

JK Lakshmipat University, Jaipur Institute of Management

Post Graduate Diploma In Analysis and Research (Batch 2019-20)

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Semester I



Course Title: Mathematical Thinking Course Code: ID2180 Credit: 2 Course Instructors: Dr. Yugank Goyal

Course Description:

The purpose of this course is to explore mathematics as an idiom of thought. This idea goes further from understanding math as merely a technique, and explores the subject as an independent mode of inquiry. Students often believe they dislike mathematics by the time they come to college. Some students fear math. Some just loathe it. This course aims to bring mathematics to the students, as it philosophically is, not what it appears to be. In other words, the objective of the course is to develop sensitivity and appreciation towards logical reasoning which is manifested in looking at the world through numbers, frames, quantitative design and therefore develop interest in math-based subjects that student may want to engage in, later. That said, the course may not act as a prerequisite for other advanced courses relying on mathematics, but it definitely forms an introduction to mathematical thinking, to generate interest in it in the first place. It frames solid base of applying mathematics in everyday thinking.

The course will demonstrate how mathematics is the language of nature. Students will approach mathematics not only as a set of problems, but also as a natural as well as social phenomenon. The course will also approach mathematical inquiry as a means for exploring both the physical sciences and social sciences with examples ranging from genetics, computer science, linguistics, design, abstract reasoning, cartography, formal and informal logic. The course does not assume students to have had a background in mathematics, and therefore has a foundational promise, with swift possibilities to build advanced concepts over them.

Course Intended Learning Objectives:

Students, by the end of the course should be able to think and develop mental faculties with respect to the following frames of imagination:

- a. Inductive and deductive reasoning
- b. Building a mathematical formulation or a picture in head, about a non-mathematical problem
- c. Heightened sensitivity towards understanding logic
- d. Abstract thinking about infinitesimally small distances, and theorize on thought experiments
- e. Idea of randomness
- f. Create distorted representation of pictorial figures if asked
- g. Tricks to find the important idea amongst all the good and bad ideas bundled up together
- h. Basic mathematical literacy to understand some symbolic representation
- i. Ability to convert symbols into sentences and the other way round
- j. Question and critique on logic
- k. Sensitivity for proofs
- 1. Perceive the foundational applications of AI, ML
- m. Appreciate the nondeterministic nature of this world, alongside powers of numerical precision



Tentative Session Plan:

During the eight sessions of the course we will address a number of key areas in mathematical thinking. The objectives will be to both understanding how math assists thinking, as well as how the mechanics of various problem types are best approached and solved.

Session One: Mathematics in Nature (2 hours)

- Introduction to the Course
- Appreciating how mathematics is a language of nature, its presence around us and identifying it,
- The history of mathematics as a discipline and its foundational philosophy
- Math as a way of thinking
- Complexity theory

Session Two: Logic (4 hours)

- Using logic to interpret meanings, words, and symbols,
- deductive and inductive logic,
- Truth tables (thinking like a computer) and using logic to understand truth tables, statements
- Extensive understanding of critical thinking Math as rhetoric
- Turing Machine
- Cellular Automata
- Genetic Algorithms

Session Three: Number System and Set Theory (4 hours)

- Understanding sets, and seeing the application
- Concept of random numbers
- Logarithm
- Number systems
- Calculation of numbers with different bases
- Gödel's incomplete theorem
- Russel's Paradox
- Cantor's Diagonal Proof

Session Four: Graph Theory (3 hours)

- Graph theory with Euler's diagrams
- Hamiltonian Paths
- Imagining and drawing graphs
- Applications in cartography

Session Five: Geometry (1 hour)

- Understanding axiomatic approach
- Finding geometric proofs using deductions and why it works best
- Basic understanding of dimensions

Session Six: Fair Distribution (2 hours)

- Dividing up when equal division is not possible
- Dividing up in 2, 3, or n unequal but fair parts



Session Seven: Introduction to philosophy of calculus (4 hours)

- Why functions and what makes them powerful in mathematical thinking,
- All modeling is done through functions
- Need for thinking about infinitesimally small values
- Limits to a value, and difference from the value itself
- Simple derivation to get a sense

Session Eight: Index numbers (optional, 2 hours)

- Mathematics in policymaking
- How to benchmark or rate attributes mathematically (best colleges ranking, for example)
- Some commonly observed indices (consumer price index, human development index, political scorecard)

Reading Material:

Will be discussed and shared by the end of the term. At this stage, the entire learning will be driven by class discussions. A tentative list, which may or may not be referred to, is mentioned below. The structure and the content of the class will vary depending on the receptivity of each class and therefore, it is important to recognize the participatory nature of the sessions.

- 1. Angel, A. R., & Porter, S. R. (2009). *A survey of mathematics with applications*. Pearson Addison Wesley.
- 2. D.J. Struik (1942), On the Sociology of Mathematics, Science & Society, Guilford Press
- 3. Dantzig, T. (2007). Number: The language of science. Penguin.
- 4. Edward Burger and Michael Starbird (1999), *The Heart of Mathematics: An Invitation to Effective Thinking*, Key College
- 5. G.H.R. Parkinson and H.G. Shanker, *Routledge History of Philosophy: Philosophy of Science, Logic and Mathematics in the* 20th *Century,* London: Routledge (select chapters)
- 6. Gel'fand, S. I. et. al. (2002). Sequences, combinations, limits (Vol. 3). Courier Corporation.
- 7. Gerard Alberts (1994), On Connecting Socialism and Mathematics: Dirk Struik, Jan Burgers and Jan Tinbergen, *Historia Mathematica*
- 8. H.J.M. Bos and H. Mehrtens (1977), The Interaction of Mathematics and Society in History Some Exploratory Remarks, *Historia Mathematica*
- 9. Jack C. Gill & Robert Blitzer, *Competency in College Mathematics*, H&H Publishing, Clearwater Florida (select chapters)
- 10. John Tabak, *Mathematics and the Laws of Nature: Developing the Language of Science*, New York: Facts on File
- 11. Karl J. Smith, The Nature of Mathematics (12e), Little, Brown
- 12. Keith Devlin (2012), Introduction to Mathematical Thinking
- 13. Kline, M. (1967). Mathematics for liberal arts. Addison-Wesley Pub. Co..
- 14. Marcia Ascher (1984), Mathematical Ideas in Non-western Culture, Historia Mathematica
- 15. McGinnis, R. (1965). Mathematical foundations for social analysis. The Bobbs-Merrill.
- 16. Mitchell, Melanie (2009). Complexity: A guided tour. Oxford University Press.
- 17. Ore, O. (1990). Graphs and their uses (Vol. 34). Cambridge University Press.
- 18. Paulus Gerdes (1994), On Mathematics in the History of Sub-Saharan Africa, *Historia* Mathematica
- 19. Polya, G. (1954). Induction and analogy in Mathematics, Princeton University Press
- 20. Polya, G. (2014). *How to Solve It: A New Aspect of Mathematical Method: A New Aspect of Mathematical Method.* Princeton university press.

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- 21. Sarukkai, S. (2005). Revisiting the 'unreasonable effectiveness' of mathematics. *Current science*, *88*(30), 415-423.
- 22. Sarukkai, S. (2003). Applying mathematics: The paradoxical relation between mathematics, language and reality. *Economic and Political Weekly*, 3662-3670.

