fundamental right to water, water user associations' laws or groundwater laws) and proposed new regulatory initiatives seeking to address the shortcomings noted in the multiple existing water laws, including the lack of framework legislation of the kind that exists in environmental law. This module also includes case studies, such as concerning the regulatory aspects of inter-sectoral allocation of water or dams.

WATER REGULATION - Subodh Wagle

Lecture 1: Regulation, Regulatory Theory, and Independent Regulation

This lecture will introduce the fundamental concepts and theory of regulation. On this foundation, the idea of independent regulation will be discussed. Some key aspect of the independent regulation in the electricity sector in India will also be introduced as the background for subsequent lectures.

Lecture 2: Independent Water Sector Regulation in India

This lecture will be devoted to explaining the structures and functioning of the water sector regulatory bodies in the Indian states. However, the main focus will be on the structure and functioning of Maharashtra Water Resources Regulatory Authority (MWRRA). The structure and functioning of MWRRA will be compared with those of State Electricity Regulatory Commissions in India.

Lecture 3: Critiques and Performance of Water Regulators in India

The lecture will be focused on the critique of the structure and functioning of MWRRA and discussion of its performance. Again effort will be made to compare this performance with the Maharashtra Electricity Regulatory Commission (MERC). Some time will be spent on the brief discussion on the performance of the state water regulatory bodies in other state.

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Lecture 4: Alternative Structure of Water Regulatory Body

This lecture will be devoted to the discussion on an alternative structure of a state-level water regulatory authority. The discussion will be based on a bill developed for the Planning Commission of India. This alternative structure is derived from various critiques of independent regulatory agencies in general and particularly of MWRRA.

WSP 514
Fieldwork: Sustainable groundwater management

October 2018

The first semester included a module on aquifers that laid out the global situation on groundwater resources, the uniqueness of India's groundwater dependency and a variety of concepts that define and describe aquifers (September 2017). The common pool nature of aquifers, their properties and their relevance to social, economic and environmental aspects of aquifers formed the interdisciplinary pedagogy used to discuss aquifers.

TheFebruary 2018 module for the second semester focused on understanding groundwater resources across the diverse hydrogeological and socio-ecologic typology of India. The problems surrounding groundwater exploitation and contamination were explained while also providing insights into the evolving responses to these problems. A review of policies and programmeswas coupled with narratives of conventional and off-beat responses to the problems, while highlighting the gaps between the practice and policy of groundwater management. Externalities to both aquifers and communities, such as energy regimes and policies, and the integrative nature of key responses provided the multidisciplinary touch to the module. The module concluded with certain insights to the field exposure on aquifers and groundwater management that forms the one-month field-module on sustainable groundwater management in Semester 3 of the WSP course.

The phenomenally high dependency of India's population on groundwater is often ignored both in practice and policy. Even while some of the problems that stem from such high dependency are acknowledged and felt, groundwater remains the most poorly understand and therefore often ignored component of the water cycle. Such ignorance is felt even more through the gap between theory, practice and field exposure for students.

In the third semester, the field-based module on Sustainable Groundwater Management will be conducted for the students by ACWADAM from 1st to 26th October (Sundays and National Holidays included). Firstly, a clear layering of the modules from semesters 1 and 2 is envisaged with the field exposure. The first week aquifer characteristics and the common pool nature of aquifers will be explained through detailed, field-based training sessions in October 2018. This exposure will help build field-level understanding on the meaning of 'commons' of which groundwater is a part. The groundwater component will include exposure to the skills of field-hydrogeology, conducting certain tests and the connection between the hydrogeological perspective and socio-economic implications of aquifers. Students will be exposed to the meaning of equitability, efficiency and sustainability dimensions of groundwater resources in the field, even while they understand similar concepts around land and forests. The first week of the module will summarise concepts and synthesis from semesters 1 and 2 so that even fresh, certificate students are able to undertake the module on a stand-alone basis. Degree and diploma students can brush up the understanding they have developed during the first and second semesters while also building up the field-level connect between groundwater science, the practice of PGWM and the policy interface during their preparation for the field-stint.

All students will be exposed to sustainable participatory groundwater management through an exposure (almost as short-term interns) in ACWADAM's field areas. They will be continuously mentored by the ACWADAM team and will learn-while-undertaking certain key tasks in field hydrogeology and social extension on groundwater. They will be exposed to tasks that include groundwater monitoring and social aspects of groundwater management like developing changes in community behavior, decision-making and action on groundwater management and governance. All students will write up a field report, make a presentation and will be assessed by the ACWADAM team during the field work for how well they have assimilated field-level perspectives, skills and at least some key applications.

Time table

Week	Indicative dates	Topics	Key activities
Week 1 *Classroom sessions including practicals*	1 - 5 Oct 2018 (2nd Oct will be a holiday) *Revising and contextualizing the first and second semester content to the field situation*	• India's unique groundwater situation • The relevance of aquifers and their properties • Aquifers as CPR • Reflection of the critical issues at the field level • The importance of building local understanding on aquifers, including field-level 'socio-hydrogeology' • Participatory groundwater management • Institutions and groundwater governance • An introduction to the field area(s)	• Exposure and revision of theory through classroom sessions that explain concepts and also include practical sessions to build analytical skills. • Prepare an inventory of tasks to be undertaken during the 15-day intensive field sessions. • Choose a topic for preparing their field report in discussion with respective mentors from ACWADAM. • Understanding the context and field locations of their exposure visits.
Week 2 *Classroom and field sessions*	8 – 12 Oct 2018 *Understanding the problem in the field, given the background of lectures &practicals conducted during week 1*	• Reconnaissance • Situation analysis through sample data collection and identifying specific problems • Systematic collection of social and hydrogeological data • Understanding the work of local partners including GPs • Key inferences on local groundwater resources	• Key sessions on preparing for the field including a situational analysis through practical sessions. • Field surveys – social and hydrogeological components • Systematic measurement of social and groundwater parameters • Dialogue with partners, including village level institutions • Analyses of data – back to the classroom
Week 3 *Fieldwork*	15 – 19 Oct 2018 (17th Oct will be a holiday) *Situational analyses and locating aquifers and communities into the theoretical framework of aquifers and common pool resources. Also, exposure to measurement and monitoring of key parameters*	• Analysing community interface • Understanding various levels of participation • Participation in the long-term strategy preparation on PGWM • Developing / analyzing an early groundwater balance • Preparing for potential groundwater management protocols • Understanding institutional dynamics and governance at the village level for future action	• Preparing for a dialogue with the community • Community dialogue including sensitization and awareness generation on aquifers • Understanding the local dynamics around groundwater including the social, hydrogeological, economic and ecological aspects • Analysing groundwater management protocols in the context of local dynamics
Week 4 *Fieldwork and some conclusive classroom sessions*	22 – 26 Oct 2018 *Field level analyses and socio-hydrogeological application of the results and drafting out the field report. Some of these results will be used by ACWADAM for further work on PGWM in the field locations*	• Participating in ACWADAM's team discussions on the field-component of the programme on which the students will have associated. • Preparing a report for the one-month training and exposure in line with discussions with ACWADAM. • Preparing a presentation regarding the field exposure, including a summary of learnings. • Conclusion and feedback	• Discussion with ACWADAM staff • Sharing the draft and the subsequent versions of the report which should be finalized before the students leave ACWADAM • Presentation to the ACWADAM team. • Filling out a feedback form and a synthesis of the field exposure.

SEMESTER 3: FIELD-BASED TRAINING IN WATERSHEDS

Field Location: SAMAJ PRAGATI SAHAYOG, BAGLI, DISTRICT DEWAS (MP)

In the first two semesters of the WSP programme, the watershed approach and several of its technical and social issues have been discussed. In this module, the students get a first-hand exposure to field experiences of watershed management. They get to understand the need for watershed management, the ridge-to-valley approach and participatory planning methods used, the details of watershed structures constructed as well as the social issues that arise during implementation. The students will get to understand the rationale of watershed structures, their location, design, construction and maintenance aspects. They will get hand-on experience in developing watershed treatment plans with costing and physical and financial planning. The students get exposure to the kinds of contestations that watershed management can create which require imaginative conflict resolution mechanisms. The core part of this field training is the close familiarity that the students would be exposed to with the institutional framework (watershed committees, user groups, self-help groups and SHG federations and the PRI system) of watershed management projects.

WATER SCIENCE AND POLICY PROGRAMME - SEMESTER 3		
Summary Schedule for 30 DAY Field Training in Watershed Development		
No.	**Topics**	**Days**
1	INTRODUCTION	1
2	FIELD VISIT TO TREATED WATERSHED	1
3	SURVEYING AND MAPPING	5
4	BASIC CONCEPTS OF WATERSHED DEVELOPMENT	1
5	LOCATION, DESIGN AND CONSTRUCTION OF WATERSHED STRUCTURES	9
6	ESTIMATES AND COSTING	3
7	PARTICIPATORY PLANNING PROCESSES	2
8	PREPARATION OF PARTICIPATORY WATERSHED ACTION PLAN (DPR)	3
9	PRESENTATION OF DPR AND CONCLUSION	2
10	HOLIDAYS	3
	TOTAL	**30**

WATER SCIENCE AND POLICY PROGRAMME - SEMESTER 3		
Detailed Schedule for 30 DAY Field Training in Watershed Development		
Days	**Topic & Sub topics**	**Methodology**
Day 1	**Introduction**	
	Introduction of Trainees and Trainers and Course Outline	Classroom Lecture
	Experiences, Needs and Expectations of Participants	
	Water Policy in India: Illustration of Environment-Development Conflict	
	Interlinking of Rivers: Mirage or Possibility?	

	Total Watershed Planning: Significance, Principles and Objectives	
	Training Film: *Basic Principles of Watershed Development*	
Day 2	**Surveying a Watershed**	
	What is Surveying?	Classroom Lecture
	Why is Surveying Required?	
	What is Required for Surveying	
	Contouring and Slope Measurement	
	How to make A-Frame	
	Video: *How to make A-Frame*	
	How to Make Pipe level	
	Contouring survey	
	Slope Measurement	
Day 3	Field Visit to treated watershed	Field Visit
Day 4	**Using Maps**	
	What is a Map?	Classroom Lecture and Practicals
	Types of Maps	
	Classification of Toposheets	
	Using Toposheets for Watershed Demarcation	
	Calculation of Area of a Watershed	
	Calculation of Overall Slope of the Watershed	
Days 5 to 7	**Surveying a Watershed: Dumpy Level**	
	Use of Dumpy level	Classroom Lecture and Field Exercises
	Parts of Dumpy and their use	
	Dumpy Fector	
	How to Level the Instrument	
	Describe Height of instrument/ Collimation Plan/Line of sight	
	How to take reading through Dumpy level (UR, MR and LR)	
	How to Shift Dumpy Level	
	How to fill Field book	
	Transfer RL from Bench mark	
	Calculation of Slope using reading	
	Identification of Contour of different RL using Dumpy Level	
	Compass reading and Plotting	
	Field survey for Plotting	
Day 8	HOLIDAY	
Day 9	**Basic Concepts of Earthen Engineering**	
	Drainage Line: Naali, Naala, Nadi	Classroom Lecture
	Why Watershed Development?	
	The Water Cycle	
	Water Balance Identity	
	Rainfall, Runoff and Runoff Coefficient (RoC)	
	Factors Influencing Runoff Coefficient	
	Flood Discharge and Total Yield from Catchment	
	Flood Routing	
	Introduction to Soils	
	Soil Texture and Structure	

	Soil Erosion	
	Properties of Earth Materials: Porosity and Permeability	
	Properties of Earth Materials, Natural Angle of Repose	
Day 10	**Ridge Area Treatment: Contour Trenches and Bunds**	
	Objectives	Field Exercises
	Location	
	Distance between Successive Rows of Trenches and Bunds	
	Design of Contour Trenches and Bunds	
	Solved Numericals	
	DOs and DONTs in Contour Trenches and Bunds	
	Training Film: Ridge Area Treatment	
	Planning a Ridge Area Treatment	
	Practicals	
Day 11	**Drainage Line Treatment: Loose Boulder Checks**	
	Objectives	Field Exercises
	Location	
	Design	
	Determining the Height of Different Points of a Boulder Check	
	Construction Process	
	DOs and DONTs	
	Training Film: Boulder Check	
	Laying out Boulder Checks on a Stream	
	Practicals	
Day 12	**Drainage Line Treatment: Gabion Structure**	
	Objectives	Field Exercises
	Location	
	Design	
	Different Parts of the Gabion	
	Material	
	Construction	
	DOs and DON'Ts	
	Training Film: Gabion Structure	
	Practicals	
Day 13	**On Farm Activity: Farm Bunding**	
	Permeable Soil	Field Exercises
	Objectives	
	Spacing	
	Design	
	Impermeable Soil	
	Objectives	
	Spacing	
	Design	
	DOs and DON'Ts	
	Training Film: Farm Bunding	
	Practicals	
Day 14	HOLIDAY	

Day 15	**On Farm Activity: Dugout Farm Ponds**	
	Objective	Field Exercises
	Site Selection	
	How to make a DOP	
	Special Precautions	
	DOs and DON'Ts	
	Training Film: Farm Pond	
	Planning and Layout	
Days 16 to 18	**Drainage Line Treatment: Earthen Dams**	
	Objectives	Field Exercises
	Location	
	Different Parts and their importance	
	Material	
	Construction Step by Step	
	Estimation of capacity	
	DOs and DON'Ts	
	Training Film: Earthen Dam	
	Survey and Layout	
Day 19	**Drainage Line Treatment: Masonry Dams**	
	Objectives	Classroom Lecture
	Location	
	Different Parts and their importance	
	Design	
	Material	
	Construction Step by Step	
	DOs and DON'Ts	
	Survey and Layout	
Day 20	HOLIDAY	
Days 21 to 23	**Estimation and Costing of Structures: Schedule of Rates**	
	What is a Schedule of Rates?	Classroom Lecture
	How do we use a Schedule of Rates?	
	What an SoR Contains	
	Precautions While Using SoRs	
	Estimation of Quantity of Work	
	What does a Task Rate Signify?	
	How is the Task Rate arrived at?	
	Problems of Using Schedule of Rates and Possible Modifications	
	Transparency in the Process of Preparation of SoRs	
	Examples of Costing of Structures	
Days 24 to 25	**Participatory Net planning**	
	Institutional Aspects of Watershed Development	Field Exercises
	Conceptual introduction of participatory planning process, methods for eliciting PPP - RRA, PRA, PALM, PNP , Participatory Monitoring tools and CPA etc;	
	Process of PNP , Resources required, and advantages of PNP, do and don’ts of PNP and prescribed format of PNP;	

	Exercise of Base Line Survey and understanding secondary data and interpretation of data;	
	Water budgeting and various hydrological aspects in planning and implementation of Watershed development activities;	
	Water budgeting on the basis of Human , animals, and crop wise requirement of water;	
	Social Mapping	
	Resource Mapping	
	Wealth Ranking	
Days 26 to 28	**Preparation of the Watershed Action Plan**	
	Collection, collating, tabulation and analysis of secondary data	Field Exercises
	Collection, collating, tabulation and analyzing data from primary source like- PRA, Base line, HHS, PNP, stake holder consultation,	
	Social Mapping	
	Resource Mapping	
	Wealth Ranking	
	Preparation of annual action plan, half yearly, quarterly and monthly action plan as per line item-wise, PERT, CPM, WBS, Gnatt Chart etc	
	Field Exercise for DPR	
Day 29	**Presentation of Watershed Action Plan**	
	Collection, collating, tabulation and analyzing data from secondary	In-House Presentation
	Collection, collating, tabulation and analyzing data from primary source like- PRA, Base line, HHS, PNP, stake holder consultation,	
	Preparation of annual action plan, half yearly, quarterly and monthly action plan as per line item-wise, PERT, CPM, WBS, Gnatt Chart, understanding budget based on line item and convergence factor	
	Drafting of DPR	
	Presentation of DPR in Groups	
Day 30	Conclusion and Winding Up	

Semester 1_ Curriculum details

Following is the glimpse of the highlights of Semester One.

Module	Course	Faculty	Highlights of the Module	What it will Enable
1	1. Water Cycle	**Prof. John Williams**, ANU Crawford School of Public Policy, Canberra **Prof. Kumar Gaurav**, IISER Bhopal **Dr. Girish Agrawal**, SNU **Dr. Shailesh Behra**, SNU	• Introduces the water cycle as an important component of the earth system. • Provides an understanding of the many processes that make up the Water Cycle and an opportunity to learn the methods and measurements for quantifying its different components. • Understand trade-offs critical to design a sustainable water management strategy for any developing country.	Nearly everyone seems to know of the water cycle but do we really understand the implications of the interconnections and processes within the cycle? When in government we formulate programmes and policies, when civil society practitioners implement their projects? MSc students will refresh their understanding; fill the gaps in their knowledge; and address practical problems from a deeper understanding.
	2. River Systems	**Prof. Rajiv Sinha**, IIT Kanpur **Dr.Brij Gopal**, JNU**Prof. John Williams**, ANU Crawford School of Public Policy, Canberra **Prof. S.K. Tandon**, IIT Kanpur.	• Introduction to the science of rivers • Nuances of geomorphic processes in river systems and their relationship with river ecology • Develop awareness of sustainable management of rivers through process-based understanding.	Today we have resolved to make river rejuvenation a key national mandate. This course will enable an understanding of the implications of each intervention we make on rivers, whether building dams, embankments, waterways etc. We will also understand what

				is making India's rivers dry up in such large numbers and the integral connection between river flows and the health of their catchment areas
2	3. Watersheds	**Prof. Mihir Shah**, SNU **Mr. PS Vijayshankar**, Samaj Pragati Sahayog**Mr. ApoorvaOza**, Aga Khan Rural Support Program	• What is Watershed Management: Goals and Principles • Global Origins and History of Watershed Concept • Participatory planning and social contexts of watersheds • Watershed Management: Key Interventions • Understanding Maps and their multiple uses • Determinants of the Volume and Velocity of Surface Runoff • Integrating Hydrogeology and Groundwater into watershed management • Controversies in Watershed Management: Debates and Discussions • Watershed Development as Landscape Management – An Ecosystem View of Management of Water, Forests and Commons	Watershed management has been a buzzword for some time. But do we really understand what this entails in all its dimensions? This course is critical both for those who are not familiar with watersheds but also for those who have been implementing watershed programmes within or outside government. The course will bring you up-to-date with the latest understanding of the strengths and weaknesses of the watershed approach and enable you to develop an appreciation of its many relatively neglected dimensions
	4. Aquifers	**Dr. Himanshu Kulkarni**, ACWADAM, Pune **Prof. Rajiv Sinha**, IIT Kanpur	• Understanding the concept of aquifers, their global situation and significance in India's unique groundwater story • Common pool nature of aquifers, their properties and their relevance to social, economic and environmental aspects of aquifers	Groundwater is India's single most important water resource but do we really understand the diverse nature of India's aquifers and the implications of this diversity for the way we

		Dr. Tushaar Shah, International Water Management Institute **Dr. Aditi Mukherji**, ICIMOD, Nepal	• Understanding aquifers in terms of their capacity to store and transmit water • Interrelationship of groundwater with surface water and soil-water • Mapping and management of aquifers	exploit our groundwater? And the impact our actions could have on river flows, water quality, water stored in our dams, water for life and livelihood security?
3	5. Lakes and Wetlands	**Prof. Rajiv Sinha**, IIT Kanpur **Dr.Bhishm Kumar**, Formerly at NIH Roorkee and IAEA Vienna **Dr.Brij Gopal**, JNU	• Terrestrial water cycle – lakes and wetlands – and their environmental and ecological significance • Understanding the hydrological processes operating in lakes and wetlands with a view to design sustainable strategies for their management.	Urban flooding has become a recurrent phenomenon. But do we realise how much this is linked to destruction of our lakes and wetlands? What are all the reasons these water bodies need protection and the multiple roles they play in providing us water security? All of these neglected dimensions of water management will be taught in this course.
	6. Water and Ecosystem Services	**Prof. Rajeswari Raina**, SNU **Prof. Kanchan Chopra,** former Director,IEG; **Dr.Purnamita,** IEG; **Prof. N.C. Narayanan**, IIT Bombay	• Develop an understanding on how water and its services are valued by the multiple purposes, conceptual tools, decision-makers and users, non-user living systems, and non-user life givers. • Are the economic and more crucially, monetary values good enough for all? • Different valuations and estimates of ecosystem services: what do they mean for daily economic uses, in production systems, embedded in other services, as well as in climate resilience and complex adaptive systems.	Ecosystems services is a relatively less understood and appreciated concept across the board. This course will enable water students, practitioners and policy-makers the need to embed this perspective in whatever work they do related to water. They will understand not just its emergence but also its evolution from a metaphor to an agenda-setting concept

				and now a framework for policy decisions
4	7&8. Historical, Social, Institutional and Legal Dimensions – I & II	**Dr. Deepa Joshi**, Centre for Water, Agroecology and Resilience, Coventry, UK **Dr. Margreet Zwarteveen**, UNESCO-IHE, Delft, Netherlands **Prof. Philippe Cullet**,Law, Environment and Development Centre, University of London **Prof.SubodhWagle**, IIT, Bombay **Dr.Sudeshna Guha**, SNU **Prof.Rajeswari Raina**, SNU **Dr.Mekhala Krishnamurthy**,SNU **Dr.Kaveri Gill**, SNU	• Water and the Ancient World - explores some of the connected histories of water and early civilisations; • Knowing Water: Disciplines, Actors and Systems – explores the nature and organization of water knowledge, and the need to demystify science of and expertise in water, and develop skills to explore the relationships between different forms of water knowledge; • Gender, Intersectionality and Water- critically unravels the meaning of 'gender' in relation to water and understand how it is never "pure" and never "absent"; • Masculinities in Water – critically looks at ways to research and question the 'genderedness' of science; • Water: Anthropological Perspectives – It unravels the anthropological world of water through various fundamental questions; • Political Economy of Urban Water and Waste - brings forth a complex and nuanced understanding of water and waste in the city, as a problem for some and as a possibility for others. • Legal Architecture of Water Governance - examines the myriad nuances of water from legal perspective – laws, policies, regulations; • Water Regulation - explores the world of regulation in water. Critique of the structure and functioning of water regulators and an alternative structure of a water regulatory authority.	Do we realise that history is critical for a real understanding of water? Do we know what roles gender and caste have played in shaping access to water? What are the different ways of knowing water? Are we even aware that there is an entire body of work on the anthropology of water? What are all the dimensions involved in the governance of water? How are water laws important? All this and much more will become available through this unique module

SHIV NADAR UNIVERSITY

DEPARTMENT OF MATHEMATICS

SCHOOL OF NATURAL SCIENCES

GRADUATE PROSPECTUS
M.Sc. and Ph.D. in Mathematics

www.snu.edu.in

Contents

Overview

The Department of Mathematics at SNU offers programs and courses that highlight the interdisciplinary and the multidisciplinary nature of the university. Its academic programs provide a solid base for careers in both academia and industry. There is a great demand for mathematicians in various sectors: investment banks, insurance companies, financial institutions, engineering consultancies, medical research, bioinformatics, software, computer security, and defense. Well trained students are also sought by universities all over the world for their research programs.