Abbebbillent Scheme.			
S. No.	Specifications	Marks	
1	Class Participation	20	
2	Presentation	40	
3	Final Exam	40	
	Total (100)	100	



Course Title: Probability and Statistics Course Code: AS2170 Credit: 4 Course Instructors: Dr. Umesh Gupta

Course Description:

This course will introduce various statistical topics such as probability, descriptive statistics, statistical inference, sampling distributions, point and interval estimates, regression analysis with applications drawn from diversified areas including economics, business, public policy and governance, health etc. Statistical computing includes calculations using the Microsoft Excel.

Course Learning Outcomes:

- 1. On successful completion of this course, the students should be able to:
- 2. use graphical and numerical methods to calculate and illustrate descriptive statistics;
- 3. analyze and interpret different datasets using discrete and continuous probability distributions and apply the same for problem solving;
- 4. formulate and validate parametric hypothesis with reference to different datasets;
- 5. apply regression analysis for modeling, analysis, interpretation and forecasting;
- 6. use the probability models that are most widely used in economics, and apply them correctly and carry out the appropriate statistical analysis;
- 7. assess the accuracy of the resulting estimates and conclusions;
- 8. use Excel to make basic statistical calculations and critically evaluate the basis for these calculations

Course Content:

- Frequency Distribution- discrete and continuous, diagrammatic and graphic representation, Graphs histograms, frequency polygon, cumulative frequency curves/ ogives; Measures of central tendency and dispersion
- Probability theory classical and axiomatic approaches, conditional probability, Bayes theorem, random variables, Probability distribution discrete and continuous distribution
- Study design- Scientific method, Measurements, Basics of data collection
- Sampling theory- Basics of sampling, sampling distribution of the mean, variance and proportion, degrees of freedom, central limit theorem; Estimation- point estimation, confidence interval
- Hypothesis testing- Type I and II errors, significance testing, parametric hypothesis concerning mean, variance and proportion for single sample, two independent and paired samples
- Regression analysis- linear regression, standard error of the estimate, Pearson's correlation
- MS Excel- application of basics statistics, graphs and charts, hypothesis testing, regression analysis

Reading Material:

 David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Jeffrey D. Camm, and James J. Cochran, Statistics for Business and Economics, 12th Edition, Cengage India, 2018



Course Material:

- 1. David M. Lane, David Scott, Mikki Hebl, Rudy Guerra, Dan Osherson, and Heidi Zimmer, Introduction to Statistics, Online edition
- 2. James T. McClave, P. George Benson, and Terry Sincich, Statistics for Business and Economics, 13th Edition, Pearson, 2018
- 3. Richard J. Larsen, and Morris L. Marx, Introduction to Mathematical Statistics and Its Applications, 4th ed. Upper Saddle River, NJ: Pearson Prentice Hall, 2005
- 4. David M Levine, David F. Stephan, Timothy C Krehbiel and Mark Berenson, Statistics for managers: using Microsoft excel, 6th Edition, PHI Learning India, 2012
- 5. Ken Black, Business statistics for contemporary decision making, 5th Edition, Wiley India, 2009

Prerequisites: Elementary Statistics and Basic Calculus

Sr. No	Specifications	Marks
01	Assignment	20
02	Class Participation and Quiz	20
03	Theory Exam - I	20
04	Theory Exam – II	20
05	Minor project	20
	Total (100)	100



Course Title: Univariate Calculus Course Code: AS2171 Credits: 2 Course Instructors: Dr. Jaya Gupta

Course Description:

This course is aimed to learn and understand the fundamental concepts of functions, Differentiation and integration, and apply these concepts in real life problems of rate of change, approximation and maxima-minima.

Course Learning Outcomes:

On successful completion of this course, the students should be able to:

- 1. Work with functions represented in a variety of ways like graphical, analytical etc.
- 2. Demonstrate the concepts of limit and continuity both graphically and mathematically.
- 3. Compute derivatives of elementary functions and demonstrate them analytically and graphically.
- 4. Apply the concept of derivative in various problems of rate of change and approximation and solve extremum problems of economics
- 5. Compute definite and indefinite integrals of elementary functions and understand the relation between differentiation and integration.

Course Content:

- Functions polynomial functions, rational functions, exponential functions and logarithmic functions, limit and continuity of functions.
- The derivative, derivative as the rate of change, rules of differentiation (product rule, quotient rule and chain rule), approximation, applications of differentiation in extremum problems of one variable.
- Definite and Indefinite Integration, relation between integration and differentiation, The Fundamental Theorem of Calculus.

Reading Material:

1. Stewart, J., Calculus with Early Transcendental Functions, Cengage

Course Material:

- 1. Chiang, A.C., Fundamental Methods of Mathematical Economics, Mc Graw Hill.
- 2. Weir, M.D. and Hass, J., Thomas' Calculus, Pearson.
- 3. Apostol, T.M., Calculus: Vol. I, Wiley, India.
- 4. Simon, C.P. and Blume, L., Mathematics for Economics, Viva.

Prerequisites: Basic algebraic operations

Assessmen	nt Scheme:	

Sr. No	Specifications	Marks
01	Assignment	20
02	Class Participation	10
03	Quiz	10
04	Theory Exam	20
05	Theory Exam	40
	Total (100)	100



Course Title: Cognition & Critical Thinking Course Code: CC2170 Credits: 2 Course Instructors: Meena Vaidyanathan

Course Description

The course aims to provide a macro level understanding of the principles critical thinking and improve cognitive behavior in the context of sustainability.

Course Learning Outcomes:

The course has been designed to achieve the following outcomes:

- 1. Understand the principles of sustainability and how they apply to business / life
- 2. Appreciate the elements of critical thinking and how they help in creative problem solving
- 3. Understand the importance of raising vital questions and importance of articulation to receive accurate data
- 4. Understand how to translate data into useful and well-reasoned information
- 5. Apply the elements of critical thinking to build more sustainable business and systems

Tentative Session Plan:

The course will have total of 20 contact hours.

Topic	Description	Relevance to Cognitive Skills and Critical Thinking	Number of hours
Introduction to Sustainability	Three pillars of Sustainability. SDGs and how they apply to organizations and individuals. Importance of being sustainable in work and life.	Introductory session	2
Sustainability and Behavior Change	Key elements of conservation psychology and behavior change strategies as well as community engagement tools that are designed to produce results.	Critical thinking / Elements of Thought (Reasoning) / Developing Intellectual Standards	2
Measurement of change	Theory of Change, Logic model framework, essentials of measuring sustainability and social change. Difference between Outputs and Outcomes. How to question intelligently? Understanding implications and assumptions. Understanding the difference between Efficiency and Effectiveness	Critical Thinking / Examine data critically / Elements of Reasoning	6
Critical Thinking Model	Paul Elder Critical Thinking Model and its application to sustainability practices	Critical thinking Model and	4



		application to	
		business and	
		everyday life	
Application of		Application of	
Intellectual traits to	Case studies where Humility, Empathy,	Intellectual Traits	
solve critical	Integrity, Courage, Perseverance,	to solve practical	6
problems (related to	Confidence and Fair-mindedness helped	problems in	0
the three pillars of	solve issues	business and	
sustainability)		everyday life	

Reading Material:

- 1. https://open.umn.edu/opentextbooks/textbooks/sustainability-a-comprehensive-foundation
- 2. https://www.academia.edu/36997171/Critical_Thinking_for_Global_Peace_A_key _for_Sust ainable_Development
- 3. http://samples.jbpub.com/9781449645311/14867_ch01_chiras.pdf
- 4. Courtice, P. 'The critical link: strategy and sustainability in leadership development', in CPSL

(2012) The Future in Practice – the State of Sustainability Leadership, University of Cambridge Programme for Sustainability Leadership, Cambridge.

http://digital.edition- on.net/links/6431_the_future_in_practice_cpsl.asp

- 5. Gore, A (2013) The Future, W.H. Allen, New York.
- 6. SDSN (2103) An Action Agenda for Sustainable Development Report for the UN Secretary-

General, Leadership Council of the Sustainable Development Leadership Council. http://unsdsn.org/resources/publications/an-action-agenda-for-sustainable-development/

Assessment Scheme:

Each student will be assessed on class participation and one written assignment/ presentation. The aim is to understand comprehension level of students on the topics taught so far and their ability to apply.