The following distinguishing features are common to all our programs:

- Accessibility to students from diverse backgrounds
- Melting of the artificial barriers between pure and applied mathematics and between mathematics and other disciplines.
- Exposure to leading mathematicians, scientists and thinkers from India and abroad.

The department offers the following degree programs at the graduate level:

- **M.Sc. in Mathematics**
- **Ph.D. in Mathematics**

The department has a close relationship with research centers at SNU; especially the **Institute for Innovations and Inventions with Mathematics and IT (IIIMIT)** and the **Big Data Analytics Center (BDAC)** which are currently headed by mathematics faculty. We have regular seminars, and have hosted national conferences and programs such as

- *Northern Regional Conference of the National Initiative in Mathematics Education* (2011, co-hosted with Ambedkar University, Delhi).
- *27th Annual Conference of the Ramanujan Mathematical Society* (2012)
- *Annual Foundation School* for Ph.D. students (2015, sponsored by the National Centre for Mathematics).
- *Mathematical Training and Talent Search* program (2015 and 2016, sponsored by the National Board for Higher Mathematics).
- *Advanced Instructional School on Matrix Analysis* (2016, sponsored by the National Centre for Mathematics).
- *National Conference on Cross-disciplinary Applications of Complex Networks* (2018, sponsored by Science and Engineering Research Board, India).
- *Annual Conference of Indian Women and Mathematics* (June 2018, sponsored by National Board for Higher Mathematics).

Research is further supported by facilities such as individual laptops/desktops for faculty, a 30-PC computer lab with Mathematica and Matlab, a generous library budget for books, and subscriptions to diverse journals. In 2015, we were awarded a five-year

grant under the **DST-FIST** scheme for developing a Research Computer Lab and a Department Library.

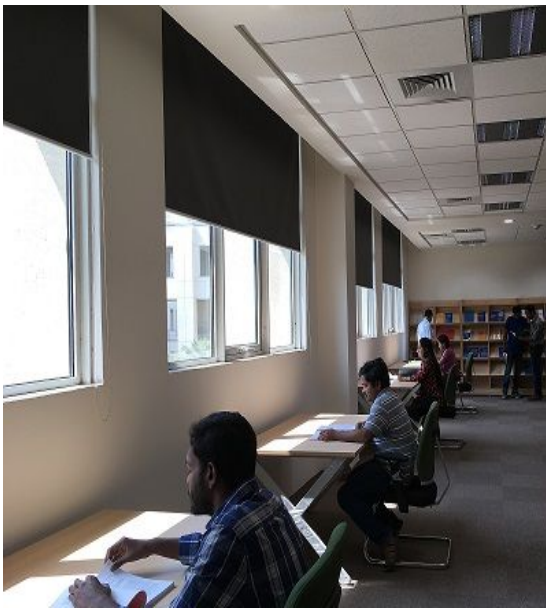
All graduate programs at SNU are managed and coordinated by the office of the **Dean of Research and Graduate Studies**. The overall goals of graduate study at SNU are:

1. Provide scholars with a discovery-driven intellectual environment
2. Develop scholars for leadership positions in academic and research focused organizations
3. Encourage the development of interdisciplinary research orientation focused on tackling intellectually and socially relevant problems
4. Train scholars in academic and research publishing processes
5. Hone scholars' teaching abilities

Department faculty, staff and graduate students in front of the Library in December 2015.

The Department of Mathematics is housed in the School of Natural Sciences.

Graduate students at Research Computer Lab in the department. It is funded by DST under the FIST scheme.



The department library. It is funded by DST under the FIST scheme.

Faculty

The members of the faculty of mathematics at SNU have studied or worked at leading institutions. Their mathematical interests vary across areas such as functional and harmonic analysis, representation theory, differential geometry, number theory, encryption, game theory, graph theory, category theory, differential equations, signal processing, computational methods, statistics, mathematical finance, mathematical biology, and medical imaging.

Faculty Member	Qualifications	Areas of Interest
Sanjeev Agrawal Professor	Ph.D. Delhi M.A. Oxford	Functional Analysis, Operator Theory, Error Correcting Codes, Encryption
Sudeepto Bhattacharya Associate Professor	Ph.D. Nagpur M.Sc. Nagpur	Complexity, Game theory, Network Theory, Mathematical Modeling
Samit Bhattacharyya Assistant Professor	Ph.D. Univ. of Calcutta M.Sc. Univ. of Calcutta	Applied Mathematics and Computational Biology
Debashish Bose Assistant Professor	Ph.D. IIT Kanpur M.Sc. IIT Kanpur	Harmonic Analysis, Number Theory, Combinatorics, Percolation
Suma Ghosh Assistant Professor	Ph.D. Univ. of Calcutta M.Sc. Univ. of Burdwan	Mathematical Biology, Nonlinear Dynamics, Optimal Control Theory
Priyanka Grover Assistant Professor, DST-Inspire Faculty	Ph.D. ISI Delhi M.Sc. Univ. of Delhi	Matrix Analysis, Operator Theory
Neha Gupta Assistant Professor	Ph.D. Univ. of Warwick M.Sc. Univ. of Warwick	Quantum Groups, Category Theory
Amber Habib Professor & Head	Ph.D. Berkeley M.S. (Int) IIT Kanpur	Representation Theory, Mathematical Finance
Ajit Kumar Assistant Professor	Ph.D. Univ. of Houston M.S. Univ. of Houston	Partial Differential Equations, Finite Element Method
Pradip Kumar Assistant Professor	Ph.D. HRI M.Sc. IIT Kanpur	Differential Geometry, Global Analysis
Sneh Lata Assistant Professor; Graduate Advisor	Ph.D. Univ. of Houston M.S. Univ. of Houston	Frame theory, Operator Theory and Function Theory
A Satyanarayana Reddy Assistant Professor	Ph.D. IIT Kanpur M.Sc. Andhra University	Algebraic Graph Theory, Discrete Mathematics, Algebraic Number Theory
Niteesh Sahni Assistant Professor; Undergraduate Advisor	Ph.D. Delhi University M.Sc. Delhi University	Functional Analysis, Operator Theory, Dynamical Systems
Charu Sharma Assistant Professor	M.S. Univ. of Houston	Bioinformatics, Computational Finance

Santosh Singh Associate Professor; Director BDAC	Ph.D. IIT Kanpur M.A. Agra University	Medical image analysis, Image reconstruction, Computational photography, Light field and Optimization techniques
L. M. Saha Professor; Fellow at IIIMIT	Ph.D. Univ. of Calcutta M.Sc. Patna University	Dynamical Systems & Chaos Theory, Celestial Mechanics & Astrophysics, Application of Nonlinear Dynamics to Bio-Science & other areas of science

Some major journals in which our faculty members have published:

- Proceedings of the American Mathematical Society
- Proceedings of the National Academy of Sciences, USA
- Studia Mathematica
- Journal of Functional Analysis
- Linear Algebra and its Applications
- Forum Mathematicum
- Indiana University Mathematics Journal
- Journal of Theoretical Biology
- Bulletin of Mathematical Biology
- Stochastic Analysis and Applications
- Proceedings of the Indian Academy of Sciences
- Journal of Mathematical Analysis and Applications
- Journal of Ramanujan Mathematical Society
- Houston Journal of Mathematics

M.Sc. in Mathematics

Our two-year M.Sc. program epitomizes SNU's development of innovative offerings that open new avenues for students. Our students acquire the training, the exposure, and the creative thinking needed to develop new mathematics and to take on challenges such as detecting cancer, managing financial risk, modeling complex systems, etc. At the same time our students are well exposed to the rigour of mathematics. The M.Sc. degree can be used to provide the base for a Ph.D. in mathematics and its applications, or a career in industry. In support of our argument a few concrete examples of what our M.Sc. graduates can do are given on Page 7.

- **Duration:** Four semesters, extendable by two semesters.
- **Eligibility:** A B.A./B.Sc./B.S./B.Tech. Degree in Mathematics/Physics/Science/ Engineering or similar disciplines with overall marks of at least 50% (or equivalent grade). Final year students can apply on the basis of their earlier marks. Please write to us in case you have

a different background or are uncertain about your eligibility for any reason. (Contact details are given at the end of this prospectus)

- **Admission:** Admission is through a written test. The syllabus for the test is described in the **Admission Process** section.

- **Course Structure:**

Semester I	Analysis I	Algebra I	Linear Algebra	Numerical Analysis & Computer Programming
Semester II	Complex Analysis	Algebra II	Functional Analysis	ODE
Semester III	Lebesgue Measure Theory	Topology	Elective	Project/Elective
Semester IV	Elective	Elective	Elective	Project/Elective

- **Electives:** The department offers a wide range of elective courses such as – Number Theory, Error Correcting Codes, Commutative Algebra, Non-Negative Matrices, Graph Theory, Algebraic Graph Theory, Topological Graph Theory, Representation Theory, Lie Groups , Matrix Analysis, Fourier Analysis, Hardy-Hilbert Spaces and Applications, Algebra of Operators, General Measure Theory, Differential Geometry, Dynamical Systems, Numerical Differential Equations, Computational Economics, Formal Languages and Automata Theory, Game Theory, Evolutionary Game Theory, Biomathematics, Statistics, Probabilistic Models and Statistical Inference, Complex Networks, etc.
- **Project:** In semester III and IV, students can choose to do a project, spread over 2 semesters, where they work with a faculty to develop a master's thesis.
- **Degree Requirements:** The student must
  1. Complete 16 graduate courses of level 600 and above, totaling a minimum of 64 credits. Up to two of the elective courses may be replaced by level 500 courses, or by courses from other departments. All exceptions require the prior approval of the Graduate Advisor.
  2. Maintain a CGPA of 5.0 (i.e. an average grade of C-). A student who does not have a CGPA of at least 5.0 at the start of the 3rd semester will be asked to leave the program.
- **Fees and Financial Aid:** All students of M.Sc. Mathematics receive financial aid in the form of a teaching assistantship. Continuation of the assistantship is contingent on maintaining a minimum CGPA of 7.0, and compliance with all university regulations. Further, it is only offered for the regular duration of the M.Sc. program (i.e. four semesters). The details of fees and the teaching assistantship can be found on SNU website. **Please see the university's Policy for Retention of Tuition Fee Waivers.**

Examples of career options for a M.Sc. (Mathematics) graduate from SNU:

1. Once a student has a thorough understanding of our core courses like Linear Algebra, Analysis I, Functional analysis, Complex analysis, Lebesgue Measure Theory, he/she can do advanced courses in areas like Complex Analysis, Functional Analysis or Harmonic Analysis and go for a Ph.D. in these areas.
2. A Ph. D. in Biomathematics or a job in an industry that manages Weather Prediction/Biomedical Modelling & Simulation - This requires a thorough understanding of our core courses like Analysis, ODE and Numerical Analysis & Computer Programming. After this the student can take up electives like Biomathematics, Complex Networks, etc. to start a Ph. D. in Biomathematics or apply in industries that manage Weather Predictions, Biomedical Modelling & Simulations, Traffic Modelling, etc.
3. A Ph.D. in Computational Finance or a job in Finance industry – This requires thorough understanding of our core courses like Linear algebra, Analysis I, and Lebesgue Measure Theory. After this student can take up advanced courses in Computational Finance as electives and is ready to do a Ph.D. in Computational Finance or join a research team in a firm who manages Mutual Funds and Hedge Funds. Suppose a student chooses to go for Ph.D. first, he/she can directly apply for higher posts in similar firms.
4. Core courses like Analysis, Linear Algebra, ODE, Numerical Analysis & Computer Programming and Functional Analysis also prepare a student for applied areas like CFD. Interested student can take electives such as Numerical PDE and few other advanced courses in CFD and can choose either go for a Ph.D. in CFD or apply in industries such as Aeronautic, Automobile, Product Design & Optimization, etc.

Ph.D. in Mathematics

The faculty members of the Department of Mathematics at SNU have research interests over wide areas of pure and applied mathematics. The broad areas of interest of our individual faculty have been listed earlier.

Ph.D. students can also carry out their research in collaboration with faculty in other departments or research centres such as IIIMIT, BDAC and the Centre for Informatics.

The detailed SNU Ph.D. Regulations can be obtained from the SNU website. A summary of the Mathematics Ph.D. program is given below:

- **Duration:** Six to ten semesters.
- **Admission:** Admission is through a written test and interview. The written test is described in the **Admission Process** section.
- **Course-Work:** The student must register for the following, in consultation with the Graduate Advisor:
    - Three courses of 4 credits each in the first semester.
    - Research Methodology course.

- Coursework in the second semester will depend on performance in the first semester.
- Retention of fellowship requires a minimum CGPA of 7.0. For more details, see SNU **Policy for Retention of Tuition Fee Waivers**.

- **Degree Requirements:** To earn a Ph.D. degree the student must:
  - Complete the required course-work.
  - Pass the Comprehensive Examination, which consists of Qualifying Examinations and a Research Seminar, by the end of the 4^{th} semester.
  - Publish one research paper in a refereed journal before thesis submission.
  - Submit and defend the doctoral thesis.
- **Eligibility:** A Master's Degree in Mathematics or related disciplines with overall marks of at least 60% (or equivalent grade). Please enquire in case you are uncertain about your eligibility for any reason. Candidates who have qualified for CSIR-UGC NET-JRF, GATE-JRF, JEST or NBHM Fellowship are preferred.
- **Fees and Financial Aid:** All students admitted to our Ph.D. program receive a Teaching Assistantship as well as significant Tuition and Hostel Fee waivers. **Please see SNU website for details.**

  Continuation of the assistantship is contingent on satisfactory performance in the program evaluated continuously, and compliance with all University regulations. Further, the scholarship is only offered for the regular duration of the Ph.D. program (i.e. eight semesters).

Department of Mathematics

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: MEASURE AND INTEGRATION**

II. **COURSE CODE : MAT 620**

III. **COURSE CREDITS (L:T:P): 4 (**3:1:0)

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (**3:1:0)

V. **COURSE TYPE (Core/Elective): Elective**

VI. **PREREQUISITE/S (IF ANY): MAT 220**

VII. **SCHOOL/ DEPARTMENT: SNS/Mathematics**

VIII. **COURSE CONTENT & SYLLABUS:**

Overview: This course puts the concept of integration of a real function in its most appropriate setting. It is also a prerequisite for the study of general measures, which is the foundation for a large part of pure and applied mathematics – such as spectral theory, probability, stochastic differential equations, harmonic analysis, Sobolev spaces, and partial differential equations.

Detailed Syllabus:

1. **Review of Set Theory and the Real Number System:** Operations with infinite collection of sets, algebras of sets, extended real numbers, sequences of real numbers, open and closed sets of real numbers, Borel sets, continuous functions.

2. **Lebesgue Measure:** Outer measure, measurable sets, Lebesgue measure, measurable functions, pointwise convergence, almost everywhere convergence.

3. **Lebesgue Integral:** Riemann integral, Lebesgue integral of a bounded measurable function over a set of finite measure, Lebesgue integral of a non-negative and a general measurable function.

4. **Differentiation and Integration:** Differentiation of monotone functions, functions of bounded variation, differentiation of an integral, absolute continuity.

5. **The Classical Banach spaces:** The L^p spaces, Minkowski and Hölder inequalities, completeness of L^p spaces, bounded linear functions on L^p spaces.

6. **Topics for Student Presentations:** A non-measurable set, Littlewood's three principles, convergence in measure, absolute continuity, convergence and completeness in L^p spaces, approximation in L^p spaces.

IX. EVALUATION SCHEME: (Can be modified by instructor)

Assignments	20%
Presentations	20%
Midterm	20%
Final	40%

X. RECOMMENDED READING(S):

1. *Real Analysis* by H. L. Royden and P. Fitzpatrick. 4th edition, Prentice-Hall India, 2010.
2. *Measure Theory and Integration* by G. de Barra, New Age International, reprint 2006.
3. *Real Analysis: Modern Techniques and their Applications* by G. B. Folland, Wiley, 2nd edition, 1999.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Analysis I

II. COURSE CODE : MAT 621

III. COURSE CREDITS (L:T:P): 4 (3:1:0)

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (3:1:0)

V. COURSE TYPE (Core/Elective): Core for MSc

VI. PREREQUISITE/S (IF ANY): MAT 320 for undergraduates

VII. SCHOOL/ DEPARTMENT: SNS/Department of Mathematics

VIII. COURSE CONTENT & SYLLABUS:

Overview: The aim of this course is to build a rigorous base for advanced topics such as Complex Analysis, Measure & Integration, Numerical Analysis, Functional Analysis, and Differential Equations. The course design also attempts to take into account the diverse backgrounds of our students.

Topics under each section are divided in two parts. Part (a) contains topics that will be covered only briefly whereas topics in part (b) will be done in detail.

1. **Real number system**

(a) Archimedean property, density of rationals, extended real numbers, countable sets, uncountable sets.

(b) Cauchy completeness of reals, Axiom of Choice, Zorn's Lemma, equivalence of AC & ZL.

2. **Metric spaces**

(a) Definitions and examples, open sets, closed sets, limit points, closure, equivalent metrics, relative metric, product metric, convergence, continuity, connectedness, compactness.

(b) Uniform continuity, completion of a metric space, Cantor's intersection property, finite intersection property, totally bounded spaces, characterization of compact metric spaces.

3. **Sequences and Series of Functions**

(a) Pointwise and uniform convergence, uniform convergence and continuity, uniform convergence and integration, differentiation, Weierstrass M-test.

(b) Power series, exponential and logarithmic functions, Fourier series, equicontinuous family of functions, Stone-Weierstrass approximation theorem, Arzela-Ascoli theorem.

IX. EVALUATION SCHEME: Determined by instructor.

X. RECOMMENDED READING(S):

1. *Principles of Mathematical Analysis* by Walter Rudin, Tata McGraw-Hill
2. *Mathematical Analysis* by Tom M. Apostol, Narosa
3. *Topology of Metric Spaces* by S. Kumaresan, Narosa
4. *Introduction to Topology & Modern Analysis* by G. F. Simmons, Tata McGraw-Hill
5. *Real Analysis* by N. L. Carothers, Cambridge University Press

GRADUATE COURSE

I. **COURSE TITLE: TOPOLOGY**

II. **COURSE CODE: MAT 622**

III. **COURSE CREDITS (L:T:P): 3:1:0**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:1:0**

V. **COURSE TYPE (Core/Elective): Elective**

VI. **PREREQUISITE/S (IF ANY): MAT 621**

VII. **SCHOOL/ DEPARTMENT: SNS/Mathematics**

VIII. **COURSE CONTENT & SYLLABUS:**

Overview: This course concerns 'General Topology' which can be characterized as the abstract framework in which the notion of continuity can be framed and studied. Thus topology provides the basic language and structure for a large part of pure and applied mathematics. Following topics will be emphasized: Open and closed sets, continuous functions, subspaces, product and quotient topologies, connected and path connected spaces, compact and locally compact spaces, Baire category theorem, separability axioms.

Detailed Syllabus:

1. **Review:** Operations with infinite collections of sets, axiom of choice, Zorn's lemma, real line, metric spaces.
2. **Topological Spaces:** Definition and examples of topological spaces, Hausdorff property, fine and coarse topologies, subspace topology, closed sets, continuous functions, homeomorphisms, pasting lemma, product topology, quotient topology.
3. **Connectedness and Compactness:** Connected spaces and subsets, path connectedness, compact spaces and subsets, tube lemma, Tychonoff theorem, local compactness, one-point compactification, Baire category theorem.
4. **Separation Axioms:** First and second countability, separability, separation axioms (T_1 etc.), normal spaces, Urysohn lemma, Tietze extension theorem.
5. **Topics for Student Presentations:** Order topology, quotients of the square, locally (path) connected spaces, sequential and limit point compactness, topological groups, nets, applications of Baire category theorem.

IX. **EVALUATION SCHEME:** Announced by the instructor

X. RECOMMENDED READING (S):

1. *Topology* by James R. Munkres, 2nd Edition. Pearson Education, Indian Reprint, 2001.
2. *Basic Topology* by M. A. Armstrong. Springer-Verlag, Indian Reprint, 2004.
3. *Topology* by K. Jänich. Undergraduate Texts in Mathematics, Springer-Verlag, 1984.
4. *Introduction to Topology and Modern Analysis* by G. F. Simmons. International Student Edition. McGraw-Hill, Singapore, 1963.
5. *Topology of Metric Spaces* by S. Kumaresan. 2nd edition, Narosa, 2011.

GRADUATE COURSE

I. **COURSE TITLE: Analysis II**

II. **COURSE CODE : MAT 623**

III. **COURSE CREDITS (L:T:P): 4 (3:1:0)**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (3:1:0)**

V. **COURSE TYPE (Core/Elective): Core for MSc**

VI. **PREREQUISITE/S (IF ANY): MAT 621**

VII. **SCHOOL/ DEPARTMENT: Department of Mathematics**

VIII. **COURSE CONTENT & SYLLABUS:**

- **Lebesgue Measure:** Outer measure, measurable sets, Lebesgue measure, measurable functions, pointwise convergence, almost everywhere convergence.
- **The Lebesgue Integral:** Riemann integral, Lebesgue integral of a bounded measurable function over a set of finite measure, Lebesgue integral of a non-negative and a general measurable function.
- **Differentiation and Integration:** Differentiation of monotone functions, functions of bounded variation, differentiation of an integral, absolute continuity.
- **The Classical Banach spaces**: L^p spaces, Minkowski and Hölder inequalities, completeness of L^p spaces, bounded linear functions on L^p spaces.
- **Introduction to General Topology:** Open and closed sets, bases, separation properties, countability and separation, continuous maps, compactness, connectedness.

IX. **EVALUATION SCHEME: Determined by Instructor.**

X. **RECOMMENDED READING(S):**

1. *Real Analysis* by H. L. Royden and P. Fitzpatrick. 4th edition, Prentice-Hall India, 2010.
2. *Measure Theory and Integration* by G. de Barra, New Age International, reprint 2006.
3. *Real Analysis* by N. L. Carothers, Cambridge University Press.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: Complex Analysis**

II. **COURSE CODE : MAT 624**

III. **COURSE CREDITS (L:T:P): 4 (3:1:0)**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (3:1:0)**

V. **COURSE TYPE (Core/Elective): Core for MSc**

VI. **PREREQUISITE/S (IF ANY): MAT 621**

VII. **SCHOOL/ DEPARTMENT: SNS/Department of Mathematics.**

VIII. **COURSE CONTENT & SYLLABUS:**

Overview: A graduate course of one variable complex analysis.

"The shortest path between two truths in the real domain passes through the complex domain" – Jacques Hadamard.

Detailed Syllabus:

1- The complex number system: The field of Complex numbers, the complex plane, Polar representation and roots of complex numbers, Line and Half planes in the Complex plane, the extended plane and its Stereographic representation.
2- Metric spaces and Topology of complex plane. Open sets in Complex plane, Few properties of metric topology, Continuity, Uniform convergence
3- Elementary properties of Analytic functions. Analytic functions as mapping. Exponential and Logarithm
4- Complex Integration: Basic review of Riemann-Stieltjes integral (without proof), Path integral, Power series representation of an analytic function, Liouville's theorem and Identity theorem, Index of a closed curve, Cauchy theorem and Integral Formula, Open mapping theorem.
5- Singularities: Removable singularity and Pole, Laurent series expansion, Essential singularity and Casorati-Weierstrass theorem Residues, Solving integral, Argument Principle, Rouche's Theorem, Maximum modulus theorem.
6- Harmonic Functions: Basic properties, Dirichlet problem, Green function.

IX. **EVALUATION SCHEME: Determined by Instructor.**

X. **RECOMMENDED READING(S):**

1) *Functions of One Complex Variable* by John B Conway, 2nd edition, Narosa.
2) *Complex Analysis* by Lars Ahlfors, 3rd edition, McGraw Hill Education India.
3) *Introduction to Complex Analysis* by H A Priestley, Oxford University Press.

4) *Complex Function Theory* by D Sarason, 2nd edition, TRIM Series, Hindustan Book Agency.
5) *Complex Analysis* by T W Gamelin, Springer.
6) *Complex Variables* by M J Ablowitz and A S Fokas, 2nd edition, Cambridge University Press.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: FUNCTIONAL ANALYSIS**

II. **COURSE CODE: MAT 626**

III. **COURSE CREDITS (L:T:P): 4 (**3:1:0)

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (**3:1:0)

V. **COURSE TYPE (Core/Elective): Elective**

VI. **PREREQUISITE/S (IF ANY): MAT 260, MAT 320**

VII. **SCHOOL/ DEPARTMENT: SNS/Mathematics**

VIII. **COURSE CONTENT & SYLLABUS:**

Overview: This course provides an acquaintance with the tools of Banach and Hilbert Spaces, which generalize linear algebra and geometry to infinite dimensions. It is a prerequisite for advanced topics like Spectral Theory, Operator Algebras, Operator Theory, Sobolev Spaces, and Harmonic Analysis. Functional Analysis is a vital component of applications of mathematics to areas like Quantum Physics, and Information Theory.

Detailed Syllabus:

1. **Banach Spaces**
   a. **Normed Spaces:** Some inequalities, Banach Spaces, finite dimensional spaces, compactness and dimension, quotient spaces, bounded operators, sums of normed spaces, bounded linear operators.
   b. **Category Theorems:** Baire Category Theorem, Open Mapping Theorem, Closed Graph Theorem, Principle of Uniform Boundedness.
   c. **Dual Spaces:** Hahn-Banach Theorem, Spaces in Duality, Adjoint operator.
   d. **Weak Topologies:** Weak topology induced by seminorms, weakly continuous functionals, Hahn-Banach separation theorem, weak*-topology, Alaouglu's Theorem, Goldstine's Theorem, reflexivity, extreme points, Krein-Milman Theorem.
   e. **Operators:** Invertible operators, compact operators, spectrum.

2. **Hilbert Spaces**
   a. **Inner products:** Inner product spaces, Hilbert spaces, orthogonal sum, orthogonal complement, orthonormal basis, orthonormalization, Riesz Representation Theorem, direct sum of Hilbert spaces.
   b. **Operators:** Adjoint operators and involution in B(H), invertibility, normality and positivity in B(H), projections and diagonalizable operators, invariant and reducing subspaces, unitary operators, isometries and partial isometries, compact normal operators.
   c. **Trace:** Invariance properties of the trace on B(H), trace class operators,

Hilbert-Schmidt operators.

IX. EVALUATION SCHEME: (Can be modified by instructor)

Assignments	20%
Presentations	10%
Midterm	30%
Final	40%

X. RECOMMENDED READING(S):

1. E. Kreyszig*: Introductory Functional Analysis with Applications*, Wiley India.
2. G. F. Simmons: *Topology and Modern Analysis*, Tata McGraw-Hill, 2004.
3. Gert K. Pedersen: *Analysis Now*, Springer, 1988.
4. John B. Conway: *A Course in Functional Analysis*, Springer International Edition, 2010.
5. V. S. Sunder: *Functional Analysis - Spectral Theory*, Hindustan Book Agency, 1997.
6. S. Kesavan: *Functional Analysis*, Hindustan Book Agency, 2009.
7. Bachman and Narici: *Functional Analysis*, 2nd edition, Dover, 2003.
8. Sterling K Berberian: *Lectures in Functional Analysis and Operator Theory*, Springer, 1974.

GRADUATE COURSE

I. COURSE TITLE: Ordinary Differential Equations

II. COURSE CODE : MAT 630

III. COURSE CREDITS (L:T:P): 4 (3:1:0)

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (3:1:0)

V. COURSE TYPE (Core/Elective): Core for MSc

VI. PREREQUISITE/S (IF ANY): MAT 220 Real Analysis I, MAT 260 Linear Algebra I, MAT 430 Ordinary Differential Equations for undergraduates.

VII. SCHOOL/ DEPARTMENT: SNS/Department of Mathematics.

VIII. COURSE CONTENT & SYLLABUS:

(a) **Review of Solution Methods** for first order and second order linear equations.

(b) **Existence and Uniqueness of Initial Value Problems:** Lipschitz and Gronwall's inequality, Picard's Theorem, dependence on initial conditions, continuation of solutions and maximal interval of existence.

(c) **Higher Order Linear Equations and Linear Systems:** fundamental solutions, Wronskian, variation of constants, matrix exponential solution, behaviour of solutions.

(d) *** Two Dimensional Autonomous Systems and Phase Space Analysis:** critical points, proper and improper nodes, spiral points, saddle points, Limit cycles, and periodic solutions.

(e) *** Asymptotic Behavior:** stability (linearized stability and Lyapunov methods).

(f) **Sturm-Liouville Boundary Value Problems:** Sturm-Liouville problem for 2^{nd} order equations, Green's function, Sturm comparison theorems and oscillations, eigenvalue problems.

Sections (d) and (e) will also be explored by computer implementation using MATLAB or other software.

IX. EVALUATION SCHEME: Determined by Instructor.

X. RECOMMENDED READING(S):

7- M. Hirsch, S. Smale and R. Deveney, *Differential Equations, Dynamical Systems and Introduction to Chaos*, Academic Press, 2004.

8- L. Perko, *Differential Equations and Dynamical Systems*, Texts in Applied Mathematics, Vol. 7, 2^{nd} edition, Springer Verlag, New York, 1998.

9- G. F. Simmons and S. G. Krantz, *Differential Equations, Theory, Technique, and Practice*, 4th edition, McGraw Hill Education, New Delhi, 2013.

10- William E. Boyce and Richard C. DiPrima, *Elementary Differential Equations and Boundary Value Problems*. Wiley, New York, 1992.

I. **COURSE TITLE: GEOMETRY**

II. **COURSE CODE : MAT 632**

III. **COURSE CREDITS (L:T:P):** 4 (3:1:0)

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 4 (3:1:0)

V. **COURSE TYPE (Core/Elective): Elective**

VI. **PREREQUISITE/S (IF ANY).** MAT 260

VII. **SCHOOL/ DEPARTMENT:** SNS/Mathematics

VIII. **COURSE CONTENT & SYLLABUS:**

Overview: This course provides a bridge to modern geometry. It provides a unified axiomatic approach leading to a coherent overview of the classical geometries (affine, projective, hyperbolic, spherical), culminating in a treatment of surfaces that sets the stage for future study of differential geometry.

Detailed Syllabus:

1. **Affine geometry** – finite planes, planes over fields, affine transformations, collineations, affine coordinates, triangles and parallelograms, classical theorems of Menelaus and others.
2. **Projective geometry** – finite planes, projective completion of affine planes, homogeneous coordinates, projective transformations, collineations, projective line, poles and polars.
3. **Conics** – affine and projective classifications, group actions.
4. **Euclidean geometry** – isometries, triangles, parallelograms, length minimizing curves, geometry of plane curves.
5. **Hyperbolic geometry** – Poincare upper half plane, Poincare metric, distance function, triangles and area, two-point homogeneity.
6. **Spherical geometry** – Sphere, tangent space, great circles, triangles and area, two-point homogeneity
7. **Surfaces** – Level surfaces, parametrized surfaces, curvature, Gauss theorem, introduction to manifolds.

IX. **EVALUATION SCHEME:** (Can be modified by instructor)

Assignments	20%
Presentations	20%

Midterm 1	15%
Midterm 2	15%
Final	30%

X. RECOMMENDED READING(S):

1. *An Expedition to Geometry* by S Kumaresan and G Santhanam. Hindustan Book Agency, 2005.
2. *Geometry* by M. Audin. Springer International Edition, Indian reprint, 2004.
3. *Geometry* by Roger A Fenn, Springer International Edition, 2005.
4. *Geometry* by David A Brannan, Matthew F Esplen, and Jeremy J Gray. 2nd edition, Cambridge University Press, 2012.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: DIFFERENTIAL GEOMETRY**

II. **COURSE CODE : MAT 634**

III. **COURSE CREDITS (L:T:P): 4 (3:1:0)**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (3:1:0)**

V. **COURSE TYPE (Core/Elective): ELECTIVE**

VI. **PREREQUISITE/S (IF ANY): MAT 621 ANALYSIS I**

VII. **SCHOOL/ DEPARTMENT: SNS/MATHEMATICS**

VIII. **COURSE CONTENT & SYLLABUS:**

Overview: Differential Geometry generalizes the calculus of several variables on Euclidean spaces to `differential manifolds'. This enables the use of analysis and linear algebra to study geometry. The two highlights of this course are the study of Lie groups and of differential forms, with the latter leading to the general Stokes' theorem in integration.

Detailed Syllabus:

Part 1: Calculus in R^n

$\mathbf{R}^n$ as a normed linear space, derivative, chain rule, mean value theorem, directional derivatives, inverse mapping theorem, implicit function theorem, immersions and submersions, integration, higher derivatives, maxima and minima, existence of solutions of ODE.

Part 2: Differential Manifolds and Lie Groups

Differential manifolds, smooth maps and diffeomorphisms, Lie groups, tangent spaces, derivatives, immersions and submersions, submanifolds, vector fields, Lie algebras, flows, exponential map, Frobenius theorem, Lie subgroups and subalgebras.

Part 3: Differential Forms and Integration

Multilinear algebra, exterior algebra, tensor fields, exterior derivative, Poincare lemma, Lie derivative, orientable manifolds, integration on manifolds, Stokes' theorem.

IX. EVALUATION SCHEME: Determined by Instructor

X. RECOMMENDED READING(S):

1. *An Introduction to Differentiable Manifolds and Riemannian Geometry* by William M Boothby, 2nd edition, Academic Press.
2. *A Course in Differential Geometry and Lie Groups* by S Kumaresan, TRIM Series, Hindustan Book Agency.
3. *Analysis on Manifolds* by James Munkres, Addison-Wesley.
4. *Calculus on Manifolds* by Michael Spivak, Addison-Wesley.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Algebra I

II. COURSE CODE : MAT 640

III. COURSE CREDITS (L:T:P): 4 (3:1:0)

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (3:1:0)

V. COURSE TYPE (Core/Elective): Core for MSc

VI. PREREQUISITE/S (IF ANY): MAT 240 for undergraduates

VII. SCHOOL/ DEPARTMENT: SNS/Mathematics

VIII. COURSE CONTENT & SYLLABUS:

Overview

This course is an introduction to the major areas of algebra – groups, rings, integral domains, fields, vector spaces and modules.

Syllabus:

Section 1: Groups: definitions, subgroups, cyclic groups, homomorphisms, normal subgroups, group actions, semi-direct products, Sylow's theorems.

Section 2: Ring Theory: definitions, subrings, ideals, homomorphisms, types of rings, integral domains, Euclidean Domains, PID, UFD.

Section 3: Polynomial rings and fields: Quotient rings, field extensions, finite fields, irreducible polynomials.

Section 4: Modules: definitions, examples, submodules, homomorphisms, quotients, sums, rank, free modules, finitely generated modules, decomposition theorems.

IX. EVALUATION SCHEME: (Can be modified by instructor)

Assignments	30%	Quizzes	30%	Midterm	20%	Final	20%

X. RECOMMENDED READING(S):

1) *Introduction to Commutative Algebra* by Michael Atiyah & I. G. MacDonald, Addison-Wesley, USA 1969.

2) *Rings, Modules and Linear Algebra* by B. Hartley & T. D. Hawkes, Chapman and Hall Ltd., UK, 1970.

3) *Algebra* by Thomas W. Hungerford, Springer Verlag, GTM 73, India 2004.

4) *A First Course in Module Theory* by M. E. Keating, World Scientific, USA 1998.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: GRAPH THEORY

II. COURSE CODE : MAT 642

III. COURSE CREDITS (L:T:P): 3:1:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:1:0

V. COURSE TYPE (Core/Elective): Elective

VI. PREREQUISITE/S (IF ANY): MAT 260 Linear Algebra

VII. SCHOOL/ DEPARTMENT: SNS/Mathematics

VIII. COURSE CONTENT & SYLLABUS:

Overview: Combinatorial graphs serve as models for many problems in science, business, and industry. In this course we will begin with the fundamental concepts of graphs and build up to these applications by focusing on famous problems such as the Traveling Salesman Problem, the Marriage Problem, the Assignment Problem, the Network Flow Problem, the Minimum Connector Problem, the Four Color Theorem, the Committee Scheduling Problem , the Matrix Tree Theorem, and the Graph Isomorphism Problem. We will also highlight the applications of matrix theory to graph theory.

Detailed Syllabus:

1. **Fundamentals:** Graphs and Digraphs, Finite and Infinite graphs, Degree of a vertex, Degree Sequence, Walk, Path, Cycles, Clique, Operations on Graphs, Complement, Subgraph, Connectedness, Components, Isomorphism, Special classes of graphs: Regular, Complete, Bipartite, Cyclic and Euler Graphs, Hamiltonian Paths and Circuits. Trees and binary trees.
2. **Connectivity:** Cut Sets, Spanning Trees, Fundamental Circuits and Fundamental Cut Sets, Vertex Connectivity, Edge Connectivity, Separability.
3. **Planar graphs,** Coloring, Ramsey theory, Covering, Matching, Factorization, Independent sets, Network flows.
4. **Graphs and Matrices:** Incidence matrix, Adjacency matrix, Laplacian matrix, Spectral properties of graphs, Matrix tree theorem, Automorphism group of a graph, vertex, edge and distance transitive graphs, Cayley graphs.
5. **Algorithms and Applications:** Algorithms for connectedness and components, spanning trees, minimal spanning trees of weighted graphs, shortest paths in graphs by DFS, BFS, Kruskal's, Prim's, Dijkstra's algorithms.

IX. EVALUATION SCHEME:

Assignments	20%
Presentations	20%
Midterm	20%
Final	40%

X. RECOMMENDED READING (S):

1. D. West, *Introduction to Graph Theory*, Prentice Hall
2. Narsingh Deo, *Graph Theory: With Application to Engineering and Computer Science*, PHI, 2003.
3. Chris D. Godsil and Gordon Royle, *Algebraic Graph Theory*, Springer-Verlag, 2001.
4. Norman Biggs, *Algebraic Graph Theory*, 2nd edition, Cambridge Mathematical Library.
5. Frank Harary, *Graph Theory*, Narosa Publishing House.
6. J. A. Bondy and U. S. R. Murty, *Graph Theory with Applications*, Addison Wesley.
7. R. J. Wilson, *Introduction to Graph Theory*, 4th Edition, Pearson Education, 2003.
8. Josef Lauri, Raffaele Scapellato, *Topics in Graph Automorphisms and Reconstruction*, London Mathematical Society Student Texts.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: Linear Algebra**

II. **COURSE CODE : MAT 660**

III. **COURSE CREDITS (L:T:P): 4 (3:1:0)**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (3:1:0)**

V. **COURSE TYPE (Core/Elective): Core for MSc**

VI. **PREREQUISITE/S (IF ANY): MAT 240 and MAT 260 for undergraduates**

VII. **SCHOOL/ DEPARTMENT: Department of Mathematics**

COURSE CONTENT & SYLLABUS:

Overview: The theory of vector spaces is an indispensable tool for Mathematics, Physics, Economics and many other subjects. This course aims at providing a basic understanding and some immediate applications of the language of vector spaces and morphisms among such spaces.