Sr. No	Specifications	Marks
01	Presentation	60
02	Class Participation	40
	Total (100)	100



Course Title: Micro Economics Course Code: EP2270 Credits: 4 Course Instructors: Dr. Krishna K. Ladha

Course Description:

Microeconomics is the study of how individual economic units – firms and households – make decisions and how these decisions interact to produce observed outcomes. The focus of this course will be on techniques of making optimal consumption, production and pricing decisions, and on how these decisions depend on demand, the cost of production, and the level of competition in the industry. We will study industries with varying levels of competition: perfect competition, monopoly, and oligopoly. In particular, we will learn game theory and the economics of incentives and information. Applications will include international trade, analysis of government intervention, and issues arising from market and government failures. At the end of the course we should have learned the approach of microeconomics with the ability to apply it to the questions of economics, politics, philosophy and organizations.

Course Objectives:

- 1. To introduce students to the elements of microeconomic analysis.
- 2. To enhance student ability to appreciate and critically evaluate economic models, and apply them to the analysis of concrete situations.

Course Learning Outcomes:

By the end of this course, students should be able to understand:

- Demand, Supply, Equilibrium, Pareto optimality
- Elasticity and its relationship with pricing and revenue
- Economics of production
- Economic costs for decision-making
- Different types of market structures (e.g., Perfect Competition, Monopoly, Duopoly)
- Basic models of Game Theory
- Pricing
- Market Failures
 - $\circ \quad \text{Public Goods}$
 - Externalities
 - Moral Hazard
 - o Adverse Selection
- The role of government in correcting market failures. Of particular interest is the effect of taxes and government policies on markets.
- Applications of economic principles to policy questions

Preparation for each class:

Student should come to class having read and reflected over the assigned readings. Advance preparation would make life easier, even enjoyable! Expect to work 3.5 to 5 hours (depending on your prior coursework) per week outside of class.



Reading Material:

- <u>Microeconomics</u>, 8th Edition, by Pindyck and Rubinfeld, Published by Pearson India.
- A set of videos at <u>https://www.youtube.com/watch?v=_8T8glylBFc&index=6&list=PL-uRhZ_p-BM4XnKSe3BJa23-XKJs_k4KY</u>

Session Plan:

Session No.		Topics	Text by Pyndick and Rubinfeld
1	Sep 18	Slope + Comparative Adv	Videos 41-44 (30 mins)
2	Sep 20	Comparative Adv + Introduction	Ch. 1
3-4	Sep 24 Tue	Demand and supply, elasticity of demand, consumer Surplus	Ch. 2, V2-V17, V30-40
5-6	Sep 26 Th	Consumer Behavior	Ch. 3
7-8	Oct 1 Tue	Individual and Market Demand	Ch. 4
9-10	Oct 3 Th	Uncertainty and Consumer Behavior	Ch. 5
11-12	Oct 7 Mon	Uncertainty and Consumer Behavior	Ch. 5
13-14	Oct 14 Mon	Production	Ch. 6, V29
15-16	Oct 15 Tu	The Cost of Production	Ch. 7
17-18	Oct 17 Th	Profit Maximization and Competitive Supply	Ch. 8, V26-27, V53-59, V61
19-20	Oct 24 Th	The Analysis of Competitive Markets	Ch. 9, V18-22
21-22	31 Oct Th	Monopoly and Monopsony	Ch. 10, V61-68
23-24	5 Nov Tu	Pricing with Market Power	Ch. 11
25-26	7 Nov Th	Monopolistic Competition and Oligopoly	Ch. 12
27	11 Nov M	Monopolistic Competition and Oligopoly	Ch. 12
28	11 Nov M	Game Theory and Competitive Strategy	Ch. 13
29-30	14 Nov Th	Game Theory and Competitive Strategy	Ch. 13
31	19 Nov Tu	Game Theory and Competitive Strategy	Ch. 13
32	19 Nov Tu	Markets for Inputs	Ch. 14, V69
33-34	21 Nov Th	Investment, Time and Capital Markets	Ch. 15
35-36	26 Nov Tu	General Equilibrium & Economic Efficiency	Ch. 16
37-38	29 Nov Fri	Markets with Asymmetric Information	Ch. 17, V71-72, V79-83
39-40	29 Nov Fri	Externalities and Public Goods	Ch. 18, V47-52, V75-78

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Sr. No	Specifications	Marks
01	Class Participation	10
02	Homework (Student must show his/her	10
	work and writes in complete sentences)	
03	Quiz-I	20
04	Quiz-II	25
05	End Term Exam	35
	Total (100)	100



Course Title: Spreadsheet Applications Course Code: ID2170 Credits: 2 Course Instructors: Dr. Ashwini Sharma

Course Description:

Spreadsheet software (e.g., MS-Excel) offer tremendous functionality and plenty of in-built features that are essential for any data analysis job. Developing proficiency in the use of spreadsheet software can offer an advantage position to those who have to analyze, summarize and report data on a regular basis. The present course introduces participants with fundamental concepts of organizing, processing and presenting data. It also develops their skills in performing data management functions using Excel. Students will be able to learn about some of the most powerful features of Excel and generate useful reports using them. After successfully completing the course, they will be able to create professional-looking worksheets using MS-Excel software and at the same be ready to undertake advanced courses in the data analytics domain.

Course Learning Outcomes:

Upon successful completion, the student should be able to -

- Create, format and link worksheets using MS-Excel.
- Use formulas and functions to perform computations on data.
- Create data visualizations using different types of charts.
- Apply Conditional formatting, Perform Goal Seek Analysis, Use lookup functions.
- Create and update Pivot Tables and Pivot Charts.
- Summarize data using Histograms and Descriptive Statistics
- Run Descriptive Analytics (Using Data Analysis Toolpak)
- Perform basic Financial Arithmetic
- Determine Optimal Product Mix (Using Excel Solver)

Tentative Session Plan:

Week (Sessions)	Remarks	
S1-S2	Excel Environment, Ribbon Layout, Entering and Editing Data, Worksheet Formatting and Printing <i>Exercise 1: XYZ Retail India</i>	2 Hours
S3-S4	Performing Data Computations, Creating Expressions, Use of basic Excel Functions, Formula Copying, Relative and Absolute Referencing <i>Exercise: Medical Office Budget</i>	2 Hours
S5-S6	Formula Auditing, Range Names, Sorting & Filtering, Custom Sort, Subtotal Function	2 Hours
S7-S8	Data Visualization, Charting in Excel	2 Hours
S9-S10	Financial Arithmetic Using Excel-I (Simple & Compound Interest Calculation, Computing Loan Instalments, Amortization Chart) <i>Exercise: Personal Budget</i>	2 Hours



Financial Arithmetic Using Excel-II (Time ValueS11-S12of Money Concepts, Present Value, Future Value,	
Annuity, NPV Analysis, Goal Seek Analysis)	
Financial Arithmetic Using Excel-II (Time Value	2 Hours
Annuity, NPV Analysis, Goal Seek Analysis)	2110015
Logical and Lookup Functions	2 Hours
Logical and Lookup Functions	2 Hours
Pivot Tables and Charts, Data Analysis ToolPak, Solver	2 Hours
	Financial Arithmetic Using Excel-II (Time Value of Money Concepts, Present Value, Future Value, Annuity, NPV Analysis, Goal Seek Analysis) Financial Arithmetic Using Excel-II (Time Value of Money Concepts, Present Value, Future Value, Annuity, NPV Analysis, Goal Seek Analysis) Logical and Lookup Functions Logical and Lookup Functions Pivot Tables and Charts, Data Analysis ToolPak, Solver

Reading Material:

• Most of the exercises will be based on using on-line documentation available with MS-Excel. Additional material, if required, shall be provided during sessions.