Detailed Syllabus:

1. **Familiarity with sets**: Finite and infinite sets; cardinality; Statements of Schroeder-Bernstein Theorem, Axiom of Choice and Zorn's Lemma.
2. **Vector spaces**: Fields; vector spaces; subspaces; linear independence; bases and dimension; existence of basis; direct sums; quotients.
3. **Linear Transformations**: Linear transformations; null spaces; matrix representations of linear transformations; composition; invertibility and isomorphisms; change of co-ordinates; dual spaces.
4. **Systems of linear equations:** Elementary matrix operations and systems of linear equations.
5. **Determinants:** Definition, existence, properties, characterization.
6. **Diagonalization:** Eigenvalues and eigenvectors; diagonalizability; invariant subspaces; Cayley-Hamilton Theorem.
7. **Canonical Forms:** The Jordan canonical form; minimal polynomial; rational canonical form.

VIII. **EVALUATION SCHEME: Determined by instructor.**

IX. **RECOMMENDED READING(S):**

1. Friedberg, Insel and Spence: *Linear Algebra*, 4th edition, Prentice Hall India
2. Hoffman and Kunze: *Linear Algebra*, 2nd edition, Prentice Hall India
3. Paul Halmos: *Finite Dimensional Vector Spaces*, Springer India
4. Sheldon Axler: *Linear Algebra Done Right*, 2nd edition, Springer International Edition
5. S. Kumaresan: *Linear Algebra: A Geometric Approach*, Prentice Hall India

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Numerical Analysis and Computer Programming

II. COURSE CODE : MAT 680

III. COURSE CREDITS (L:T:P): 4 (3:0:1)

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 5 (3:0:2)

V. COURSE TYPE (Core/Elective): Core for MSc

VI. PREREQUISITE/S (IF ANY): MAT 280 for undergraduates

VII. SCHOOL/ DEPARTMENT: Department of Mathematics

VIII. COURSE CONTENT & SYLLABUS:

Overview: This course takes up the problems of practical computation that arise in various areas of mathematics such as solving algebraic or differential equations. The focus will be on algorithms for obtaining approximate solutions, and almost half of the course will be devoted in the implementation by computer programs in MATLAB.

Detailed Syllabus:

1. Solving equations: Iterative methods, Bisection method, Secant method, and Newton-Raphson method.
2. Solving Linear systems: Gaussian Elimination and pivoting
3. Computing eigenvalue and eigenvector: Jacobi method
4. Curve fitting
5. Solution of ODEs and systems: Runge-Kutta method, Boundary value problems, Finite Difference Method
6. Solutions of PDEs

IX. EVALUATION SCHEME: (May be modified by instructor)

Assignments (single and group projects)/Tutorial/Lab	30%
Midterm Exam	30%

Final Exam	40%

X. RECOMMENDED READING(S):

1. *Numerical Methods using Matlab*, by John H. Mathews and Kurtis D. Fink, 4th edition, PHI.
2. *An Introduction to Numerical Analysis,* by E. Suli and D. Mayers, Cambridge University Press.
3. *Numerical Analysis,* by Rainer Kress, Springer.
4. *Introduction to Numerical Analysis*, by J. Stoer and R. Bulirsch, 3rd edition, Springer.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: COMPUTATIONAL ECONOMICS

II. COURSE CODE: MAT 682

III. COURSE CREDITS (L:T:P): 3:1:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:1:0

V. COURSE TYPE (Core/Elective): Elective

VI. PREREQUISITE/S (IF ANY): NIL

VII. SCHOOL/ DEPARTMENT: SNS/Mathematics

VIII. COURSE CONTENT & SYLLABUS:

Overview: This is a joint offering with Department of Economics. The objective of the course is to introduce graduate students to computational approaches for solving mathematical problems and economic models. The first half of the course will be devoted in learning (i) the core of the Python programming language, including the main scientific libraries, (ii) a number of mathematical topics central to economic modeling, such as finite and continuous Markov chains, filtering and state space models, Fourier transforms and spectral analysis and (iii) related numerical analysis methods like function approximation, numerical optimization, simulation based techniques and Monte Carlo, recursion. The second half of the course will be devoted in applying these techniques to solve economic problems like growth models, optimal savings problem, and optimal taxation problems. We will pay particular attention to methods for solving dynamic optimization problems.

Detailed Syllabus:

A. Programming.

(i) Basics of Python: Input and output statements, formatting output, copy and assignment, arithmetic operations, string operations, lists and tuples, control statements, user defined functions, call by reference, variable number of arguments, one dimensional arrays, two dimensional arrays, random number generation.

(ii) **The NUMPY and SCIPY packages:** Numpy numerical types, data type objects, character codes, dtype constructors. Mathematical libraries, plotting 2D and 3D functions, ODE integrators, charts and histograms, image processing functions, solving models involving difference equations, differential equations, finding limit at a point, approximation using Taylor series, interpolation, definite integrals.

B. Numerical analysis. Solution of equations in one variable and two variables - Bisection, Newton-Raphson, General iterative scheme, Solution of systems of linear equations – Gauss-Jordan, LU decomposition, QR factorization, Lagrange and Hermite interpolation, Orthogonal polynomials, Gaussian quadrature.

C. Deterministic dynamic programming. Understanding the fundamentals of dynamic programming and applying to solve the models for equipment replacement, Shortest path, and resource allocation.

D. Growth Models. As an application we will study the neoclassical growth model.

E. Other Applications. Other applications that we may study include the optimal savings problem, heterogeneous agents problem, etc.

IX. EVALUATION SCHEME: Announced by the respective instructor

X. RECOMMENDED READING (S):

1. John Stachurski and Thomas J. Sargent, *Quantitative Economics*, http://quant-econ.net.
2. John Stachurski, *Economic Dynamics: Theory and Computation*, MIT Press, 2009.
3. M. Miranda and P. Fackler, *Applied Computational Economics and Finance*, MIT Press, 2002.
4. K. Judd, *Numerical Methods in Economics*, MIT Press.
5. N. L. Stokey and R. E. Lucas with E. C. Prescott, *Recursive Methods in Economic Dynamics*, Harvard University Press, 1989.
6. J. Adda and R. Cooper, *Dynamic Economics: Quantitative Methods and Applications*, MIT Press, 2003.
7. S. E. Dreyfus, and A. M. Law, *The Art and Theory of Dynamic Programming*, Academic Press, 1977.
8. John Zelle, *Python Programming: An Introduction to Computer Science*, Franklin, Beedle & Associates Inc., 2010.
9. Ivan Idris, *Numpy 1.5 Beginner's Guide*, Packt Publishing, 2011.
10. Hans Petter Langtangen, *A Primer on Scientific Programming on Python*, Springer, 2011.
11. E. Sulli, and D. Mayers, *Introduction to Numerical Analysis*, Cambridge University Press, 2003.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: GENERAL MEASURE THEORY

II. COURSE CODE : MAT 721

III. COURSE CREDITS (L:T:P): 4 (3:1:0)

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (3:1:0)

V. COURSE TYPE (Core/Elective): Elective

VI. PREREQUISITE/S (IF ANY): MAT 620 or MAT 621

VII. SCHOOL/ DEPARTMENT: SNS/Mathematics

VIII. COURSE CONTENT & SYLLABUS:

1- Measure and Integration

(a) Measure Spaces
(b) Measurable functions
(c) Integration – Fatou's Lemma, Monotone Convergence Theorem, Lebesgue Convergence Theorem.
(d) General Convergence Theorems
(e) Signed Measures – Hahn Decomposition Theorem, Jordan decomposition of a measure, Radon-Nikodym Theorem, Lebesgue Decomposition Theorem.
(f) The L^p spaces – Riesz Representation Theorem.

2- Measure and Outer Measure

(a) Outer measure and measurability
(b) The extension theorem – Caratheodory Theorem
(c) The Lebesgue-Stieltjes Integral
(d) Product measures – Fubini's Theorem, Tonelli Theorem, Lebesgue Integral on R^n, change of variable.
(e) Inner Measure

3- Measure and Topology

1- Baire sets and Borel sets
2- Regularity of Baire and Borel measures
3- Construction of Borel Measure
4- Positive linear functionals and Borel Measures – Riesz Markov Theorem (Dual of $C_c(X)$).
5- Bounded linear functionals on C(X) – Riesz Representation Theorem

4- EVALUATION SCHEME: Decided by instructor

5- RECOMMENDED READING(S):

4. *Real Analysis* by H. L. Royden and P. Fitzpatrick. 4th edition, Prentice-Hall India, 2010.
5. *Measure Theory and Integration* by G. de Barra, New Age International, reprint 2006.
6. *Real Analysis: Modern Techniques and their Applications* by G. B. Folland, Wiley, 2nd edition, 1999.
7. *Measure Theory* by Paul Halmos, Springer, 1974.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: REPRESENTATION THEORY**

II. **COURSE CODE : MAT 744**

III. **COURSE CREDITS (L:T:P): 4 (3:1:0)**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (3:1:0)**

V. **COURSE TYPE (Core/Elective): ELECTIVE**

VI. **PREREQUISITE/S (IF ANY): MAT 634, MAT 640**

VII. **SCHOOL/ DEPARTMENT: SNS/MATHEMATICS**

VIII. **COURSE CONTENT & SYLLABUS:**

Overview: Representations of groups realize the group elements as linear transformations on vector spaces, or even more concretely, as matrices. This enables the use of linear algebra to study algebra, and connects group theory with other areas such as geometry, harmonic analysis and number theory. In this course, we will first study the representation theory of finite groups, and then that of compact groups.

Detailed Syllabus:

Part 1: Representations of Finite Groups

Review of group actions, representations, unitarizability and unitary equivalence of finite dimensional representations of finite groups, complete reducibility, group algebra as a *-algebra, regular representations, matrix coefficients, Schur's lemmas, tensor products of representations, orthogonality of matrix coefficients, orthogonality of characters, direct sum decompositions, projection formulas, dimension theorem, character tables, Frobenius-Schur theorem on real and quaternionic representations, Fourier analysis on finite groups, subgroups of index 2, induced representations, Frobenius character formula, Frobenius reciprocity, Mackey irreducibility criterion.

Part 2: Representations of Compact Groups

Review of manifolds and Lie groups, the classical compact groups, topological properties of G and G/H, invariant forms and integration, Haar measure, examples

of Haar measure for matrix groups, matrix coefficients, characters, Schur orthogonality, review of spectral theory, Schur's lemma, regular representations, Frobenius reciprocity, Peter-Weyl theorem, representations and harmonic analysis of SU(2), Fourier theory.

IX. EVALUATION SCHEME: Determined by Instructor

X. RECOMMENDED READING(S):

5. *Representation Theory of Finite Groups* by Benjamin Steinberg, Springer.
6. *Representations of Finite and Compact Groups* by Barry Simon, Graduate Studies in Mathematics, American Mathematical Society.
7. *Representation Theory – A First Course* by William Fulton and Joe Harris, Springer.
8. *A First Course on Representation Theory and Linear Lie Groups* by S C Bagchi, S Madan, A Sitaram, and U B Tewari, Universities Press.
9. *Compact Lie Groups* by Mark R Sepanski, Springer.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: NUMERICAL DIFFERENTIAL EQUATIONS

II. COURSE CODE : MAT 782

III. COURSE CREDITS (L:T:P): 4 (3:1:0)

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (3:1:0)

V. COURSE TYPE (Core/Elective): Elective

VI. PREREQUISITE/S (IF ANY): MAT 680 (MAT 280 for undergraduates)

VII. SCHOOL/ DEPARTMENT: SNS/Mathematics

VIII. COURSE CONTENT & SYLLABUS:

1. Review of numerical techniques for linear systems of equations,
2. Review of Numerical Differentiation and Integration: Mid-point rule, Trapezoidal rule, Simpson's rule, Richardson improvement, variable steps, errors and convergence of above methods.
3. Numerical ODE: Initial Value Problems (Euler methods, Heun's Method, Taylor Series Method, Runge Kutta method), Boundary value problems (Shooting Method).
4. Numerical PDE: Finite difference methods for 2 dimension parabolic, hyperbolic, and elliptic PDEs.
5. Eigenvalue Problems: Power Method, Jacobi's method, Householder's method
6. Programming: Matlab, C++

IX. EVALUATION SCHEME: To be decided by instructor

X. RECOMMENDED READING(S):

1- *Numerical Methods using Matlab*, John H. Mathews and Kurtis D. Fink, 4th edition, PHI Learning, 2005.

2- *Introduction to Numerical Analysis*, J. Stoer and R. Bulirsch, 3rd edition, Springer, 2002.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: DYNAMICAL SYSTEMS

II. COURSE CODE : MAT 786

III. COURSE CREDITS (L:T:P): 4 (3:1:0)

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (3:1:0)

V. COURSE TYPE (Core/Elective): Elective

VI. PREREQUISITE/S (IF ANY): MAT 320 for undergraduates

VII. SCHOOL/ DEPARTMENT: SNS/Mathematics

VIII. COURSE CONTENT & SYLLABUS:

1. **Introduction**: Definition of Dynamical Systems, Discrete and Continuous Systems, Fixed points, Iterations, Classification of orbits, Stability of a fixed point, Classification of fixed points.
2. **Bifurcation Analysis**: Definition of bifurcation, Classification of bifurcation, Period doubling phenomena, Hopf bifurcation.
3. **Chaos Theory**: Definition of chaos, Regular and chaotic evolution, How chaos appears in a system. Tools for identification of regular and chaotic motions: Time series, Phase plot, Poincarè map, surface of section.
4. **Applications**: Applications of Dynamical Systems to Population Dynamics, Predator-Prey evolution, Spread of Epidemics, Food Chain systems and in other areas.
5. Use of **Mathematica** or **Matlab** for exploring above topics.

IX. EVALUATION SCHEME: Decided by instructor.

X. RECOMMENDED READING(S):

1- R. L. Devaney: *Introduction to Chaotic Dynamical Systems*. Benjamin-Cummings, 1986
2- R. L. Devaney: *A First Course in Chaotic Dynamical Systems: Theory and Experiment*. Westview Press, 1992
3- P. G. Drazin: *Nonlinear Systems*. Cambridge Texts in Applied Mathematics, 1992
4- Stephen Lynch: *Dynamical Systems with Applications using MATHEMATICA*. Birkhäuser, 2007
5- D. K. Arrowsmith and C. M. Place: *An Introduction to Dynamical Systems*. Cambridge University Press, 1990

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: GAME THEORY**

II. **COURSE CODE : MAT 790**

III. **COURSE CREDITS (L:T:P):** 4 (3:1:0)

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 4 (3:1:0)

V. **COURSE TYPE (Core/Elective): Elective**

VI. **PREREQUISITE/S (IF ANY):** MAT 660

VII. **SCHOOL/ DEPARTMENT: SNS/Mathematics**

VIII. **COURSE CONTENT & SYLLABUS:**

1- **Simple Decision Models**
Ordinal Utility, Linear Utility, Modelling Rational Behaviour, Modelling Natural Selection, Optimal Behaviour, Strategic Behaviour, Randomizing Strategies, Optimal Strategies

2- **Strategic Games**
Interactive Decision Problems, Describing Static Games, Games in Normal Form, Describing Strategic Games, Solving Games Using Dominance, Nash Equilibrium in Strategic Games, Existence of Nash Equilibria, The Problem of Multiple Equilibria, Classifying Games, Two- Player Zero-Sum Games, Mixed Strategies in Finite Games, Matrix and Bimatrix Games, Games with n-Players

3- **Infinite Dynamic Games**
Repeated Games, The Iterated Prisoner's Dilemma, Folk Theorems

4- **Population Games**
Evolutionary Game Theory, Evolutionarily Stable Strategies, Games against the Field, Pairwise Contest Games

5- **EVALUATION SCHEME:** Decided by instructor.

6- **RECOMMENDED READING(S):**

1- K. Binmore *Playing for Real: A Text on Game Theory,* Oxford University Press.
2- J. N. Webb *Game Theory, Decisions, Interaction and Evolution*, Springer.
3- J. G-Diaz, I. G-Jurado, M. G.F-Janeiro *An Introductory Course on Mathematical Game Theory*, Graduate Studies in Mathematics 115, American Mathematical Society.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: RESEARCH METHODOLOGY

II. COURSE CODE : MAT 898

III. COURSE CREDITS (L:T:P): 2:1:1

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 2:1:1

V. COURSE TYPE (Core/Elective): Core for PhD

VI. PREREQUISITE/S (IF ANY): None

VII. SCHOOL/ DEPARTMENT: SNS/Mathematics

VIII. COURSE CONTENT & SYLLABUS:

Overview: The purpose of the course is to introduce the student to doing research in Mathematics – addressing issues of what research is and is not, practical aspects of undertaking research, basic modern computational skills, as well as the areas of research of department faculty members. The format of the course will be largely discussion-based.

Detailed Description:

1. The student will learn to write and typeset mathematical documents (articles and presentations) using LaTeX. Students will be required to write a small expository article using LaTeX.
2. The student will get a basic introduction to mathematical software such as Mathematica, Matlab and Sage.
3. The student will acquire familiarity with on-line resources – the preprint server arXiv, databases such as MathSciNet, discussion forums like MathOverflow and Mathematics Stack Exchange.
4. Each student will be assigned two faculty mentors from the department (from a list prepared by the student) and will read and present two research papers - one with the guidance of each mentor. (Note: *This is to give the students as a group exposure to more faculty. The purpose of this exercise is to give the students experience in how to read a paper and not to bring them up to date in a particular area. For example, if a student were to be assigned a paper from representation theory it would not be reasonable to give them something from the 1990s which would need several years of preparation. But Bargmann's 1945 paper on SL(2,R) would be accessible and show something new in creation, and the subsequent history would illustrate how a striking example leads to a general theory.*)
5. Students will be exposed to issues in ethics of research.
6. Seminars by department faculty members on aspects of their research and future prospects in their research areas.

IX. EVALUATION SCHEME: Announced by the instructor

X. RECOMMENDED READING (S):

(a) *LaTeX: A Document Preparation System*, 2nd edition, by Leslie Lamport, Addison-Wesley, 1994.
(b) *The LaTeX Companion*, 2nd edition, by Frank Mittelbach and Michel Goossens, Addison-Wesley, 2004.
(c) *The Mathematica Book*, by Stephen Wolfram, 5th edition, 2003.
(d) *How to write Mathematics*, Steenrod, N. E. Steenrod, Amer Math. Soc. 1983, ISBN 0821800558.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Algebraic Graph Theory

II. COURSE CODE: MAT 643

III. COURSE CREDITS (L:T:P): 4 (4:0:0)

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (4:0:0)

V. COURSE TYPE (Core/Elective): Elective

VI. PREREQUISITE/S (IF ANY): Linear Algebra

VII. SCHOOL/ DEPARTMENT: Mathematics, Natural Sciences

VIII. COURSE CONTENT & SYLLABUS:

Overview

Algebraic graph theory studies graphs using algebraic techniques. The core aim of this branch of mathematics is to translate properties of graphs into algebraic properties and then, using results and methods of algebra, to deduce theorems about graphs. The main connection between graph theory and algebra essentially arise through two algebraic objects associated with a graph: its automorphism group and its adjacency matrix. The course studies these aspects, and also builds some familiarity with some of the myriad real-world applications that algebraic graph theory lends itself to. The first three units of the course deal with the symmetry and regularity properties of graphs studied using concepts from group theory including automorphism groups, while the next three focus on the spectral properties of the adjacency matrix of graph. The last unit provides an exposure to some real-world applications of graph spectrum.

Syllabus

Unit 1

Graphs, Subgraphs, Automorphisms, Homomorphisms, Circulant graph, Line graphs.

Unit 2

Permutation groups, Counting, Asymmetric graphs, Orbits on pairs.

Unit 3

Homomorphisms, Core, Products, Map graph, Counting homomorphisms, Products and colourings, Uniquely colourable graphs, Foldings and covers.

Unit 4

Adjacency matrix, Incidence matrix, Symmetric matrices, Eigenvector, Positive semidefinite matrices, Perro-Frobenius theorem, Rank of a symmetric matrix, Binary rank of the adjacency matrix, Symplectic graphs, Spectral decomposition.

Unit 5

Spectrum of a graph, Regular graphs and Line graphs, Cycles and cuts, Spanning tree and associated structures, Vertex partition and the spectrum.

Unit 6

Eigenvalues and eigenvectors of graphs, Chromatic polynomial, Subgraph expansions, Multiplicative expansion, Induced subgraph expansion, The Tutte polynomial, Chromatic polynomials and spanning trees.

Unit 7

Some real-world applications of graph spectrum.

IX. EVALUATION SCHEME:

Component	Weightage %
Assignments	30%
Term paper	50%
Final Examination	20%

X. RECOMMENDED READING(S):

Text books

Biggs, N. *Algebraic Graph Theory*, Cambridge University Press, 2016.

Godsil, C., Royle, G. *Algebraic Graph Theory*, Springer, 2013.

Reference books

Cvetkovic, D., Rowlinson, P., Simic, S. *An Introduction to the Theory of Graph Spectra*, Cambridge University Press, 2010.

Cvetkovic, D., Rowlinson, P., Simic, S. *Eigenspaces of Graphs*, Cambridge University Press, 2008.

Mieghem, P.V. *Graph Spectra for Complex Networks*, Cambridge University Press, 2012.

Bapat, R.V. *Graphs and Matrices*, Springer, 2014.

Brouwer, A.E., Haemers, W.H. *Spectra of Graphs*, Springer, 2012.

Beineke, L.W., Wilson, R.J., Cameron, P.J. (Eds) *Topics in Algebraic Graph Theory*, Cambridge University Press, 2007.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: Biomathematics**

II. **COURSE CODE : 670**

III. **COURSE CREDITS (L:T:P): 4(3:1:0)**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4**

V. **COURSE TYPE (Core/Elective): Elective**

VI. **PREREQUISITE/S (IF ANY):** Calculus, Linear algebra, ordinary differential equations

VII. **SCHOOL/ DEPARTMENT: Mathematics**

VIII. **COURSE CONTENT & SYLLABUS:**

Modules:

1. **Mathematics for dynamic state variable models:**
   a. Nonlinear ODE models
   b. Difference equation models
   c. Partial differential equation models
   d. Standard methods of analytic and numerical solution

2. **Methods of analyzing nonlinear models:**
   a. Qualitative behavior and phase space of dynamical systems
   b. Concept of global and local stability
   c. Periodic and non-periodic solutions
   d. Chaos

3. **Survey of nonlinear models:**
   a. Population dynamic models: prey-predator models, competition models, and classic Lotka-volterra models.
   b. Application of above models in ecology, epidemiology, enzyme kinetics.

4. **Numerical implementation of above models and analysis** using MATLAB or some supporting software

IX. **EVALUATION SCHEME:**

Assignments	20
Mid-term Examination	30
Presentation	20
Final examination	30

X. RECOMMENDED READING(S):

1. Edelstein-Keshet, Leah. *Mathematical models in biology*. Vol. 46. Siam, 1988.

2. Allman, E.S. and Rhodes, J.A., 2004. *Mathematical models in biology: an introduction*. Cambridge University Press.

3. Brauer, F., Castillo-Chavez, C. and Castillo-Chavez, C., 2001. *Mathematical models in population biology and epidemiology*, New York: Springer.

4. C. S. Chou, A. Friedman 2016. *Introduction to Mathematical Biology: Modeling, Analysis, and Simulations* (Springer Undergraduate Texts), Springer.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: Hardy-Hilbert spaces and applications**

II. **COURSE CODE: MAT 724**

III. **COURSE CREDITS (L:T:P): 4 (3:1:0)**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4 (3:1:0)**

V. **COURSE TYPE (Core/Elective): Elective**

VI. **PREREQUISITE/S (IF ANY): MAT 600, MAT 620, MAT 626, MAT 624**

VII. **SCHOOL/ DEPARTMENT: SNS/Department of Mathematics**

VIII. **COURSE CONTENT & SYLLABUS:**

Overview: The course focusses on the study of Holomorphic functions whose power series have square-summable coefficients. These functions reside in a Hilbert space denoted by H^2. We shall demonstrate how elementary functional analysis techniques can be used in the space H^2 to derive deep theorems in Complex analysis. We shall also study important properties of the Shift operators and the Toeplitz operators as well as the invariant subspaces associated with them.

Detailed Syllabus: Reproducing kernel in H^2, Identifying H^2 with a closed subspace of L^2, Fatou's Theorem, The space H^∞, The shift operators, Invariant and Reducing subspaces, Inner and Outer functions, Blaschke products, The Muntz-Szasz Theorem, Outer functions, Composition operators, Littlewood subordination theorem, Invertibility of composition operators, Toeplitz operators.

IX. **EVALUATION SCHEME: Determined by instructor.**

X. **RECOMMENDED READING(S):**

1. R.A. Martinez, and P. Rosenthal, *An Introduction to Operators on the Hardy-Hilbert Space ,* Springer, 2007.
2. R.G. Douglas, *Banach Algebra Techniques in Operator Theory, Springer, 1998.*
3. P.L. Duren, *Theory of Hp Spaces,* Dover, 2000.
4. K. Hoffman, *Banach Spaces of Analytic Functions,,Dover,*

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: Evolutionary Game Theory**

II. **COURSE CODE: MATxxx**

III. **COURSE CREDITS (L:T:P): 4 (4:0:0)**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4**

V. **COURSE TYPE (Core/Elective): Elective**

VI. **PREREQUISITE/S (IF ANY): Msc level ODE**

VII. **SCHOOL/ DEPARTMENT: Mathematics, Natural Sciences**

VIII. **COURSE CONTENT & SYLLABUS:**

Overview

Evolutionary game theory studies game theory in a dynamical framework. This course will approach non-cooperative game theory as a branch of dynamical systems, and will discuss strategic interactions among individual agents in an evolutionary frame work, with consideration of evolutionary stabilities of these strategies, and the game dynamics.

Syllabus

Unit 1

Population dynamics with density dependence, Exponential growth, Logistic growth, The recurrence relation, Stable and unstable fixed points, Bifurcations.

Unit 2

Lotka-Volterra predator-prey systems and solutions, Analysis of Lotka-Volterra predator-prey equations, Predator-prey equations with intraspecific competition, On ω-limits and Lyapunov functions, Co-existence of predator and prey, Lotka-Volterra equation for two competing species.

Unit 3

Hawks and doves, Evolutionary stability, Normal form games, Evolutionarily stable startegies, Games with ESS and games without ESS, Population games.

Unit 4

The replicator equation, Nash equilibria and ESS, Strong stability, Examples of replicator dynamics, Replicator dynamics and the Lotka-Volterra equation, Rock-Scissora-Paper game, Imitation dynamics, Best response dynamics.

Unit 5

The repeated Prisoner's Dilemma, Strategies for Prisoner's Dialemma, Adaptive dynamics for Prisoner's Dilemma, ESS and adaptive dynamics gradients.

Unit 6

Some real-world applications of replicator dynamics.

IX. EVALUATION SCHEME:

Component	Weightage %
Assignments	30%
Term paper	50%
Final Examination	20%

X. RECOMMENDED READING(S):

Text books

Hofbauer, J., Sigmund, K. *Evolutionary Games and Population Dynamics*, Cambridge University Press, 2003.

Reference books

Cressman, R. *Evolutionary Dynamics and Extensive Form Games*, Harvard University Press, 2006.

Gintis, H. *Game Theory Evolving*, Princeton University Press, 2005.

Nowak, M.A. *Evolutionary Dynamics*, Harvard University Press, 2006.

Sandholm, W. *Population Games and Evolutionary Dynamics*, MIT Press, 2010.

Weibull, J. *Evolutionary Game Theory*, MIT Press, 1995.

Maynard Smith, J. *Evolution and the Theory of Games*, Cambridge University Press, 1982.

Vincent,T., Brown, J.S. *Evolutionary Game Theory, Natural Selection and Darwinian Dynamics*, Cambridge University Press, 2005.

Tanimoto, J. *Fundamentals of Evolutionary game Theory and its Applications*, Springer, 2015.

SHIV NADAR UNIVERSITY

School of Engineering

The Department of Computer Science and Engineering

Master of Technology Programme

Table of Contents

About the Programme

The Master of Technology (M.Tech) programme in the department of Computer Science and Engineering is a Full Time postgraduate programme at SNU. Students entering this programme will be awarded the M.Tech degree in Computer Science and Engineering on successful completion of 48 credits in 2 years.

Objectives of the Programme

The Master of Technology in Computer Science and Engineering is designed to prepare students for more highly productive careers in academics and industry. Students are exposed to a wide range of core and elective courses with in-depth syllabi, combined with specialized research which culminates in a thesis. Such an excellent combination provides the students the breadth and depth knowledge necessary for pursuing highly productive careers in academics as well as in industry.

Areas of Specializations

The department currently has 3 identified areas of growth. These 3 areas and some of their sub-areas of research are mentioned below:

- **Wireless, Mobile Computing and Networking**: Internet of Things, Mobile Sensing, Cyber Physical Systems, Wireless Sensor Networks, Wireless Networks.
- **Data Science and Engineering**: Data Mining, Machine Learning, Mobile Data Management, Data Analytics. Big Data.
- **Security and Privacy**: Network Security, Information Security, Cyber Security, Cryptography.

Programme Structure

Students entering this programme will have to complete 48 credits in 2 years that will comprise of coursework, and a research thesis.

The coursework comprises of (a) **Core Courses**: 16 credits, and (b) **Elective Courses**: 16 credits.

Research Thesis: 16 credits.

Semester 1 (12 credits)

	Course Code	Course Title	L T P C
1.	CSD655	Advanced Operating Systems	3 0 1 4
2.	CSD631	Advanced Programming Techniques and Algorithm Design	3 0 1 4
3.	CSD650	Advanced Probability and Statistics	3 1 0 4

Semester 2 (12 credits)

	Course Code	Course Title	L T P C
1.	CSD644	Advanced Computer Networks	3 0 1 4
2.		Elective 1	3 0 1 4
3.		Elective 2	3 0 1 4

Semester 3 (12 credits)

	Course Code	Course Title	L T P C
1.		Elective 3	3 0 1 4
2.		Elective 4	3 0 1 4
3.		Thesis	4 0 0 4

Semester 4 (12 credits)

	Course Code	Course Title	L T P C
1.		Thesis	12 0 0 12

Computer Science Engineering

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: Wireless Sensor Networks**

II. **COURSE CODE (PLEASE CROSS-LIST IF APPLICABLE): CSD 647**

III. **COURSE CREDITS (L:T:P): 3:0:1**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 5**

V. **NO. OF BATCHES: 1 (Seats limited to 40)**

VI. **COURSE TYPE (MAJOR/UWE/CCC/REAL/VELS/IC), PLEASE MENTION ALL THAT APPLIES & WRITE CREDITS FOR EACH ONE: Major (Elective)**

VII. **PREREQUISITE/S (IF ANY): At the discretion of the instructor**

VIII. **COURSE COORDINATOR/INSTRUCTOR(S): Divya Lohani**

IX. **SCHOOL/ DEPARTMENT: SoE/ CSE**

X. **DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: CSE**

XI. **COURSE CONTENT:** This course will provide an overview of wireless sensor networks and will cover a wide range of topics including node architecture, operating systems, Medium Access Control, routing protocols, time synchronization, localization, energy management, programming abstractions, mobility, and applications.

XII. **RECOMMENDED BOOK(S):**

- Holger Karl & Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley, 2005.
- Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
- Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, and Applications”, John Wiley, 2007.

XIII. **ASSESSMENT SCHEME:**

Evaluation Scheme	Weightage
Midterm	20%
Endterm	40%
Laboratory/Assignments	15%
Project	25%

SHIV NADAR UNIVERSITY

POSTGRADUATE COURSE PROPOSAL

I. COURSE TITLE: Wireless and Mobile Systems

II. COURSE CODE (PLEASE CROSS-LIST IF APPLICABLE): CSD 637

III. COURSE CREDITS (L:T:P): 2:0:1

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4

V. NO. OF BATCHES: 1 (Seats limited to 40 on a first cum first serve basis)

VI. COURSE TYPE (MAJOR/UWE/CCC/REAL/VELS/IC), PLEASE MENTION ALL THAT APPLIES & WRITE CREDITS FOR EACH ONE: Major (Elective**)**

VII. PREREQUISITE/S (IF ANY): Computer Networks, OOP in Java

VIII. COURSE COORDINATOR/INSTRUCTOR(S): Debopam Acharya

IX. SCHOOL/ DEPARTMENT: SoE/ CSE

X. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: CSE

XI. COURSE CONTENT: This course deals with the basics of cellular concept and mobile communication systems, multiple radio access procedures and channel allocation techniques, the architecture and functioning of satellite systems including global positioning systems, different wireless LAN technologies and personal area networks with an emphasis on Bluetooth networks. Laboratories will include mobile application development for cellular phones.

XII. RECOMMENDED BOOK(S):

Introduction to Wireless and Mobile Systems, by D.P. Agrawal and Q. Zeng. By Cengage Learning

XIII.ASSESSMENT SCHEME:

Midterm	20%
Endterm	40%
Class Participation	10%
Laboratory	20%
Assignments	10%

SHIV NADAR UNIVERSITY

POSTGRADUATE COURSE PROPOSAL

I. COURSE TITLE: Performance modelling of Computer Communication networks

II. COURSE CODE: CSD643

III. COURSE CREDITS (L:T:P): 3:0:0

IV. TOTAL CONTACT HOURS/ WEEK (L:T:P): 3:0:0

V. COURSE TYPE (MAJOR/UWE/CCC): Major

VI. PREREQUISITE/S (IF ANY): Computer networks and probability theory

VII. COURSE COORDINATOR(S)/INSTRUCTOR(S): Rajeev Kumar Singh/Karmeshu

VIII. SCHOOL/ DEPARTMENT: SOE / CSE

IX. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: All

X. COURSE CONTENT: Review of Probability ,Elements of stochastic process ;Markov Process; The Poisson process ; The Queuing Paradigm; The M/M/1 Queuing system; Little's law; Burke's Theorem; M/M/1/N and M/M∞ systems; Network of Queues; Real world examples.

XI. RECOMMENDED BOOK(S):

Text Books:

1. Robertazzi T.G., "Computer Networks and Systems" Springer, 3rd Edition, 2000.

2. Performance Modeling and Design of Computer Systems: Queueing Theory in Action-Mor-Harchol Balter –Cambridge university press-2013.

References:

1. K.S. Trivedi, "Probability and Statistics, with Reliability, Queuing and Computer Science Applications", Wiley, 2nd edition.
2. Jain, R., "The Art of Computer Systems Performance Analysis", J. Wiley Sons, 1991
3. Bertsekas D. and Gallager R. "Data Networks" Prentice Hall, 2nd Edition, 1992

XII. ASSESSMENT SCHEME:

Homework: 15%,
Quiz: 10%
One mid-semester exam: 20%,
Paper presentation: 15%
Final exam: 40%.

SHIV NADAR UNIVERSITY

POSTGRADUATE COURSE PROPOSAL

I. **COURSE TITLE: Information Theory**

II. **COURSE CODE (PLEASE CROSS-LIST IF APPLICABLE):** CSD 644

III. **COURSE CREDITS (L:T:P): 3:0:0**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:0:0**

V. **NO. OF BATCHES: 1**

VI. **COURSE TYPE (MAJOR/UWE/CCC/REAL/VELS/IC), PLEASE MENTION ALL THAT APPLIES & WRITE CREDITS FOR EACH ONE: UWE**

VII. **PREREQUISITE/S (IF ANY):** Probability theory is a prerequisite for this course. Since such a course has not been offered to CS students, this prerequisite will be taught in the course. However the student must be be able to grasp the prerequisite sufficiently quickly, as well as have strong mathematical skills, in order to follow the main course material. Students intending to register for the course expected to meet the instructor beforehand to determine whether they can handle the course material.

VIII. **COURSE COORDINATOR/INSTRUCTOR(S): Shashi Prabh**

IX. **SCHOOL/ DEPARTMENT: SoE/ CSE**

X. **DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: CS, ECE, EE**

XI. **COURSE CONTENT:** Relevant probability theory basics. Concept of information, entropy, entropy rate, source coding theorem, data compression, channel capacity, Gaussian channels, multiple access channels, broadcast channels and Kolmogorov complexity.

XII. **RECOMMENDED BOOK(S): Thomas M. Cover, Joy A. Thomas. E*lements of Information Theory*, 2nd Edition, Wiley 2006. ISBN: 978-0-471-24195-9**

XIII. **ASSESSMENT SCHEME:**

- **Assignments: 20%**
- **Project: 20%**
- **Mid-term exam: 25%**
- **Final exam: 35%**

School of Engineering

Department of Mechanical Engineering

M.Tech Program

The department of Mechanical Engineering in the School of Engineering at Shiv Nadar University (SNU) invites applications for admissions to its M.Tech Program.

About the Programme

The Master of Technology (M.Tech) in **Design Engineering** [Department of Mechanical engineering] is a postgraduate program at SNU. Students entering this program will be awarded the M.Tech degree on successful completion of 52 credits in 2 years.

Objectives of the Programme

This educational program has been started to address the demands of the modern industry. We at Mechanical Engineering Department (SNU) are well- aware of the fact that today's graduates must have the knowledge of the actual state of the industry, its culture and the complex interactive management and operating systems which are based on value-added efforts, team performance and result-oriented leadership.
Mechanical Engineering Department is offering M.Tech program in Design Engineering.
The Master's Program students are required to complete 24 classroom credit hours, 6 laboratory credit hours and an industrial research thesis of 25 credit hours. The thesis is designed to provide a platform for the students to demonstrate competencies in learned methodologies and acquired skills to enhance real-time performance. The Program will inculcate the skills and ability in the students to effectively fulfill the requirements of positions as Design Engineers, Stress Analyst, and Scientist in various R&D industries and Research laboratories too.

Specializations available in the department:

Design Engineering

Programme Structure

Students entering this program will have to complete 52 credits in 2 years that will comprise of coursework and a research thesis.
The semester wise program structure is mentioned below:

M.Tech. (Design Engineering)

SEMESTER-I

Course No.	Course Name	L	T	P	C
MAXXX	Designing with Advanced Materials	3	0	0	3
MEDXXX	Advanced Mechanics of Solids	2	0	1	3
MEDXXX	Modelling and Simulation	1	0	2	3
MEDXXX	Research Methodology	1	0	2	3
		9	**0**	**6**	**12**

SEMESTER-II

Course No.	Course Name	L	T	P	C
MEDXXX	Advanced Machine Design	3	0	0	3
MEDXXX	Finite Element Method	3	0	0	3
MEDXXX	Dynamics and Vibration	3	0	0	3
MEDXXX	Elctive-2	3	0	0	3
MEDXXX	Elctive-3	3	0	0	3
		15	**0**	**0**	**15**

SEMESTER-III

Course No.	Course Name	L	T	P	C
MEXXX	Dissertation –I	0	0	10	10
		0	**0**	**10**	**10**

SEMESTER-IV

Course No.	Course Name	L	T	P	C
MEXXX	Dissertation- II	0	0	15	15
		0	**0**	**15**	**15**

List of Electives

Advanced CAD
Advanced Vibration
Vibration and Acoustics
Reliability and Fault Diagnostics
Continuum Mechanics
Mechatronics

Mechanical Engineering

SHIV NADAR UNIVERSITY

GRADUATE COURSE PROPOSAL

I. **COURSE TITLE: Operation Research (OR)**

II. **COURSE CODE: MED 506**

III. **COURSE CREDITS (L:T:P):**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 2:1:0**

V. **NO. OF BATCHES:**

VI. **COURSE TYPE (MAJOR/UWE/CCC/REAL/VELS/IC), PLEASE MENTION ALL THAT APPLIES: Major**

VII. **PREREQUISITE/S (IF ANY):**

VIII. **COURSE COORDINATOR/INSTRUCTOR(S): Dr. Divya Pandey**

IX. **SCHOOL/ DEPARTMENT: SOE/ Mechanical Engg.**

X. **DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: Mechanical**

XI. **COURSE CONTENT:**

- **a.** Introduction to OR
- **b.** Linear programming (Algebraic method, Graphical method, Simplex method, Linearity Conditions, Duality)
- **c.** Assignment problem
- **d.** Transportation problem
- **e.** Queuing theory
- **f.** Game theory
- **g.** Goal Programming
- **h.** PERT/CPM