Sr. No	Specifications	Marks
01	Continuous Evaluation	
	 Knowledge Checks - 20% 	
	• Quizzes (Two) - 60%	100
	Participation-20%	
02	Mid Term Exam	-
03	End Term Exam	-
	Total (100)	100



Course Title: Linear Algebra (Elective) Course Code: AS2172 Credits: 3 Course Instructors: Dr. Richa Sharma

Course Description:

This course introduces matrix theory, basic Linear Algebra Principles and Linear Programming Problem. Students are also expected to gain an appreciation for the applications of linear algebra and LPP to area such as economics, social sciences, business, public policy and governance, health etc.

Course Learning Outcomes:

On successful completion of this course, the students should be able to:

- 1. Interpreting complex situations in various domains using Linear Algebra.
- 2. Model complex systems as Linear simultaneous equations and analyze the same using Matrix methods
- 3. Model Data as matrices then able to determine Determinant, Eigen Values and Eigen Vectors and Apply the same for problem solving, e.g., ranking and performance analysis summarize and visualize different datasets.
- 4. Formulate linear programming problems with respect to industrial or societal issues such as production, pollution, transportation, etc.
- 5. Identify parameters or variables to formulate cost or profit function for sustainable use of available resources.
- 6. Use software TORA to solve large scale LPP.

Course Content:

- Matrices: Matrix algebra, Matrix Operations, Matrix addition, Matrix subtraction, Scalar multiplication, Matrix multiplication, Matrix inverses, Powers of a matrix, Determinants, Cramer's rule, Inverse matrices, Rank of a Matrix, Elementary row operations, Echelon forms eigenvalues and eigenvectors, Systems of linear equations
- Vector Spaces and Subspaces, Bases and Dimensions, Linear Transformations, Linear Independence and Dependence, Orthogonality
- Linear Programming Problems: Introduction to LPP and its scope, Formulating a Mathematical Model, Deriving Solutions from the Model, Graphical Method.

Text Book:

1. Hoy, M., Livernois, J., McKenna, C, Rees, R and Stengos, T, Mathematics for Economics, PHI, third edition, 2014.

E-books:

- 1. Fuad Aleskerov, Hasan Ersel, Dmitri Piontkovski, Linear Algebra for Economists. Springer, 2011.
- 2. Gilbert Strang. Introduction to Linear Algebra. Wellesley-Cambridge Press, 4th edition, 2009.
- 3. Murthy, P. R., Operations Research, Second Edition, New Age International, 2007.

Reading Material:

- 1. Shayle R. Searle, Lois Schertz Willett, Matrix Algebra for Applied Economics, 1st Edition, John Wiley & Sons, 2001.
- 2. Serre Denis, Matrices Theory and Applications, Springer, 2010.

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3. Taha. H. A, Operations Research: An Introduction, Pearson Education, 7th ed., 2003. Prerequisites: **Elementary Statistics and Basic Calculus**

Assessment Scheme			
Sr. No	Specifications	Marks	
01	Assignment	15	
02	Class Participation and Quiz	10	
03	Theory Exam - I	20	
04	Theory Exam – II	30	
05	Case Study - 1/ Project-1/Research Paper-1	25	
	Total (100)	100	

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Course Title: Indian Government (Elective) Course Code: EP2280 Credits: 2 Course Instructors: Dr. Krishna K. Ladha

Course Description:

Making sense of Indian government and politics is the purpose of this course. We want to know the way things are (the empirical part) and why so (the theoretical part). The goal is to discover order in the chaotic world of Politics. For this, the course teaches general theories that help explain political outcomes as those arising from collective decisions made in the public arena consisting of political institutions and processes.

Course Objectives:

To introduce tools and method of political science and economics to understand Indian government and politics.

Course Learning Outcomes:

Students should be able to understand the following:

- An analytical treatment that helps understand Indian government and politics
- The logical inferences that flow from the assumption that political actors work in self-interest.
- The role of collective action and the institutional arena in which collective action unfolds.
- Why do the governments govern the way they do? For example, why do governments make unenforceable laws and pass populist policies?

Pre-Requisites for the Course: Adverse Selection, Signaling, Moral Hazard, Externalities, Public Goods, Prisoner's Dilemma game, Nash Equilibrium.

Reading Materials:

- *Public Institutions in India: Performance and Design,* Edited by Devesh Kapur and Pratap Bhanu Mehta, 2007, Oxford India Paperbacks.
- *Rethinking Public Institutions in India*, Edited by Devesh Kapur, Pratap Bhanu Mehta and Milan Vaishnav, 2017, Oxford Publishing House.
- *The Oxford Companion to Politics in India*, Edited by Niraja Gopal Jayal and Pratap Bhanu Mehta, 2011, Oxford India Paperbacks.
- India's Politics, by Bimal Jalan, 2007, Penguin

Course Content:

- SESSION 1 Why Government?
 - Market Failures
 - > Externalities, Public Goods, Tragedy of the Commons
 - Moral Hazard, Adverse Selection
 - > Monopoly
 - Prisoner's Dilemma game
- SESSIONS 2-3 THE PROBLEM OF COLLECTIVE ACTION Ian Mclean, Obituary: Professor Mancur Olson, 1998 (2 pages) <u>http://www.independent.co.uk/news/obituaries/obituary-professor-mancur-olson-</u>



Olson, Mancur, The Logic of Collective Action **Shepsle**, Collective Action pp. 224-5, 240-50

- SESSIONS 4-5 POLITICAL ENTREPRENEURSHIP *Olson*, Dictatorship, Democracy and Development
- SESSION 6 CONSTITUTION & COMMITMENT
 North and Weingast: Constitutions and Commitment
- SESSIONS 7-8 CONSTRUCTING A GOVERNMENT Lowi, Ginsberg, Shepsle, & Ansolabehere, American Government
- SESSION 9 INDIAN CONSTITUTION
 Mehta, Constitutionalism in The Oxford Companion to Politics in India (Eds. Javal and Mehta), 2011
- SESSIONS 10-12 Riker
 Shepsle, Ch 5
 DEMOCRATIC ACTORS & INSTITUTIONS Pliny the Younger on Parliamentary Law (12 pages) Spatial Models of Majority Rule
- INDIAN INSTITUTIONS:
- SESSIONS 13-14 The Indian Parliament
 - Parliament by M.R. Madhavan in Rethinking Public Institutions in India (Eds. Kapur, Mehta and Vaishnav), 2017.
 - Parliament by Vernon Hewitt and Shirin M Rai in The Oxford Companion to Politics in India (Eds. Jayal and Mehta), 2011
 - The Indian Parliament by Arun Agrawal in Public Institutions in India (Eds. Kapur and Mehta), 2005
 - India's Politics by Bimal Jalan, 2007, Penguin
- SESSIONS 15 The Election Commission of India The Election Commission by Alistair McMillan
- SESSION 16 Indian Civil Service Civil Service: An Institutional Perspective by KP Krishnan and TV Somanathan
- SESSIONS 17-18 India's Judiciary
 - > The Supreme Court by Lavanya Rajamani and Arghya Sengupta
 - > India's Judiciary: The Promise of Uncertainty by Pratap Bhanu Mehta
 - Shepsle, Ch 15 Courts and Judges
 - Frontline, A judicial Clarification
 - Chief Justice of India Speech to celebrate the golden jubilee of the Supreme Court
- SESSION 19-20 FOOD SAFETY National Food Security Act, 2013

S. No	Specifications	Marks
01	Quiz	35
02	Paper & Presentation	25
03	End Term Exam	40
	Total (100)	100



Semester II



Course Title: Academic Writing Course Code: CC2172 Credit: 3 Course Instructors: Dr. Vrishali Subhhramanian

Course Description:

Academic writing is a critical skill in the success of your graduate studies in policy and social sciences, and your professional life thereafter. Graduate students tend to find academic writing challenging due to limited experience in writing and reading. The first challenge is to identify a novel and relevant policy problem and scoping the literature, i.e. selecting unit of analysis, audience and conceptual and methodological lenses to approach it. Further, writing is thinking on paper, and it involves a tension between the creative impulse needed to build your ideas and the critical impulse needed to structure and refine these ideas into a coherent composition. This course explicitly aims to equip you to resolve this tension by implementing a *process-oriented* approach that sequentially addresses content, structure, and presentation aspects of academic writing (Figure 1).



Figure 1: Sequential approach to academic writing

In your current tenure as an LSEF-UMass scholar, you are required to produce a thesis that formulates a research problem and addresses it through suitable analytical methodologies. The core activities that lead up to this thesis are formulating a problem on a topic, survey the literature and synthesize the work that has been done in the research domain, and craft a research design that addresses gaps in the literature to further problem solving. Over ten class sessions, we will cover skills such as formulating a problem, conducting a literature review using various tools (databases, citation software), structuring and presenting the writing in an appropriate format, preparing good representations (i.e., figures and tables), linking it to a research design and planning execution of the proposed research. The literature review will form the biggest focus area of this course, and we will aim to work towards this part of your thesis or -if you so choose- the standards of aspirational journals in your research domain. You will apply the skills introduced in your own project toward a final "Fellowship proposal" assignment, which will comprise of a problem formulation, literature review, research design, and project planning sections. All assignments for this

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class (except Assignment 7 on peer review) and some class activities will feed toward the Fellowship proposal project (Assignment 6).

In terms of broader pedagogical aims, the class aims to make you an active participant of the research community. The class aims to simulate the culture in which academic writing occurs through the following activities: a) You will create Mendeley accounts to organize and store their bibliography, annotate and tag papers, add references, create information-sharing groups with their peers, interact with external researchers , and b) You will provide constructive peer review of each other's writing.

As one credit hour in the U.S. University system equals three hours of work per week, beyond three hours dedicated to class and writathon, it is expected that you will spend atleast six hours per week of independent work on your project. It is in your best interest to make use of this course, along with the course on research design, to make progress on your thesis.

Course Objectives:

The objectives of the class are to train you in how to:

- 1. Formulate a research problem
- 2. Complete a literature review on a topic with good content, structure, and presentation
- 3. Coherently link a literature review to a suitable research design
- 4. Constructively critique peers on structure, content, and style of the writing

Course Learning Outcomes:

By the end of the course, it is expected that you will:

- 1. Use academic and non-academic sources to formulate a relevant problem that can be addressed within your academic context
- 2. Communicate clearly the importance of your problem to the academic community and funding agencies
- 3. Plan an academic writing activity systematically
- 4. Conduct a literature review with analytical rigour
- 5. Provide constructive feedback to your peers on writing
- 6. Link your literature reviews to research design¹ to adequately respond to the problem formulation

Class	Title	Scope	Assignments	Assignments due
			given	
1	Introduction to the course	Overview and Goals of class, How to engage with the research literature, Learning styles, Databases and Search Strategies, Introduction to Mendeley	ASSIGNMENT 1: Annotated paper ASSIGNMENT 2: Problem Narrative	
		and how it will be used in the class		
2	Content 1	Paraphrasing and Synthesizing		ASSIGNMENT 1: Annotated paper

Tentative Session Plan:



3	Content 2	Reasoning for generating content: What, Why, Why not	ASSIGNMENT 3: Synposis	ASSIGNMENT 2:Problem Narrative
4	Structure 1	Structuring arguments		
5	Structure 2	Drilling down-section, sub-section, paragraph, sentence, words		ASSIGNMENT 3: Synposis
6	Presentation 1	Representation (tables, figures), Revising and Critiquing peers writing	ASSIGNMENT 4: Representation	
7	Presentation 2	General academic writing language and style issues, Introduction to APA and other styles		ASSIGNMENT 4: Representation
8	Linking literature review and research design	Presentation and discussion of research design	ASSIGNMENT 7: Peer critique of Literature Review Draft 1	ASSIGNMENT 5: Literature Review Draft 1
9	Research Project Planning	Professional Canvas, Gantt Chart, Risk Management		ASSIGNMENT 7
10	Wrap up	Presentation of Assignment 6, Wrap up, Feedback		ASSIGNMENT 6: Fellowship Proposal Project is due on May 1

Description of Activities and Assignments:

Writathon

It is frequently observed that graduate students keep on collecting information but are not able to translate it to writing due to improper linking of ideas, writer's block, etc. Plagiarism is often caused by the absence of this ability or not allowing it time to develop. It is very important to get into the habit of committing initial ideas to paper, even if they are not fully developed. In fact, once ideas are put down on paper, it is much easier to link and refine them. Bear in mind that our goal is to generate atleast three internal drafts of your literature review before you submit Assignment 6, and these sessions are built in to the course to ensure that the substantial amount of writing expected from you does indeed happen.

Writathons require a commitment of (atleast) 1.5 hours each week to paraphrase and generate ideas based on the reading done each week. Before each class, you will fill in a short questionnaire (one-minute duration) stating your goal for this session, and after the session, you will evaluate how far you have achieved your target and any problems encountered.² No other activities are allowed during the Writathon session, including cellphone use, browsing, talking to your peers, and not even much reading. Doing a committed writing session with a group (alone!) has been found to increase one's productivity and sense of solidarity in the lonely writing process! *Assignments*

² You will not be graded for how you performed in a particular writathon session. Filling the questionnaire is just to keep you conscious of your goals and troubleshoot on any issues that delay your progress.



We will use Mendley for managing bibliography, storing class documents (writathon documents and assignments), citing in assignments and inteact with external research. Detailed assistance on using Mendley can be found <u>here</u>, but they key functions we will use include the ones shown below.



The completed assignment must be shared with the instructor (or peer in case of Assignment 7) before the class on the day of the deadline. The assignments and their contribution to the overall grade are briefly described below.