XII. RECOMMENDED BOOK(S): Hira & Gupta, R.K Gupta, Hiller and Liberman

XIII. ASSESSMENT SCHEME:

Lab assignments/class participation	Minor	Major
20	40	40

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: ADVANCED REFRIGERATION AND AIRCONDITIONING**

II. **COURSE CODE: MED305**

III. **COURSE CREDITS (L:T:P): 3 0 1**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):**

V. **NO. OF BATCHES:**

VI. **COURSE TYPE (MAJOR/UWE/CCC/REAL/VELS/IC), PLEASE MENTION ALL THAT APPLIES:**

VII. **PREREQUISITE/S (IF ANY): THERMODYNAMICS**

VIII. **COURSE COORDINATOR/INSTRUCTOR(S): NITIN D. BANKER,**

a. Nitin.banker@snu.edu.in, **Ph no.: 0120-3819100, ext-289**

IX. **SCHOOL/ DEPARTMENT: SCHOOL OF ENGINEERING, MECHANICAL ENGINEERING**

X. **DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: MECHANICAL**

XI. **COURSE CONTENT:**

a. VAPOUR COMPRESSION REFRIGERATION SYSTEMS, VAPOUR ABSORPTION REFRIGERATION SYSTEMS, COMPRESSORS, CONDENSERS, EVAPORATORS, EXPANSION DEVICES, REFRIGERANTS, HEAT PUMP, PSYCHROMETRY, PSYCHROMETRY PROCESSES, PSYCHROMETRY OF AIR CONDITIONING SYSTEMS, EVAPORATIVE, WINTER AND ALL YEAR AIR CONDITIONING SYSTEMS

XII. **RECOMMENDED BOOK(S):**

a. **C.P. ARORA**
b. **J.K. GUPTA and R.S. KHURMI**
c. **R.K. RAJPUT**
d. **WILBERT STOECKER**
e. **A.R. TROTT and T.WELCH**

XIII. **ASSESSMENT SCHEME:**

a. **MID TERM (25 MARKS)**
b. **FINAL EXAM (45 MARKS)**
c. **LAB EXAM (30 MARKS)**

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: Conduction and Convective Heat Transfer**

II. **COURSE CODE (PLEASE CROSS-LIST IF APPLICABLE): MED502**

III. **COURSE CREDITS (L:T:P): 3:0:0**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:0:0**

V. **NO. OF BATCHES: 1**

VI. **COURSE TYPE (MAJOR/UWE/CCC/REAL/VELS/IC), PLEASE MENTION ALL THAT APPLIES & WRITE CREDITS FOR EACH ONE: MAJOR**

VII. **PREREQUISITE/S (IF ANY): Thermodynamics**

VIII. **COURSE COORDINATOR/INSTRUCTOR(S): Dr. Nitin D. Banker**

IX. **SCHOOL/ DEPARTMENT: School of Engineering, Mechanical**

X. **DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST:**

a. **Mechanical**

XI. **COURSE CONTENT:**

a. **Basic of heat transfer; Steady and Unsteady heat conduction; Numerical methods in heat conduction; Forced convection; Natural convection.**

XII. **RECOMMENDED BOOK(S):**

1 **Heat and Mass Transfer by Yunus A. Cengel, Afshin J. Ghajar**
2 **Heat and Mass Transfer by P K Nag**
3 **Fundamentals of Heat and Mass Transfer by Lavine, Incropera, Dewitt, Bergmann**
4 **Heat and Mass Transfer by R.K. Rajput**

XIII. **ASSESSMENT SCHEME:**

a. **Mid Term- 25%**
b. **Project- 30%**
c. **Final Term- 45%**

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: Solar Energy Systems**

II. **COURSE CODE (PLEASE CROSS-LIST IF APPLICABLE): MED503**

III. **COURSE CREDITS (L:T:P): 3:0:0**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:0:0**

V. **NO. OF BATCHES: 1**

VI. **COURSE TYPE (MAJOR/UWE/CCC/REAL/VELS/IC), PLEASE MENTION ALL THAT APPLIES & WRITE CREDITS FOR EACH ONE: Major**

VII. **PREREQUISITE/S (IF ANY): Thermodynamics, Heat and Mass Transfer**

VIII. **COURSE COORDINATOR/INSTRUCTOR(S): Dr. Harender and Dr. Nitin D. Banker**

IX. **SCHOOL/ DEPARTMENT: School of Engineering, Mechanical**

X. **DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST:**

a. **Mechanical**

XI. **COURSE CONTENT:**

a. **Introduction; Solar collectors; Solar thermal energy systems; Solar refrigeration systems; Solar power plant.**

XII. **RECOMMENDED BOOK(S):**

a. **Solar energy by H.P. Garg and J. Prakash**
b. **Solar energy by S.P. Sukhatme**
c. **Solar thermal engineering by P.J. Lunde**
d. **Solar energy by J.S. Hsieh**
e. **Solar thermal engineering systems by G.N. Tiwari and S. Suneja**

XIII. **ASSESSMENT SCHEME:**

a. **Mid Term- 25%**
b. **Project- 30%**
c. **Final Term- 45%**

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: ADVANCED ENGINEERING THERMODYNAMICS

II. COURSE CODE : MED 507

III. COURSE CREDITS (L:T:P): 3:0:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):

V. COURSE TYPE (Core/Elective): CORE

VI. PREREQUISITE/S (IF ANY): ENGINEERING THERMODYNAMICS

VII. SCHOOL/ DEPARTMENT: MED

VIII. COURSE CONTENTS & SYLLABUS

a. Review of first and second law of thermodynamics, Maxwell equations, Joule-Thompson experiment, irreversibility and availability, exergy analysis, phase transition, types of equilibrium and stability, multi-component and multi-phase systems, equations of state, chemical thermodynamics, combustion. Third law of thermodynamics, Kinetic theory of gases- introduction, basic assumption, molecular flux, equation of state for an ideal gas, collisions with a moving wall, principle of equipartition of energy, classical theory of specific heat capacity. Transport phenomena-intermolecular forces, The van der Waals equation of state, collision cross section, mean free path, Statistical thermodynamics introduction, energy states and energy levels, macro and microscales, thermodynamic probability, B-E, F-D, M-D statistics, distribution function, partition energy, statistical interpretation of entropy, application of statistics to gases-mono-atomic ideal gas.

IX. EVALUATION SCHEME:

a. Class Participation 10%
b. Mid-Term 30%
c. Final 60%

X. RECOMMENDED READING(S):

1. Bejan, Advanced Engineering Thermodynamics, 3rd edition, John Wiley and sons, 2006.
2. F.W.Sears and G. L. Salinger, Thermodynamics, Kinetic Theory and Statistical Thermodynamics, Narosa Publishing House, New Delhi, 3rd edition, 1998.
3. M.J.Moran and H.N.Shapiro, Fundamentals Of Engineering Thermodynamics, John Wiley and Sons.
4. M. W. Zemansky and R. H. Dittman, Heat and Thermodynamics, Mc Graw Hill International Editions, 7th edition, 2007.
5. I. K. Puri and K. Annamalai, Advanced Engineering Thermodynamics, CRC Press, 2001.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Advanced Numerical Computing

II. COURSE CODE (PLEASE CROSS-LIST IF APPLICABLE): MED 510

III. COURSE CREDITS (L:T:P): 2:0:1

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 2: 0: 3

V. COURSE TYPE (Core/Elective): Elective

VI. PREREQUISITE/S (IF ANY):NA

VII. SCHOOL/ DEPARTMENT: SoE/ Department of Mechanical Engineering

VIII. COURSE CONTENT & SYLLABUS:

- Practice Session on MATLAB and MATHEMATICA Software. Curve fitting and Data handling in MATLAB.
- Linear Equations and Non-linear Equations; finding roots of polynomial by MATLAB and MATHEMATICA
- Solving Linear Systems: Gauss Elimination, Gauss-Jordan; LU Decomposition; Implementation in MATLAB and MATHEMATICA
- Solving Linear System with iterative methods: Jacobi method, Gauss-Seidel Method; Implementation in MATLAB and MATHEMATICA
- Numerical Integration: Trapezoid Rule, Simpson's Rule, Gaussian Quadrature; Implementation in MATLAB and MATHEMATICA
- Interpolation and Extrapolation Techniques
- Ordinary Differential Equations: Runge-Kutta Method, Predictor-Corrector Method; Implementation in MATLAB and MATHEMATICA
- Partial Differential Equations: Model Problems, Finite Difference Method, Numerical Stability

Case studies of various models from engineering through the use of MATLAB.

IX. EVALUATION SCHEME:

Assignments: 20%
Lab Exam: 20 % (total)
Midterm Exam 30 %
Final Exam 30 %

X. RECOMMENDED READING(S):

1. Laurene V. Fausett "Applied Numerical Analysis using MATLAB", Pearson.
2. Santosh K Gupta, “Numerical Methods for Engineers”, New Age International Publishers.
3. Rudra Pratap“Getting Started with MATLAB: A Quick Introduction for Scientist and Engineers”, Oxford University Press.
4. Edward B. Magrab "An Engineer's Guide to Mathematica ", Wiley.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Fracture Mechanics

II. COURSE CODE (PLEASE CROSS-LIST IF APPLICABLE): MED 512

III. COURSE CREDITS (L:T:P): 2:0:1

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 2:0:3

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY):Statics and Dynamics, Mechanics of Deformable Bodies, Machine Design, Finite Element Method (Desirable)

VII. SCHOOL/ DEPARTMENT: SoE/ Department of Mechanical Engineering

VIII. COURSE CONTENT:

- **Introduction:** Fundamentals of the Theory of Elasticity and Indicial Notations; The birth of fracture mechanics, Modes of loading, Classification as LEFM and EPFM, Fracture Toughness Parameters.
- **Elastic Crack Model:** Energy release rate, Resistance, Griffith Theory of fracture, Extension of Griffith Theory by Irwin, Stress and Displacement fields in the very near and near-tip fields, Westergaard, Williams and Generalized Westergaard solutions, Crack-tip Stress and Displacement Fields, Necessary and sufficient conditions for fracture. Stress Intensity Factor, Equivalence between SIF and G, Various methods for evaluating Stress Intensity Factors.
- **Plastic Crack Model:** Modeling plastic zone at the crack-tip, Irwin and Dugdale models, J-Integral and Crack Tip Opening Displacement, HRR field.
- **Crack Growth and Fatigue:** Fracture toughness testing, Paris law, Mixed-mode fracture, Crack arrest methodologies.
- **Advance Topics:** Fracture in bi-materials and composites, FEM modelling of Fracture problems, Quarter point elements, Partition of Unity based computational methods for fracture modelling, Virtual crack closure technique, Domain based Interaction Integral, Experimental Methods for Fracture Toughness.

IX. EVALUATION SCHEME:

Quiz 10 %
Presentation 10%
Lab Assignment: 10%

Lab Report 10%
Viva 10%
Midterm Exam 20 %
Endterm Exam 30 %

X. RECOMMENDED BOOK(S):

5. Prashant Kumar, Elements of Fracture Mechanics, McGraw Hill Education (India) Private Limited; 1 edition, 2009.
6. T.L. Anderson, Fracture Mechanics - Fundamentals and Applications, 3rd Edition, Taylor and Francis Group, 2005.
7. CT Sun, ZH Jin, Fracture Mechanics, Academic Press Inc, 2011.
8. Meinhard Kuna, Finite Elements in Fracture Mechanics: Theory - Numerics - applications (Solid Mechanics and its Applications), Springer; Softcover reprint of the original 1st ed. 2013 edition.
9. Vijay G Ukadgaonker, Theory of Elasticity and Fracture Mechanics, PHI Eastern Economy Edition, 2015.

XI. RECOMMENDED JOURNAL(S):

1. International Journal Of Fracture (Springer)
2. Engineering Fracture Mechanics (Elsevier)
3. International Journal of Fatigue (Elsevier)
4. International Journal of Numerical Methods in Engineering (Wiley)

SHIV NADAR UNIVERSITY

GRADUATE COURSE PROPOSAL

I. COURSE TITLE: Advanced Material Science

II. COURSE CODE: MED 513

III. COURSE CREDITS (L:T:P): 2:0:1

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 4

V. NO. OF BATCHES: 01

VI. COURSE TYPE (MAJOR/UWE/CCC/REAL/VELS/IC), PLEASE MENTION ALL THAT APPLIES:

VII. PREREQUISITE/S (IF ANY): None

VIII. COURSE COORDINATOR/INSTRUCTOR(S): Dr. Harpreet Singh Arora

IX. SCHOOL/ DEPARTMENT: SoE/ Department of Mechanical Engineering

X. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST:

a. **Mechanical Engineering, Civil Engineering, Chemical Engineering, Physics**

XI. COURSE CONTENT:

1. **Basic Concepts in Material Science**
   Crystal Geometry and structure, Chemical bonding, Phase diagrams
2. **Phase Transformations**
   Time scale for phase change, Nucleation and Growth, Nucleation and Kinetics, Applications
3. **Plastic Deformation of Crystalline Solids**
   Lattice defects, Deformation by slip, Slip in perfect crystal, Slip by dislocation movement, critical resolved shear stress for slip
4. **Dislocation Theory**
   Observation of dislocations, Burgers vector and dislocation loops, stress fields and energies of dislocation, forces on dislocations, forces between dislocations, dislocation climb, intersection of dislocations, Jogs, Dislocation sources, dislocation multiplication, Dislocation pile-ups.
5. **Strengthening Mechanisms**

Introduction, Grain boundaries and deformation, strengthening from grain boundaries, Low angle grain boundaries, Yield point phenomenon, Solid Solution strengthening, Strengthening from fine particles, Strain hardening, Bauschinger effect

6. **Advanced Materials**
   Metallic Glasses, Glass forming ability, Inoue criteria, Mechanical behavior, High entropy alloy (HEAs), Alloy formation rules.

XI. RECOMMENDED BOOK(S):

1. Material Science and Engineering- An Introduction; William D. Callister
2. Material Science and Engineering; V. Raghavan
3. Mechanical Metallurgy; George E. Dieter
4. Bulk Metallic Glasses; C. Suryanarayana and A. Inoue

XII. RECOMMENDED JOURNALS:

1) Scripta Materilia
2) Acta Materilia
3) Metallurgical and Materials Transactions A
4) Metallurgical and Materials Transactions B
5) Material Science and Engineering A
6) Applied Surface Science

XIII. ASSESSMENT SCHEME:

Term Paper (15%)
Presentations (15%)
Mid-term (30%)
End-term (40%)

SHIV NADAR UNIVERSITY

GRADUATE COURSE PROPOSAL

I. **COURSE TITLE: Advanced Tribology**

II. **COURSE CODE: MED 514**

III. **COURSE CREDITS (L:T:P): 3:0:0**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3**

V. **NO. OF BATCHES: 01**

VI. **COURSE TYPE (MAJOR/UWE/CCC/REAL/VELS/IC), PLEASE MENTION ALL THAT APPLIES:**

VII. **PREREQUISITE/S (IF ANY): None**

VIII. **COURSE COORDINATOR/INSTRUCTOR(S): Dr. Harpreet Singh Grewal**

IX. **SCHOOL/ DEPARTMENT: SoE/ Department of Mechanical Engineering**

X. **DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST:**

a. **Mechanical Engineering, Civil Engineering, Chemical Engineering, Physics**

XI. **COURSE CONTENT:**

a. Introduction to Tribology: Background and meaning of tribology, application and importance of tribology for different industries, multi-disciplinary nature, economic aspects of tribology

b. Surfaces and Contacts: Surface characterization, physio-chemical layer, surface energy and its tribological aspects, contact between solids, contact models, real and apparent contact area, Greenwood-Williamson model, effect of sliding on contact, characterization of particles.

c. Friction: Genesis of friction, laws of friction, friction mechanisms, sliding and rolling friction, influence of important variables, friction of metals and non-metals, stick–slip phenomenon, thermos-elastic instability.

d. Wear: wear modes, major wear mechanisms- adhesive, abrasive, erosive, fatigue wear, minor wear mechanisms – fretting, impact, diffusive wear, controlling parameters, contribution of corrosion and oxidational wear, Tribo-corrosion, wear maps, wear of non-metallic materials (ceramics, polymers), break-in behavior and wear transition.

e. Testing, modeling and simulation: Testing configurations, Instrumentation, Influences of test parameters, statistical analysis, different modeling and simulation approaches, friction and wear models, limitation of the modeling strategies.

f. Surface Protection: use of coatings and surface treatments for protection from wear, coating techniques, characterization of coatings, and failure modes.

g. Lubrication:

h. Physical properties of lubricants, types of lubricants and their characteristics, Lubricant additives, Hydrostatic and hydrodynamic lubrication, Reynolds equation, bearing parameters, boundary and extreme pressure lubrication, solid-film lubrication.

XII. RECOMMENDED BOOK(S):

[1] G. Stachowiak and A. W. Batchelor, *Engineering Tribology,* Butterworth-Heinemann (2013)
[2] Kenneth G. Budinski, *Guide to Friction, Wear and Erosion Testing*, ASTM International (2007)
[3] B. Bhushan, *Principles and Applications of Tribology*, Wiley (2013)
[4] P. Sahoo, *Engineering Tribology*, Prentice-Hall India (2005)
[5] B. Bhushan, *Handbook of Micro/Nano Tribology*, CRC Press (1998)
[6] M.M. Khonsari and E. R. Booser, *Applied Tribology: Bearing Design and Lubrication*, Wiley (2008)

XIII. RECOMMENDED JOURNALS:

7) Wear
8) Tribology International
9) Tribology Letters
10) Journal of Tribology
11) Applied Surface Science
12) Surface Coatings and Technology

XIV. ASSESSMENT SCHEME:

Term Paper (15%)
Presentations (15%)
Mid-term (30%)
End-term (40%)

SHIV NADAR UNIVERSITY

UNDERGRADUATE COURSE PROPOSAL

I. COURSE TITLE: Operations Planning and Control

II. COURSE CODE (PLEASE CROSS-LIST IF APPLICABLE): MED 504

III. COURSE CREDITS (L:T:P): 3:0:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3

V. NO. OF BATCHES:1

VI. COURSE TYPE (MAJOR/UWE/CCC/REAL/VELS/IC), PLEASE MENTION ALL THAT APPLIES & WRITE CREDITS FOR EACH ONE: Major

VII. PREREQUISITE/S (IF ANY): NO

VIII. COURSE COORDINATOR/INSTRUCTOR(S): Dr. Divya Shrivastava

IX. SCHOOL/ DEPARTMENT: SOE/ Mechanical

X. DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST: Mechanical,

XI. COURSE CONTENT: PRODUCTION Planning and control

- **Introduction to Industrial Engineering:** History, Definition, product/process strategy, trend in IE, Scope of IE, Productivity, Efficiency and Effectiveness.
- **Work Study:** Scope, Work Measurement and Method Study, Standard Data, Ergonomics and Its Industrial Applications.
- **Introduction to Production Planning and Control**
- **Forecasting Technique:** Simple Average Method, Moving Average Method, Weighted Moving Average, Exponential Smoothing method, Linear Regression method, Holt's Method, Seasonality model, Winter's Model, Auto Regressive Model, Goodness of Fit measures.
- **Aggregate Production Planning:** Introduction, Tabular method, Linear programming model, Transportation Model, Production cost estimation.
- **Inventory Control:** Scope, purchasing and storing, Economic Oder quantity model With and Without Backordering; Economic Batch Model With and Without Backordering, Quantity Discount Model, Selective Inventory- ABC, VED, FSN Model.
- **Material Requirement Planning:** Introduction, Dependent Vs independent Demand, Master production Schedule, Bill of Material (BOM), MRP logic, Lot by Lot model, Fixed Order Quantity Model, Periodic Order Quantity Model.

- **Production Sequencing and Scheduling:** Introduction, n jobs–single machine sequencing, n jobs-parallel machine sequencing, Flow shop sequencing, Job Shop scheduling, SPT rule, EDD rule, Jonhsons's rule, Branch –Bound technique, Gantt chart
- **Introduction to Statistical Quality Control**
- **Introduction to Supply Chain Management**

XII. RECOMMENDED BOOK(S):

S.No.	Title	Author
1	Modern Production / Operations Management	E.S. Buffa, and R.K. Sarin, , John Wiley & Sons
2	Industrial Engineering and Management	Ravi Shankar
3	Industrial Engineering and Management	O.P. Khanna
4	Industrial Engineering and Management	C.Natha Muhi Reddy
5	Specifications of Industrial Engineering and Management: A New Perspective	Philip E Hicks
6.	Quantitative Models in Operations and SCM	G. Srinivasan
7.	Statistical Quality Control	Douglas C. Montgomery

XIII. ASSESSMENT SCHEME:

Assignments/class participation/ Cases /Hands-on exercises	Project	Minor	Major
10 %	20	30 %	40 %

SHIV NADAR UNIVERSITY

GRADUATE COURSE PROPOSAL

I. **COURSE TITLE:** Advanced Numerical Computing

II. **COURSE CODE (PLEASE CROSS-LIST IF APPLICABLE):** MED510

III. **COURSE CREDITS (L:T:P):** 2:0:1

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 2:0:2

V. **COURSE TYPE (MAJOR/UWE/CCC/REAL/VELS/IC), PLEASE MENTION ALL THAT APPLIES & WRITE CREDITS FOR EACH ONE:** Elective

VI. **PREREQUISITE/S (IF ANY):NA**

VII. **COURSE COORDINATOR/INSTRUCTOR(S):** Dr. Ramesh Gupta & Dr. Himanshu Pathak

VIII. **SCHOOL/ DEPARTMENT:** SoE/ Department of Mechanical Engineering

IX. **DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST:** All branches of engineering, Physics and Mathematics

X. **COURSE CONTENT:**

- Practice Session on MATLAB and MATHEMATICA Software. Curve fitting and Data handling in MATLAB.
- Linear Equations and Non-linear Equations; finding roots of polynomial by MATLAB and MATHEMATICA
- Solving Linear Systems: Gauss Elimination, Gauss-Jordan; LU and QR Decomposition; Implementation in MATLAB and MATHEMATICA
- Solving Linear System with iterative methods: Jacobi method, Gauss-Seidel Method; Implementation in MATLAB and MATHEMATICA
- Numerical Integration: Trapezoid Rule, Simpson's Rule, Gaussian Quadrature; Implementation in MATLAB and MATHEMATICA
- Ordinary Differential Equations: Runge-Kutta Method, Predictor-Corrector Method; Implementation in MATLAB and MATHEMATICA

Case studies of various models from engineering through the use of MATLAB and MATHEMATICA.