ASSIGNMENT 1: Problem Narrative (5%)

This is a two-page paper that describes a policy-relevant phenomenon that is interesting to the writer. THIS IS NOT AN EXERCISE IN ACADEMIC WRITING; the goal of this assignment is to practice using coherent, logical, and persuasive writing to express to nonspecialists the importance of the problem. You are requested to use news archives to make a pitch of salience and relevance of the topic that you intend to pursue in this class. Grading criteria include adherence to guidelines and timely submission.

ASSIGNMENT 2: Journal article Critique (5%)

This is a pdf journal article that been annotated and highlighted to demonstrate that the you understand how to read a paper from an academic perspective. Detailed guidelines on how to read academic papers will be provided in class, and you are expected to apply them in this assignment. Grading criteria (one point each) include adherence to guidelines, clarity, attention to detail, effective paraphrasing and ability to abstract insights for your topic.

ASSIGNMENT 3: Synopsis (5%)

This is a three-page assignment that formulates a research problem that you would like to address as a coherent argument. Elements of this assignment should include a problem statement with a central thesis, unit of analysis, the scope of the literature needed to develop a baseline understanding of the problem, search strategy used, and atleast two journals that are suitable audiences for their literature review. Grading criteria (one point each) include adherence to guidelines, clear arguments, good composition, relevant topic and audience. *ASSIGNMENT* 4: Representation (5%)



This assignment comprises of two representations (e.g., conceptual model, a summary table, etc.) that you can include in their literature review. Grading criteria (one point each) include clarity, inclusion of important concepts in your literature review, summary/explanatory value, aestheics and timely submission.

ASSIGNMENT 5: Literature Review Draft 1 (5%)

This is a 20-page assignment (excluding bibliography), with due attention to good content, structure, and presentation concepts taught in the class. Grading criteria (one point each) include adherence to guidelines, clarity, attention to detail, effective paraphrasing and ability to abstract insights for your topic.

ASSIGNMENT 6: Fellowship Proposal Project (45%)

This is the final assignment that will coherently synthesize problem formulation, literature review, research design, and planning for the proposed project³. The final assignment should follow the style guidelines for UMass thesis and dissertations described in this <u>link</u>. Exceptions can be made to use different formatting if you make requests to use the format of a journal/book chapter/fellowship to which they plan to submit specific /all portions of this assignment. This assignment shall be graded as per the detailed rubric provided below.

Criteria	Evaluative sub-criteria	
Content	 Problem is formulated clearly and persuasively 	
(15 points)	 Good paraphrasing of existing literature 	
	Adequate and systematic coverage of relevant literature	
	Critical analysis and insight	
	 Use of appropriate examples to explain points where 	
	necessary	
Structure	 Broad themes and sub-themes have been identified and 	
(15 points)	synthesized well	
	 Assignment is organized logically 	
	 Effective, smooth, and logical transitions 	
	 Attention to logic and reasoning 	
	• Effective representation that is seamlessly integrated with	
	text	
	 Seamless links to research design and project planning 	
Presentation	 Prescribed style format is followed 	
(15 points)	• Tone is clear, consistent and appropriate for intended	
	audience	
	• Thorough proofreading: Good punctuation and spelling, no	
	typos	
	Good Grammar	
	 Appropriate vocabulary-use of correct technical language 	
	but clear expression without jargon	

ASSIGNMENT 7: Peer critique (10% by peer)

³ Based on activities in Class 9



This assignment is the critique provided by you on Assignment 4 and 5 for their peers. Note that this assignment will be graded by the peer you provide feedback to as based on usefulness, clarity and tone of the critique.

The connections between the assignments and other activities in the class are illustrated below.



A-Assignment

Contact information and timings:

Writathon session: Monday, 1600-1730 hours

Class session: Tuesday, 1600-1730 hours

You are encouraged to actively engage and ask questions about academic writing during class hours. A Mendeley group will be created, where all members are encouraged to ask questions, as well as share resources on academic writing and research.

You can also seek an individual meeting with the instructor to update her on their progress on their assignment and discuss any issues. Ideally, such meetings should be scheduled right after class on Monday or Tuesday by emailing in advance <u>subramanian.vrishali@gmail.com</u>. You are encouraged to engage with the instructor on their assignments and resolve issues and concerns sooner rather than later.

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S. No	Specifications	Marks	
01	Assignments (Assignment 1-5) (5% each assignment)	25	
02	Assignment 6	10	
03	Assignment 7	45	
04	Writathon Questionnaire	10	
05	Class Participation	10	
06	Total (100)	100	



Course Title: Critical Thinking for Developing Perspectives Course Code: CC2171 Credit: 3 Course Instructors: Dr. Richa Mishra

Course Description:

The ability to clearly reason through problems and to present arguments in a logical, and compelling way, have become a key skill for survival in today's world. In this course, students will learn to dissect and evaluate the components of argument. Students will learn to raise vital questions, think from multiple perspectives, become aware of their biases, gather and assess information and come to a well-reasoned position.

Course Learning Outcomes:

The students will be able to:

- Explain the relevance of critical thinking
- Formulate significant questions for inquiry.
- Evaluate information and evidence for correctness, consistency, and relevance.
- Compose well-structured and well-reasoned arguments.
- Recognize their own beliefs, biases, claims and assumptions by viewing the issues from multiple perspectives

Topics to be Covered:

I. Introduction to the concept of critical thinking: (6 hours)

- Evolution of the concept: Philosophy and Cognitive psychology as origins of critical thinking
- Revisit Paul-Elder Critical Thinking Framework

Reading Material:

- 1. The Evolution of Critical Thinking (Research project by Barba Albers, Washington, State University ,2004
- 2. Critical Thinking https://plato.stanford.edu/entries/critical-thinking/#Aca
- 3. Bowker, M. H., & Fazioli, K. P. (2016). Rethinking Critical Thinking: A Relational and Contextual Approach. Pedagogy and the Human Sciences, 6(1), 1-26.
- 4. Bauer, N. J. (1991). Dewey and Schon: An Analysis of Reflective Thinking.

II. Questioning for Critical Thinking (4 hours)

- *Importance of questioning*
- Models of Questioning: Questioning Circles Model, Christenbury and Kelly (1983), Webb's Depth of Knowledge (1997). Elder & Paul (2007). Socratic Questioning Taxonomy.

Readings:

 Nappi, J. S. (2017). The importance of questioning in developing critical thinking skills. Delta Kappa Gamma Bulletin, 84(1), 30. <u>https://cpb-us-</u> <u>e1.wpmucdn.com/cobblearning.net/dist/6/3101/files/2018/05/The-Importanceof-Questioning-2aqkc5j.pdf</u>

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- 2. Bloom, B. S. (1956). Taxonomy of educational objectives. Vol. 1: Cognitive domain. New York: McKay, 20-24.
- 3. Paul, R., & Binker, A. J. A. (1990). Socratic questioning. Critical thinking. Center

III. Understanding Arguments (20 hours)

The sessions under this topic will make use of the context of current media, social and political debates to comprehend the topics.

- Meaning and Elements of Reasoning
- Formation of Arguments: Premise and Conclusion
- Inductive –Deductive reasoning: Difference between valid and invalid arguments/ between sound and unsound arguments.
- Evaluating Arguments: Examining data and information critically
- Cognitive Biases and Fallacies: Distinguishing between fact and opinion

Readings/Video(s):

- 1. Informal Logic <u>https://plato.stanford.edu/entries/logic-informal/</u>
- 2. Analyzing the argument Part 1 of 2 (Video) https://www.youtube.com/watch?v=pP8dWURrEF0
- 3. Battersby, M., & Bailin, S. (2013). Critical thinking and cognitive biases. <u>https://pdfs.semanticscholar.org/5e69/adfd998705dd8285bcbd8cfc7851bd7dc2ed.p</u> <u>df</u>

Reference Books:

- 1. Moore, B. N., & Parker, R. (2009). Critical thinking. Boston, MA: McGraw-Hill. eBook
- 2. Sinnott-Armstrong, W., & Fogelin, R. J. (2014). Cengage Advantage Books: Understanding Arguments: An Introduction to Informal Logic. Cengage Learning eBook

S. No	Specifications	Marks
01	Assignments	20
02	Quizzes	40
03	Report	15
04	Presentation	15
05	Class Participation	10
	Total (100)	100



Course Title: Research Design Course Code: ID2172 Credit: 4 Course Instructors: Dr. Ashwini Sharma

Course Description:

Research in Social Sciences allow scholars to make a better sense of the world around them. It helps them to look for answers to the questions that why people and institutions behave in the manner they do. It also helps them in becoming informed consumers of research findings and enable them to critique the literature. The objective of this course is to introduce participants to various elements of a research project starting from the methodological foundations to ethical considerations. Beginning with introducing the philosophy of scientific enquiry, it equips them with necessary knowledge and skills to identify and formulate a research problem, frame research questions about the validity and reliability of measures, select the appropriate research design, and ultimately prepare a research proposal. Intermediate issues like sampling, design and analysis considerations, as well as those of research validity are adequately dealt with as the course progresses.

Course Learning Outcomes:

Upon successful completion, the student should be able to:

- Demonstrate an understanding of various stages of scientific research
- Evaluate and synthesize research material to identify relevant areas of research
- Critically analyze and demonstrate an ability to formulate viable research questions
- Compare and contrast between various research methodologies
- Prepare a research proposal

Course Content:

- Foundations: Philosophy, Characteristics and Method of Scientific Research
- Theory of Measurement: Validity, Reliability, Levels of Measurement
- Sampling: Sampling Techniques, Sampling Issues
- Experimental Research Design
- Survey Research and Scaling
- Research Proposal Write up

S. No	Specifications	Marks
01	Reading Checks/Assignments/Quizzes	20
02	Class Participation/Attendance	15
03	MOOCs (Prescribed Course)	35
04	Research Proposal Write up	30
	Total (100)	100



Course Title: Multivariate Calculus (Elective) Course Code: AS2173 Credit: 3 Course Instructors: Dr. S.P. Gupta

Course Objectives:

This course is aimed to provide the students

- the fundamental concepts of functions of several variables, partial differentiation, multiple integrals, and application of these concepts in real life problems of rate of change, approximation, constrained and unconstrained maxima-minima
- the skills of vector calculus operations, understanding of vector fields, Green's Theorem, Divergence Theorem and the Stokes theorem.

Course Learning Outcomes:

On successful completion of this course, students will be able to

- investigate the limit and continuity of a function of several real variables at any point or over a specified region.
- compute partial derivatives of a function of several real variables and find the stationary points of a function of several real variables.
- utilize the method of Lagrange multipliers to calculate relative extrema subject to given constraints.
- transform functions from the Cartesian coordinate system to polar, cylindrical and spherical polar coordinate systems.
- transform multiple integrals into different curvilinear coordinate systems and evaluate the resulting integrals.
- formulate and evaluate double integrals to calculate surface area
- find directional derivatives and gradients of scalar functions.
- evaluate line integrals through scalar or vector fields and provide physical interpretations of these integrals.
- use Green's, divergence, and Stokes' theorems

Course Content:

- **Partial derivatives:** Functions of Several Variables, Limits and Continuity, Partial Derivatives, Tangent Planes and Linear Approximations, The Chain Rule, Directional Derivatives and the Gradient Vector, Maximum and Minimum Values, Lagrange Multipliers.
- **Multiple integral:** Double Integrals over Rectangles, Double Integrals over General Regions, Double Integrals in Polar Coordinates, Applications of Double Integrals, Surface Area, Change of Variables in Multiple Integrals.
- Vector calculus: Vector functions of a real variable and their derivatives, Vector fields, Line integrals, The Fundamental Theorem for Line Integrals, Green's theorem, Curl and Divergence, Parametric Surfaces and Their Areas, Surface Integral, Stokes' Theorem, The Divergence Theorem.



Reading Material:

James Stewart, "Calculus: Early Transcendentals", Brooks/Cole, 8th Ed., 2015.

Reference Book:

Geoff Renshaw, "Maths for Economics", Oxford (Indian Edition) 2nd Ed., 2009

S. No	Specifications	Marks
01	Mid Term-I	15
02	Class Participation	15
03	Quiz	20
04	Assignment	20
05	End Term Exam	30
	Total (100)	100



Course Title: Computer Programming (Elective) Course Code: ID2171 Credit: 3 Course Instructors: Prof. Alok Kumar

Course Objective:

The aim of the course is to build up a clear understanding of the fundamentals of Python programming. The course will discuss and cover the topics necessary for the students to write and execute the programs on their own.

Course Learning Outcomes:

On successful completion of this course, the students should be able to:

- 1. Write pseudo code for computable problem.
- 2. Use lists, tuples, and dictionaries in Python programs.
- 3. Identify Python object types.
- 4. Design structure and components of a Python program.
- 5. Use Python Control and Decision making Structures for writing programs
- 6. Write long iterative programs into recursive code.
- 7. Build programs that related to text analytics.
- 8. Build small graphics and animation programs.
- 9. Read and write files in Python.
- 10. Use Data Handling Techniques of Python
- 11. Use exception handling in Python applications for error handling, find syntax errors

Course Content:

- Algorithms and Program Development: Pseudocode, Algorithm, Algorithm Features, Developing an Algorithm, Programming Logic, Readability, Robustness, Correctness, Strategies for Program Design
- *Fundamentals of Python*: Beginnings with Python, Parts of a Program: Modules, Statements and Expressions, Whitespace, Comments, Special Python Elements: Tokens, Naming Objects, Variables, Objects and Types, Operators;
- *Control*: The Selection Statement for Decisions: if,
- Repetition: for Statement, In-Depth Control: Boolean Variables, Relational Operators, Boolean Operators, Precedence, while Statement, Nesting, Recursion;
- *Functions*: What Is a Function? Python Functions, Flow of Control with Functions, Scope, Arguments, Parameters, and Namespaces, Default Values and Parameters, Functions as Objects;
- *Files and Exceptions*: What Is a File?, Accessing Files: Reading Text Files, Accessing Files: Writing Text Files, Reading and Writing Text Files in a Program, File Creation and Overwriting, Handling Errors: Error Names, The try-except Construct, try-except Flow of Control, Exception;
- *Strings*: The String Type, String Operations, Formatted Output for Strings;



- *Lists and Tuples*: What Is a List? Iteration, Indexing and Slicing, Operators, Lists vs Strings, Split and Other Functions and Methods, Anagrams, Tuples from Lists, Python Diversion: List Comprehension;
- *Dictionaries and Sets*: Dictionaries, Python Dictionaries, Dictionary Indexing and Assignment, Sets, Python Sets, Methods, Operators, and Functions for Python Sets, Set Methods;
- Introduction to *Classes*: Object-Oriented Programming, Characteristics of OOP, Class and Instance, Object Methods, Fitting into the Python Class Model, Python and OOP, Python and Other OOP Languages, Classes, Types, and Introspection, Inheritance