XI. RECOMMENDED BOOK(S):

10. Laurene V. Fausett "Applied Numerical Analysis using MATLAB", Pearson.
11. Santosh K Gupta, “Numerical Methods for Engineers”, New Age International Publishers.
12. Rudra Pratap“Getting Started with MATLAB: A Quick Introduction for Scientist and Engineers”, Oxford University Press.
13. Edward B. Magrab "An Engineer's Guide to Mathematica ", Wiley.

XII. ASSESSMENT SCHEME:

Homework Assignments (monthly):	40 %
Midterm Project:	30 %
Final Project:	30 %

SHIV NADAR UNIVERSITY

GRADUATE COURSE PROPOSAL

I. **COURSE TITLE:** Computational Mechanics of Composite Structures

II. **COURSE CODE (PLEASE CROSS-LIST IF APPLICABLE):** MED511

III. **COURSE CREDITS (L:T:P):** 3:0:0

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):**

V. **COURSE TYPE (MAJOR/UWE/CCC/REAL/VELS/IC), PLEASE MENTION ALL THAT APPLIES & WRITE CREDITS FOR EACH ONE: Elective**

VI. **PREREQUISITE/S (IF ANY):** Strength of Materials

VII. **COURSE COORDINATOR/INSTRUCTOR(S):** Dr. Ramesh Gupta

VIII. **SCHOOL/ DEPARTMENT:** SoE/ Department of Mechanical Engineering

IX. **DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST:** Mechanical, Civil and Mathematics

X. **COURSE CONTENT:**

a. Introduction to composite materials, advantages and applications of composite materials, Macromechanics of lamina and laminate, Classical Lamination Plate theory (CLPT), First Order Shear Deformation Theory (FSDT), Micromechanics of lamina, Bending, buckling and vibration of laminated plates, Inter-laminar stresses, Delamination models, Composite tailoring, Introduction to design of composite structures and nano composites. Introduction to nonlinear analysis of composite structures, Geometric nonlinear analysis of plates.

XI. **RECOMMENDED BOOK(S):**

a. Jones, R. M., Mechanics of Composite Materials, Technomic Publication.
b. Herakovich, C.T., Mechanics of Fibrous Composites, John Wiley & Sons, Inc. New York, 1998.
c. Gibson, R. F., Principles of Composite Material Mechanics, CRC Press, 2nd Edition, 2007.
d. Reddy, J. N., Mechanics of Laminated Composite Plates and Shells – Theory and Analysis, CRC Press, 2nd Edition, 2004.

e. Twardowski, T. E., Introduction to Nanocomposite Materials: Properties, Processing, Characterization, Destech Publications, 2007.
f. Crisfield, M. A., Non-Linear Finite Element Analysis of Solids and Structures: Advanced topics, Volume 2, Wiley, 1997, (ISBN 047195649X).

XII. ASSESSMENT SCHEME:

a.	Assignments:	10%	
b.	Midterm Exam:	20%	
c.	Project/presentation	20%	
d.	Q&A	10%	
e.	Programs		10%
f.	Final Exam:	30%	
	Total	**100%**	

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE:** Energy and Variational Methods in Structural Mechanics

II. COURSE CODE : MED516

III. **COURSE CREDITS (L:T:P):** 3:0:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:0:0

V. COURSE TYPE (Core/Elective): Elective

VI. **PREREQUISITE/S (IF ANY):** Solid mechanics

VII. SCHOOL/ DEPARTMENT: Mechanical Engineering/SoE

VIII. COURSE CONTENT & SYLLABUS:

i. Vector calculus; curvilinear coordinates, covariant, contravariant vectors, Tensor analysis; deformation gradient tensor. Introduction to energy methods; concept of work and energy, principle of virtual work, principle of minimum potential energy, Raleigh Ritz method, Hamilton principle. Introduction to variational methods, weak form of governing equation, weighted residual method, Topics from variational calculus; the theory of the first variation, the canonical form of the euler equations and related topics, Application of Euler-Lagrange equations for the analytical solution of plates and shells

IX. EVALUATION SCHEME:

a.	Assignments		15%
b.	Presentations	20%	
c.	Midterm Exam	25 %	
d.	Final Exam		40 %
e.	Total	100 %	

X. RECOMMENDED READING(S):

XI. J. N. Reddy, Energy principles and Variational Methods in Applied Mechanics, Wiley, ISBN: 978-0-471-17985-6

XII. Toshio Mura, Variational Methods in Mechanics, Oxford University Press, ISBN: 9780195068306

XIII. Irving Herman Shames, Clive L. Dym, Energy and Finite Element Methods in Structural Mechanics, New Age International, ISBN: 9788122407495

XIV. I. M. Gelfand, S. V. Fomin, Calculus of Variations, Dover Books on Mathematics, ISBN: 9780486135014

XV. Hans Sagan, Introduction to the Calculus of Variations, Dover Books on Mathematics, ISBN: 9780486138022

SHIV NADAR UNIVERSITY

UNDERGRADUATE COURSE PROPOSAL

I. **COURSE TITLE:** Finite Element Method in Engineering

II. **COURSE CODE:** CED 623

III. **COURSE CREDITS (L:T:P):** 3:0:0

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 3:0:0

V. **NO. OF BATCHES:** 1

VI. **COURSE TYPE (MAJOR/UWE/CCC/REAL/VELS/IC), PLEASE MENTION ALL THAT APPLIES:** Major Elective, IC

VII. **PREREQUISITE/S (IF ANY):** Strength of Materials or equivalent

VIII. **COURSE COORDINATOR/INSTRUCTOR(S):** Dr. Ramesh Gupta

IX. **SCHOOL/ DEPARTMENT:** SoE, Mechanical Engineering Department

X. **DISCIPLINES TO WHICH THE COURSE MAY BE OF INTEREST:**

a. Mechanical, Civil, Electrical

XI. **COURSE CONTENT:**

a. Linear finite elements procedures in solid mechanics, convergence, isoparametric mapping and numerical Integration. Application of finite element method to Poisson equation, calculus of variations, weighted residual methods, introduction of constraint equations by Lagrange multipliers and penalty method, solution of linear algebraic equations, application of finite element method to linear elasto dynamics, solution of eigenvalue problems, mode superposition and direct time integration algorithms, finite element programming. Finite element analysis using FE software. Seminar and report preparation.

XII. **RECOMMENDED BOOK(S):**

XIII. Cook, R. D., Malkus, D. S., and Plesha, M.E., Concepts and Applications of Finite Element Analysis, 3rd Edition, John Wiley, 1989.

XIV. Bathe, K. J., Finite Element Procedures, Prentice Hall of India, 1982.

XV. Zienkiewicz, O.C., and Taylor, R.L., The Finite Element Method, Vol. 1 (The Basis), Butterworth-Heinemann, 2000.

XVI. Krishnamoorthy, C. S., Finite Element Analysis (theory and programming), 2nd Edition, Tata McGraw-Hill Education, 1995.

XVII. ASSESSMENT SCHEME:

a.	Quiz/Assignments	20%
b.	Midterm Exam	30 %
c.	Final Exam	50 %
d.	Total	100 %

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE:** INDUSTRIAL LUBRICATION

II. **COURSE CODE :** MED 517

III. **COURSE CREDITS (L:T:P):** 2:1:0

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P):** 2:1:0

V. **COURSE TYPE (Core/Elective):** Elective

VI. **PREREQUISITE/S (IF ANY):** Fluid Mechanics at Undergraduation Level

VII. **SCHOOL/ DEPARTMENT:** SoE/ Mechanical Engineering Department

VIII. **COURSE CONTENT & SYLLABUS:**

S. No.	Descriptions		No. of Lect. Hours (30)
Unit 1	Industrial Lubricants and Their Additives	Introduction, Functions of lubricants, types of lubricants and their industrial uses; Solid lubricants and their functions, liquid mineral lubricants, synthetic liquid lubricants, greases, properties of liquid and grease lubricants, viscosity, Newtonian and Non-Newtonian lubricants, temperature and pressure dependence measurement, other properties of lubricants; Lubricant additives, general properties and selection for machines and processes; Oil reclamation and preventive maintenance for lubricants.	**04**
Unit 2	Fluid-Film Lubrication:	Fluid mechanics concepts, equations of continuity and motion; Generalized Reynold's equation with incompressible lubricants; Hydrodynamic lubrication, Tower's experiment, finite bearings, partial journal bearings, solution of finite bearings using FEM.	**08**
Unit 3	Dynamically loaded journal bearings:	Solution of the generalized Reynold's equation for infinite and short bearing, load carrying capacity, Sommerfield Number, Hydrostatic lubrication-- basic concepts, applications, compensated thrust and journal bearings and their solution using FEM, controlling flow with restrictors, design of restrictors for compensated bearings.	**08**
Unit 3	Bearing Design and Selection of Bearings	Comparative performance of various modes of lubrication, and bearing selection; Design of hydrostatic thrust bearing, fixed type hydrodynamic and hydrostatic journal bearings, materials for sliding bearings; Bearing types, selection of rolling elements bearing, bearing life, bearing load, bearing selection.	**10**

IX. **EVALUATION SCHEME:**

Mid Term Examination:	25%

Presentation	15%
End Term Exam:	60%

X. RECOMMENDED READING(S):

1. Conner, J.J. and Boyd, J., "Standard Handbook of Lubrication Engineering", McGraw Hill. 1968

2. Stachowiak, G. and A W Batchelor, A. W., "Engineering Tribology", 3rd Ed, Butterworth-Heinemann. 2005

3. Khonsari, M. M. and Booser, E. R., "Applied Tribology: Bearing Design and Lubrication", 2nd Ed, Wiley. 2008

4. Kudish, I. I. and Covitch, M. J., "Modeling and Analytical Methods in Tribology", Chapman and Hall/CRC. 2010

5. Bhushan, B., "Principles and Applications of Tribology", Wiley. 1999

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. **COURSE TITLE: Nanomaterials - Synthesis, Properties and Applications**

II. **COURSE CODE : MED 501**

III. **COURSE CREDITS (L:T:P): 3 (3:0:0)**

IV. **TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3 hrs**

V. **COURSE TYPE (Core/Elective): Core**

VI. **PREREQUISITE/S (IF ANY):**

VII. **SCHOOL/ DEPARTMENT: SOE and SNS (All Department)**

VIII. **COURSE CONTENT & SYLLABUS:**

This course is aimed at providing various concepts of nanosized materials. In this course we focus on various physical and chemical approaches including both the bottom-up and the top-down methods for the synthesis of nanostructured materials. The course will then focus on different type of nanostructures and self assembly of these nanostructures. The size and shape dependent properties such as mechanical, optical, electronic, magnetic, thermal and thermoelectric properties of different class of nanomaterials will be illustrated. Various applications and perspectives of nanomaterials for developing nano-scale devices will also be covered.

Course Content:

S.No.	Topics	No.of Lectures
Module 1	**Introduction**	**2**
Module 2	**Synthetic methodologies:** Sol-gel, Co-precipitation, Microemulsion, Thermal decomposition, Hydrothermal, Spary Pyrolysis, Template based synthesis, Lithography, Vapor (solution)-liquid-solid growth, (VLS or SLS) and CVD,PVD,Molecular beam epitaxy.	**10**
Module 3	**Various kind of Nanostructures**: Magnetic nanoparticles, QDs, Metal and metal oxide nanowires, Carbon fullerenes and carbon nanotubes (CNT), Self assembly of nanostructures, Core-shell nanostructures, Nanocomposites.	**10**

Module 4	**Properties of nanomaterials:** Electrical, Dielectric. Mechanical, Magnetic, Optical, Photocatalytic, (Electro)Chemical , Thermal and thermoelectric Properties	**12**
Module 5	**Applications:** Biomedical, Solar Cells, Fuel Cells, Photoelectronic, Photo-Catalysis and Other Applications	**6**
	Total	**40**

IX. EVALUATION SCHEME:

Presentation	50%
Final exam	50%

X. RECOMMENDED READING(S):

1. Guozhong Cao, Nanostructures and Nanomaterials : Synthesis, Properties and Applications, Imperial College Press 2004.
2. T. Pradeep, Nano: The Essentials Understanding nanoscience and nanotechnology, Tata McGraw-Hill Publishing Company Limited NEW DELHI, 2007.
3. Nanomaterials Synthesis, Properties and Applications Edited by A S Edelstein and R C Cammarata, IOP Publishing Ltd 1996.
4. Introduction to Nanoscience and Nanomaterials, Dinesh C Agrawal, World Scientific, ISBN: 978-981-4397-97-1
5. Encyclopedia of Nanoscience and Nanotechnology, HS Nalwa, Ed., American Scientific Publishers, 2004.
6. Nanoscale Materials in Chemistry, KJ Klabunde, Ed., John Wiley & Sons Inc., New York.-2001.
7. Introduction to Nanotechnology, CP Poole, FJ Owens, Eds., John Wiley & Sons Inc., New Jersey.-2003.
8. Nanoparticles, G Schmid, Ed., Wiley-VCH Verlag GmbH & Co. KgaA, Weinheim, Germany-2004.
9. Nanoparticles-Building Block for Nanotechnology, V Rotello, Ed., Kluwer Academic/Plenum Publishers, New York-2004.
10. Nanoscale Materials, LM Liz-Marzán, PV Kamat, Eds., Kluwer Academic Publishers, Boston-2003.
11. Chemistry of Nanomaterials, CNR Rao, A Müller, AK Cheentham, Eds., , Wiley-VCH, Weinhei-2004.

Additional Readings: Current literature

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Advanced Mechanics of Solids

II. COURSE CODE (PLEASE CROSS-LIST IF APPLICABLE): MED **519**

III. COURSE CREDITS (L:T:P): 2:0:1

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY): Strength of Materials

VII. SCHOOL/ DEPARTMENT: SoE/ Department of Mechanical Engineering

VIII. COURSE CONTENT:

Introduction to mechanics of solids, Mathematical preliminaries; tensor algebra, Governing equations: kinematics, constitutive laws, equilibrium equations, Energy and variational methods for elastic solids, Theory of the Finite Element Method, Boundary value problems for elastic-plastic materials.

IX. EVALUATION SCHEME:

Assignments:		20%
Midterm Exam:		30%
Presentation/Project:		20%
Final Exam:	30%	
Total		**100%**

X. RECOMMENDED READING(S):

a. L. S. Srinath, Advanced Mechanics of Solids, Tata McGraw Hill, 2007.
b. C. S. Krishnamoorthy, Finite Element Analysis (theory and programming), 2nd Edition, Tata McGraw-Hill Education, 1995.
c. J. N. Reddy, Energy principles and Variational Methods in Applied Mechanics, Wiley, ISBN: 978-0-471-17985-6
d. G. A. Holzapfel, Nonlinear Solid Mechanics, Wiley, New York, 2001.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

XIV. COURSE TITLE: Designing with Advanced Materials

XV. COURSE CODE : MED518

XVI. COURSE CREDITS (L:T:P): 3:0:0

XVII. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:0:0

XVIII. COURSE TYPE (Core/Elective): Core

XIX. PREREQUISITE/S (IF ANY): Material Science and Engineering

XX. SCHOOL/ DEPARTMENT: SOE/Department of Mechanical Engineering

XXI. COURSE CONTENT & SYLLABUS:

Chapter-1: Introduction

Review of basic concepts in material science, Crystal structures, Crystal imperfections, Dislocations, Plastic deformation in crystalline materials, Different types of strengthening mechanisms

Chapter-2: Need of Advanced Structural Materials

Evolution of different class of materials, Need for advanced structural materials, Categorization, Conventional structural materials- Aluminum Alloys, Stainless Steels, Duplex steels and superalloys.

Chapter-3: Design concepts for High Entropy Alloys

Concept of multi-component alloys, High entropy alloys (HEAs) - Design concepts, Thermodynamic aspects, Phase-formation rules, Four-core effects in HEAs, Fabrication Techniques, Plastic Deformation in HEAs, Physical and mechanical properties, and applications

Chapter-4: Amorphous Metals for Advanced Structural Applications

Concepts of glass formation, Origin of bulk metallic glasses, Glass forming ability, Methods to synthesize metallic glasses, Metallic glass based composites, Physical properties, Mechanical properties, Applications.

Chapter 5- Performance under extreme working conditions

Corrosion behavior, influence of composition, test environment and structural changes, High temperature oxidation behavior, Erosion and erosion-corrosion behavior

XXII. EVALUATION SCHEME:

Presentations	**30 %**
Mid-term Exam	**30 %**
End-term Exam	**40 %**
Total	**100 %**

XXIII. RECOMMENDED READING(S):

1. William D. Callister, "Material Science and Engineering", Wiley
2. V. Raghavan, "Material Science and Engineering: A First Course", PHI
3. G.E. Dieter, "Mechanical Metallurgy", McGraw Hill
4. Michael C. Gao, Jien-Wei Yeh, Peter K. Liaw, Yong Zhang, High Entropy Alloys. Fundamentals and Applications, Springer
5. C. Suryanarayana, A. Inoue, Bulk Metallic Glasses, CRC Press

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Modelling & Simulation

II. COURSE CODE : MED 520

III. COURSE CREDITS (L:T:P): 2:0:1

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 2:0:2

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY): None

VII. SCHOOL/ DEPARTMENT: Engineering/ Department

VIII. COURSE CONTENT & SYLLABUS:

Systems & models, Examples of models, Models for systems & signals, Principles of physical modeling, Computer aided modeling, Ordinary differential equations, Euler's method, Tapezoidal method, Runge- Kutta Method, Numerical Prototyping as modelling for design and Synthesis using computation tool, Simulations of electromechanical, thermos mechanical, hydraulic and pneumatic elements, Introduction to concepts of optimization.

IX. EVALUATION SCHEME:

Type of Assessment	Description	Percentage
Mid Term Exam	Based on subjective questions, numerical	25 %
Assessment	Regular on class Basis	10%
End term Exam	This will cover full syllabus and 3 hours duration.	40 %
Project	Student will have to submit a project on the modelling & simulation of Mechanical System	25%
	Total	**100%**

X. RECOMMENDED READING(S):

S. No.	Name of Authors/ Books / Publisher	Year of Publication/ Reprint
1	Gordon, G., "System Simulation", Prentice Hall.	1978
2	Lennart, L. and Torkel, G., "Modeling of Dynamic Systems" Prentice Hall.	1994
3	Bhonsle, S.R. and Weinmann, K.J., "Mathematical Modeling for Design of Machine Components", Prentice Hall.	1998
4	D'Souza, A.F., and Garg, V.K., "Advanced Dynamics: Modeling and Analysis", Prentice-Hall.	1983
5	Mukherjee, A., Karmaker, R. and Samantaray, A.K., "Bond Graph in Modeling, Simulation and Fault Identification", I & K International.	2007
6	S. S. Rao; Engineering Optimization; 4th Edition, John Wiley & Sons.	2009
7	K. Deb; Optimization for Engineering Design; Prentice Hall of India.	2005
8	K. Deb; Multi-objective Optimization using Evolutionary Algorithms; John Wiley & Sons.	2003

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Research methodology

II. COURSE CODE : MED 521

III. COURSE CREDITS (L:T:P): 3:0:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:0:0

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY): Under graduate degree

VII. SCHOOL/ DEPARTMENT: SOE/Mechanical

VIII. COURSE CONTENT & SYLLABUS:

What is research; Overview of research; Literature survey, Experimental skills; Data analysis; Modeling skills, Technical writing; Technical Presentations; Creativity in Research, Ethics in Research

IX. EVALUATION SCHEME:

Presentations	30 %
Report/Proposal writing	30 %
Assignments	40 %
Total	100 %

X. RECOMMENDED READING(S):

Transcription of a talk entitled "You and Your Research" by Richard Hamming.
How to Solve It' by Polya.
Research articles provided by Course instructors

SHIV NADAR UNIVERSITY

School of Engineering

Department of Chemical Engineering

M.Tech.

The Department of Chemical Engineering in the School of Engineering at Shiv Nadar University, (SNU) invites applications for admissions to its M.Tech. program.

About the Programme

The M.Tech is a postgraduate programme. Students entering this programme will be awarded the M.Tech degree on successful completion of 49 credits in 2 years. Full time students will get Rs 16000 /- p . m for up to 24 months on satisfaction performance all through.

Objectives of the Programme

M. Tech program is designed to prepare students for more highly productive careers in academics and industry. Students are exposed to a wide range of core and elective courses with in-depth syllabi, combined with specialized research which culminates in a thesis. Such an excellent combination provides the students the breadth and depth knowledge necessary for pursuing highly productive careers in academics as well as in industry.

Specializations available in the department:

Process engineering and intensification, Bioenergy, Waste Water Treatment , Multiphase flows, Computational Fluid Dynamics, Microfluidics and Microreactors, Film formation in water based dispersions; Applications of Ionic Liquids in Chemical Industry, Reactive Separations, etc.

Programme Structure

Students entering this programme will need to complete 49 credits in 2 years that will comprise of coursework and a research thesis. The course work for M.Tech. in Chemical Engineering comprises of following components:

a) Core Courses: 19 credits

b) Elective Courses: 12 credits

c) Thesis: 18 credits.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

I. COURSE TITLE: Advanced Reaction Engineering

II. COURSE CODE : CHD612

III. COURSE CREDITS (L:T:P): 3:0:0

IV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:0:0

V. COURSE TYPE (Core/Elective): Core

VI. PREREQUISITE/S (IF ANY):None

VII. SCHOOL/ DEPARTMENT: Engineering/Chemical

VIII. COURSE CONTENT & SYLLABUS:

Unit 1: Kinetics Of Heterogeneous Reactions: Catalytic Reactions, Rate controlling steps, Langmuir - Hinshelwood model, Rideal - Eiley Mechanism, Steady State approximation, Noncatalytic fluid - solid reactions, Shrinking and unreacted core model.

Unit 2: Population Balance Models: Mixing concepts, Residence Time Distribution, Response measurements, Segregated flow model, Dispersion model, Series of stirred tanks model, Recycle reactor model, Analysis of non-ideal reactors.

Unit 3: External Diffusion Effects In Heterogeneous Reactions: Mass and heat Transfer coefficients in packed beds, Quantitative treatment of external transport effects, Modeling diffusion with and without reaction.

Unit 4: Internal Transport Processes In Porous Catalysts: Intra pellet mass and heat transfer, Evaluation of effectiveness factor, mass and heat transfer with reaction.

Unit 5: Design Of Heterogeneous Catalytic Reactors: Isothermal and adiabatic fixed bed reactors, Non-isothermal and non-adiabatic fixed bed reactors. Introduction to multiphase reactor design, Two phase fluidized bed model, slurry reactor model, Trickle bed reactor model.

Unit 6: Introduction to multiphase reactor design: Two phase fluidized bed model, slurry reactor model, Trickle bed reactor model. Photocatalytic reactor, Sonochemical reactors.

IX. EVALUATION SCHEME: Quiz-I: 10 marks, midterm-20 marks, quiz2-10 marks, assignment-10 marks, Endterm-50 marks

X. RECOMMENDED READING(S):

: 1. Smith J.M. - " Chemical Engineering Kinetics ", McGraw-Hill, 1981.

2. Fogler H.S - " Elements of Chemical Reaction Engineering ", Prentice - Hall 1986.

SHIV NADAR UNIVERSITY

Course title	: Advanced Process Control
Course code	: CHD 621
Course instructor	: Dr. Karan Gupta
Course credits (L:T:P)	: (3:0:1) = 4 credits
Contact hours (L:T:P)	: (3:0:2) = 5 hours/ batch/ week
Course type	: Core
Prerequisite/s (if any)	: CHD 324 Process Dynamics and Control
School/ department	: SoE/ Chemical
Course content & syllabus	: Revision of fundamentals » *Laplace transforms* » *SISO transfer functions* » *Frequency domain stability analysis* » *Design of PID controllers* Development of control relevant linear perturbation models » *Linearization of mechanistic models* » *Introduction to z-transforms* » *Development of grey-box models* Development of linear black-box dynamic models » *Stability analysis, output error models* » *Stochastic processes* » *ARX/ ARMAX models* Stability analysis, interaction analysis & multi-loop control State estimation and Kalman filtering

Linear quadratic optimal control & model predictive control
» *Pole placement technique*

Evaluation scheme : Quizzes (2) → 30 marks
Assignments (2) → 20 marks
Mid-sem. exam → 20 marks
End-sem. exam → 30 marks

Grading Scheme :

80+	→ A	72 – 79.5	→ A-
64 – 71.5	→ B	56 – 63.5	→ B-
48 – 55.5	→ C	40 – 47.5	→ C-
32 – 39.5	→ D	31.5-	→ F

Textbook(s) : Astrom, K.J.; & B. Wittenmark – Computer Controlled Systems

Franklin, G.F.; Powell, J.D.; & Workman, M.L. – Digital Control Systems

Seborg, D.E.; Edgar, T.F.; & Mellichamp, D.A. – Process Dynamics and Control

Goodwin, G.C.; Graebe, S.F.; & Salgado, M.E. – Control System Design

Recommended reading(s) : Stephanopoulos, G. – Chemical Process Control

Luyben, W. – Process Modelling, Simulation, and Control for Chemical Engineers

Strang, G. – Introduction to Applied Mathematics

Ljung, L.; & Glad, T. – Modeling of Dynamic Systems

Sodderstorm, T.; & Stoica – System Identification

Soderstrom, T. – Discrete Time Stochastic Systems

Gelb, A – Applied Optimal Estimation

SHIV NADAR UNIVERSITY

GRADUATE COURSE

XI. COURSE TITLE: Advanced Transport Phenomena

XII. COURSE CODE : CHD###

XIII. COURSE CREDITS (L:T:P): 3:0:0

XIV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 3:0:0

XV. COURSE TYPE (Core/Elective): Core

XVI. PREREQUISITE/S (IF ANY): Differential and Integral Calculus, Vector and Tensor analysis, Basic fundamentals of Fluid Mechanics, Heat Transfer, Mass Transfer

XVII. SCHOOL/ DEPARTMENT: Engineering/Chemical

XVIII. COURSE CONTENT & SYLLABUS:

- Momentum Transport: Viscosity and the Mechanisms of Momentum Transport, Shell Momentum Balances and Velocity, The Equations of Change for Isothermal Systems, Velocity Distributions with More than One Independent Variable, Velocity Distributions in Turbulent Flow, Integral Averaging in Momentum Transfer, Integral Balances
- Energy Transport: Thermal Conductivity and the Mechanisms of Energy Transport, Shell Energy Balances and Temperature Distributions in Solids and Laminar Flow, The Equations of Change for Nonisothermal Systems, Temperature Distributions with More than One Independent Variable, Temperature Distributions in Turbulent Flow, Integral Averaging in Energy Transfer
- Mass Transport: Diffusivity and the Mechanisms of Mass Transport, Concentration Distributions in Solids and Laminar Flow, Shell Mass Balances; Boundary Conditions, Equations of Change for Multicomponent Systems, Concentration Distributions with More than One Independent Variable, Time-Dependent Diffusion, Integral Averaging in Mass Transfer

XIX. EVALUATION SCHEME:

Type of Assessment	Description	Percentage
Mid-Term Exam	%age marks obtained in mid-term exams	30
End-Term Exam	%age marks obtained in end-term exams	50
Attendance and Internal Assessment	Based on attendance and homework	10

Quizzes	The final evaluation will be based on the average of the marks obtained in Quiz 1 and Quiz 2	10
	Total	**100%**

XX. RECOMMENDED READING(S):

1. William M. Deen, Analysis of Transport Phenomena (Topics in Chemical Engineering) 2nd Edition, Oxford University Press
2. R. Byron Bird, Warren E. Stewart, Edwin N. Lightfoot, Transport Phenomena, John Wiley & Sons

SHIV NADAR UNIVERSITY

Course title	: Advanced Transpot Phenomenon
Course code	: CHD 6213
Course instructor	: Dr. Sachin Giri
Course credits (L:T:P)	: (3:0:0) = 4 credits
Contact hours (L:T:P)	: (3:0:0) = 3 hours/ batch/ week
Course type	: Core
Prerequisite/s (if any)	: None
School/ department	: SoE/ Chemical

Course content & syllabus :

Module 1: Membrane Separation

Introduction to the membrane process, definition of membrane, Importance process. 1

Characterization of membranes:
Characterization of porous membranes, characterization of ionic membranes, characterization of non-ionic membranes. 1

Preparation of synthetic membranes. Preparation of phase inversion membranes. Preparation techniques for immersion precipitation, preparation techniques for composite membranes, influence of various parameters on membrane morphology, preparation of inorganic membranes. 2

Transport process in membrane driving force, transport

through porous membranes, transport through non- porous membranes and transport in ion-exchange membranes. 2

Polarization phenomenon and fouling concentration polarization, characteristic flux behaviour in pressure driven membrane preparation, various models, temperature polarization, membrane fouling, methods to reduce fouling. 2

Modules and process design plate, and frame, spiral wound, tubular, capillary, hollow fibre modules and their comparison, system design. 2

Module 2: Liquid Chromatographic Process

Basic concept of chromatography, phenomena and characterization. Various chromatography options. 3

Typical Chromatographic separation systems for preparative chromatography. 2

Equipment characteristics of solids, their selection for various applications. Column design and filling. 2

Applications of chromatography in separation of enzymes and proteins. Industrial Examples 3

Module 3: Adsorption Process

Modern absorbent such as Activated carbon, molecular sieves of various types, Activated Alumina. Their characteristics and applications. 3

Regeneration & Activation of absorbents. Thermal & pressure swing process. Fixed bed, moving bed, stimulated moving bed and other processing schemes. 3

Design of adsorption process for separation and purification Industrial Examples. 4

Module 4: Super Critical Extraction

Working Principal, Advantage & Disadvantages of supercritical solvents over conventional liquid solvents 3

Advantage & Disadvantages of supercritical extraction over liquid- liquid extraction, Decaffeination, ROSE process, 3

Commercial applications of supercritical extraction. 4

Total **40**

Type of Assessment	Description	Percentage
One Midterm Exam	Assess learning till mid semester	30
2 quizzes	Assess learning part-way through the course (one before and one after mid semester exam)	20
Home assignments	Continuous understanding of the subject	10
Final Exam	Overall understanding	40
	Total	**100**

Grading Scheme : relative grading

Bibliography

1. Ruthven, D.M., Principal Adsorption & Adsorption Process, Wiley,1984.
2. Lemlich, R., Adsorptive Bubble Separation Techniques, Academic Press,1972.
3. Coulson, Richardson, Chemical Engineering, Vol.3, Pergamon.
4. Terybal, R.E, Mass Transfer Operations, McGraw Hill.
5. Ruthven, Faruqh, Knalbal, Pressure Swing Adsorption, VCH, 1994.
6. Snyder, Kirl, Introduction To Liquid Chromatography, 2 ed., 1979.

7. Scott RTW, Liquid Chromatography Column Theory, Wiley, 1992.

8. Marcel Mulder, Basic Concepts Of Membrane Technology, Kluwer Academic Publishers (1997).

9. E.J. Homan, Membrane Separation Technology, Gulf Professional Publishing.

10. Nath, Membrane Separation Process, Prentice Hall of India.

11. Membrane Handbook - Editors W.S. Winston Ho, K.K. Sirkar, Van Nostrand Reinhold Publication.

SHIV NADAR UNIVERSITY

GRADUATE COURSE

XXI. COURSE TITLE: Modelling and Simulation

XXII. COURSE CODE : CHD613

XXIII. COURSE CREDITS (L:T:P): 2:0:1

XXIV. TOTAL CONTACT HOURS/ BATCH/WEEK (L:T:P): 2:0:2

XXV. COURSE TYPE (Core/Elective):Core

XXVI. PREREQUISITE/S (IF ANY):None

XXVII. SCHOOL/ DEPARTMENT: Engineering/Chemical

XXVIII. COURSE CONTENT & SYLLABUS:

Introduction to Modeling and Simulation (IM/S) provides an introduction into modeling and simulation approaches, covering continuum methods (e.g. finite element analysis), atomistic simulation (e.g. molecular dynamics) as well as quantum mechanics. Atomistic and molecular simulation methods are new tools that allow one to predict functional material properties such as Young's modulus, strength, thermal properties, color, and others directly from the chemical makeup of the material by solving Schroedinger's equation (quantum mechanics). This approach is an exciting new paradigm that allows to design materials and structures from the bottom up — to make materials greener, lighter, stronger, more energy efficient, less expensive; and to produce them from abundant building blocks. These tools play an increasingly important role in modern engineering! In this subject you will get hands-on training in both the fundamentals and applications of these exciting new methods to key engineering problems.

XXIX. EVALUATION SCHEME: quiz-I:10 marks, midterm-20 marks, quiz-2:10 marks, assignamnet:10 marks and Endterm_50 marks

XXX. RECOMMENDED READING(S):

SHIV NADAR UNIVERSITY

School of Engineering

Department of Civil Engineering

M. Tech.

The Department of Civil Engineering in School of Engineering at Shiv Nadar University (SNU) invites applications for admissions in the Master of Technology (M. Tech.) in Civil Engineering program.

Program

The Department of Civil Engineering Department (CED), School of Engineering, Shiv Nadar University offers a two-year Master of Technology (M. Tech.) degree program. No specific specialization name is offered in this program, instead, students are required to enroll advanced courses in the thrust areas and specialized/elective courses offered in their particular area of research interest in Civil Engineering. Students joining this program will be awarded the M. Tech degree on the successful completion of 55 credits in 2 years.

This M. Tech program is designed to produce high quality professionals who can meet industry requirements, including in leading research and development (R & D) organizations and academic institutions. Keeping in mind the breadth of the Civil Engineering domain, this program is focused towards building analytical capabilities and project-based research-focused experiential learning to enable students to understand and resolve a wide variety of practical problems.

Specialized Research Areas

Geotechnical Engineering: Geotechnical earthquake engineering; soil dynamics; constitutive modeling of frictional materials; physics of granular materials; poromechanics; computational geomechanics; soil-foundation-structure interaction; electronic cone penetrometer testing and direct-push sampling (CPT-DPT) for geotechnical & geoenvironmental subsurface investigation; geoenvironmental engineering.
Structural Engineering: Sustainable design & construction; structural performance assessment & rehabilitation; structural health monitoring; smart material and structures; damage quantification and prediction using piezo vibration characteristic; analytical formulation of integrated sensor-structure system; non-destructive evaluation and system identification; seismic hazard analysis; wave propagation; vibration control systems; stochastic earthquake analysis.
Environmental Engineering: Water and wastewater treatment; air quality monitoring & modeling; solid & hazardous waste management; engine exhaust characterization & its fate analyses; health risk exposure assessment due to environmental contaminants.
Transportation Engineering: Road safety law & policy; motor vehicle safety; road traffic injuries; transportation research (safety and pollution); human tolerance biomechanics; motor vehicle safety; sustainable urban transport.
Water Resource Engineering: Hydraulic structures; experimental analysis of hydraulic flow; channel control; hydraulic engineering; river engineering; advanced hydrology.
Geoinformatics: Application of GIS and remote sensing in air-water-soil interactions; low-cost sensing systems for sustainable urban development including early warning systems for disaster management, urban morphology & others; impact of climate change on infrastructure.

Descriptions of Civil Engineering Department and the research interests of our faculty members can be found at:

https://civil.snu.edu.in/

https://civil.snu.edu.in/people/faculty

Faculty members are also engaged in interdisciplinary work with research groups across schools at SNU.

Program and Course Structures for M.Tech Program

The total minimum credits required for completing the M. Tech. Program in Civil Engineering is 55.

Table 1: Program Structure and Courses in Semester I

Sl. No.	Course Title (Code)	L: T: P	Credits
1.	Specialized/Elective Course – I*	3: 0: 0	3
2.	Specialized/Elective Course – II*	3: 0: 0	3
3.	Specialized/Elective Course – III*	3: 0: 0	3
4.	Specialized/Elective Course – IV*	3: 0: 0	3
5.	Research Methodology – I (CED891)	2: 0: 0	2
6.	Seminar (CED699)	2: 0: 0	2

*The specialized/elective course may be of 4 credits if there is any tutorial or laboratory component in any of these courses, i.e. the courses having 3L: 1T: 0P or 3L: 0T: 1P are of 4 credits.

Table 2: Program Structure and Courses in Semester II

Sl. No.	Course Title (Code)	L: T: P	Credits
1.	Specialized/Elective Course – IV*	3: 0: 0	3
2.	Specialized/Elective Course – V*	3: 0: 0	3
3.	Specialized/Elective Course – VI*	3: 0: 0	3
4.	Specialized/Elective Course – VII*	3: 0: 0	3
5.	Research Methodology – II (CED892)	2: 0: 0	2

*The specialized/elective course may be of 4 credits if there is any tutorial or laboratory component in any of these courses, i.e. the courses having 3L: 1T: 0P or 3L: 0T: 1P are of 4 credits.

Table 3: Program Structure and Courses in Semester III

Sl. No.	Course Title (Code)	L: T: P	Credits
1.	M.Tech. Thesis** (CED799)	0: 0: 12	12

Table 4: Program Structure and Courses in Semester IV

S. No.	Course Title (Code)	L: T: P	Credits

1.	M.Tech. Thesis**(CED800)	0: 0: 12	12

Students have two options for their M. Tech. Thesis (CED799 and CED800), either they may work on two separate projects (or research problems) during their third and fourth semesters, or they may work on a continuous single major project (or research problem) for these two semesters.

Table 5: List of specialized/elective courses (subject to change)

Sl. No.	Course Title	L: T: P	Credits
1.	Solid Mechanics	3: 0: 0	3
2.	Structural Dynamics	3: 1: 0	4
3.	Advanced Structural Analysis	3: 0: 0	3
4.	Plates and Shells	3: 0: 0	3
5.	Advanced Reinforced Concrete Design	3: 0: 0	3
6.	Constitutive Modeling of Geomaterials	3: 0: 0	3
7.	Fracture Mechanics	3: 0: 0	3
8.	Structural Optimization	3: 0: 0	3
9.	Finite Element Method	3: 0: 0	3
10.	Structural Health Monitoring	3: 0: 0	3
11.	Air Pollution Control	3: 0: 0	3
12.	Transport Infrastructure	3: 0: 0	3
13.	Experimental Techniques for Engineers	3: 0: 1	4
14.	Nanotechnology for Environmental Remediation	3: 0: 0	3
16.	Computational Geomechanics	3: 0: 0	3
17.	Waste Management Fundamentals	3: 1: 0	4
18.	Natural Hazards and Disasters	3: 1: 0	4
19.	Applied Statistics	3: 1: 0	4
20.	Numerical Methods	3: 1: 0	4
21.	Industrial Wastewater Treatment	3: 1: 0	4
22.	Earthquake Engineering	3: 0: 0	3
23.	Core Concepts of Data Analysis	3: 1: 0	4
26.	Industrial Environment Management	3: 1: 0	4
27.	Climate and Climate Change	3: 0: 1	4
28.	Air Quality Science and Engineering	3: 1: 0	4
30.	Advanced Environmental Engineering	3: 0: 1	4
31.	Advanced Hydrology	3: 0: 0	3
34.	Advanced Soil Mechanics	3: 0: 1	4
35.	Geotechnical Earthquake Engineering	3: 0: 0	3
36.	Advanced Foundation Engineering	3: 0: 0	3
37.	Soil Dynamics	3: 0: 0	3
38.	Geoenvironmental Engineering	3: 0: 0	3
39.	Road Geometric Design and Infrastructure	3: 0: 0	3
40.	Seminar	2: 0: 0	2

41.	M. Tech. Thesis	0: 0: 12	12
42.	M. Tech. Thesis	0: 0: 12	12
43.	Research Methodology – I	2: 0: 0	2
44.	Research Methodology – II	2: 0: 0	2

Notes: *The credit distribution requirement across the semesters and course curriculum can be changed based on the student's interest in specialization and thrust research areas. Such change must be approved by PG committee and HoD after allocation of research advisor of the student. The inputs and recommendation from the supervisor are essential for such a crucial decision. These specialized/elective courses are advanced courses with contents designed specific to PG curriculum and PG specialization requirement and these courses are subject to change from semester to semester.*