Reading Material:

- 1. William Punch, Richard Enbody, 'The Practice of Computing Using Python'. Pearson, 2016
- 2. Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, No Starch Press
- 3. Mark Lutz, Learning Python, O'Reilly

Assessment	Sc	heme:	
			-

S. No	Specifications	Marks
01	Assignment	30
02	Quiz	20
03	Lab Evaluation-I	25
04	Lab Evaluation-II	25
	Total (100)	100



Course Title: Public Policy Seminar (Elective) Course Code: EP2290 Credit: 3 Course Instructors: Prof. Jane Fountain

Course Description:

The Policy Seminar equips professional masters students to understand, analyze and develop practical skills in public policy, primarily in the U.S. context. The course examines the nature of public policy and the key actors, entities and processes by which public policy is made. It illuminates the various contexts, processes, arrangements and institutional structures by which and within which public policy is developed, implemented and evaluated. The course will describe and analyze a variety of institutional and other actors in the policy process, including civil society and business. More broadly, course readings and discussions will shed light on "the rules of the game" and how they vary according to policy cultures and the strategies employed by decision makers within them. Course readings will cover economic policy and public budgeting, criminal justice, education, immigration and civil rights, social welfare and healthcare, and environmental and energy policy. In addition, the course will have a persistent focus through a stream of readings and related materials on information technology, particularly artificial intelligence, and public polic. We will examine both the science and technology policy processes by which artificial intelligence is guided and regulated and, in turn, explore the influence and implications of the Fourth Industrial Revolution, primarily enabled by computational power and analytics. This focus on artificial intelligence, while challenging, is meant to equip public policy graduate students with knowledge, perspectives, and tools for what some have called "AI-ready government."

Course Requirements:

Preparation of Assigned Reading and Contributions to Class Discussion - 30% of grade

Students are expected to prepare thoroughly before each seminar meeting and to participate actively. Students should come to class very well prepared to engage in discussion with peers. This demands careful reading and critical analysis in advance of class sessions. Comments should reference readings. Bring copies of readings to class in order to refer to them during discussions.

Each week you will be expected to read several articles and book chapters. These are listed on the syllabus. You should be ready to critique these articles and discuss them. In addition, a student each week will read, summarize, and critique each of the optional readings. (We will circulate a sign-up sheet to distribute responsibility for the optional readings during one of the first few sessions.)

Optional Reading Presentations: Each student will lead one class discussion on the optional readings for the assigned class meeting. The presentation should summarize the key points in the optional readings and lead into the class's discussion of the required readings. These 15-minute presentations should be accompanied by not more than five slides. More details will be provided the first day of class. Please post your PowerPoint in MOODLE so other students can refer to it and/or print it for their information.



Weekly Memos - 35% of grade

All students are expected to write weekly memos of about 500 words on the assigned readings. Memos are due by *Tuesday noon*, no exceptions and no late memos will be allowed. These memos should not summarize the readings but respond critically to them either by comparing and contrasting approaches and perspectives; by applying theory to practical problems to "test" the limits of theories; or by examining their underlying assumptions, logic persuasiveness, and implications. Think of most of the memos as having three components:1) a "wow" statement: ideas, concepts, arguments that you found stimulating, worth remembering and building on; 2) "puzzles": questions, concerns, disagreements with ideas encountered; and 3) "threads": connections, linkages, contradictions between one idea or approach and another.

Memos will be graded as a PD-, PD, or PD+ where these symbols equate roughly to B, A- and A.

Final Project - 35% of grade

A central activity of the course will be the opportunity for you to develop a policy research paper that investigates a policy challenge of your choice including a class presentation stating the problem addressed, key policy research questions, the policy setting, your conclusions or lessons, and broader implications. The paper should be about 10-15 pages, double spaced (about 2500-3750 words). Students are encouraged to meet with the instructor to develop the policy paper topic. Presentations will take place during the last two class sessions.

Course Expectations:

We will build a learning community in our class. This imposes obligations on you – it invites you – to be prepared for each class, to complete and turn in assignments that are your own work and on time, to listen carefully to and to show respect to your peers and to expect that you will be listened to and respected in turn. Differing views, perspectives, case analyses are what will make our class vibrant. But all claims require evidence, careful argument. Expect to have your views challenged. Expect to learn and change your thinking as you interact with your peers. Learning how to challenge others respectfully with a view toward learning is a critical professional skill and a key process in your own lifelong learning. I will be fully engaged in our discussions as well with the expectation that my own views and understanding will change and deepen through our interactions. We will spend time during the first class introducing ourselves and our learning objectives for the course.

Campus Resources and Policies

Feel free to talk with me about learning concerns and other matters related to your ability to make the most of this course and your professional development. I am happy to serve as a resource to you or to refer you to more knowledgeable sources.

Academic Honesty. Campus policies are clear regarding academic honesty. Your reputation at UMass and onward as a professional depends crucially on your honesty and integrity.

Our learning community is built on trust and fairness with a basic assumption that each person is producing their own work. Plagiarism, in part or whole, will result in a failing grade for the course and referral for further disciplinary action. Digital information makes it all too easy to "cut and paste" text. Be sure you know when you are quoting (or paraphrasing) the work of others. Also completely unacceptable are cheating, fabrication, and facilitating dishonesty. See the useful set of resources at "How Do I Know if I'm



Plagiarizing?" at https://www.umass.edu/academichonesty/HowDoIKnow.html

Additionalpoliciesandresources:https://www.umass.edu/academichonesty/index.html;https://www.umass.edu/honesty/

Disabilities. Please see me early in the course if you require an accommodation for a documented disability on file with Disability Services. The campus is fully committed to full access, empowerment and integration into campus life for people with disabilities. Policies and resources: <u>https://www.umass.edu/disability/</u>

Identity. Each student has the right to have their chosen name and pronouns respected and used throughout the class. It may seem obvious, but learning people's names ----- meaning what they prefer to be called ----- and using them is a core professional (and human) skill. The class roster in Spire lists your name ----- either legal first name or a preferred first name that has been entered in Spire. Students may also enter the pronouns by which they would like to be referred in Spire. Policies and resources regarding gender identity: https://www.umass.edu/stonewall/

Mental Health. The campus has excellent resources to help students and others cope with stress, anxiety, and other challenges to psychological wellbeing. Policies and resources: <u>https://www.umass.edu/counseling/</u>

Course Calendar

<u>1. January 22</u> Introduction to the course and to one another. Course requirements.

- <u>2. January 29</u>
- Rinfret et al., Chapters 1 and 2, The Foundations and The Policy Process and Policy Theories, pp. 1-43.
- Okamura, Keisuke. Dynamic development of public attitudes towards science policymaking. Public Understanding of Science 25(4), 2016.
- Ben Buchanan and Taylor Miller. Machine Learning for Policymakers: What it is and why it matters. Kennedy School of Government. June 2017. https://www.belfercenter.org/sites/default/files/files/publication/MachineLearnin gfo rPolicymakers.pdf (43 pages)
- Fountain, J. 2019. "The Wicked Nature of Digital Transformation: A Policy Perspective." *Dubai Policy Review*. January. <u>https://dubaipolicyreview.ae/the-wicked-nature-of-digital-transformation-a-policy-perspective/</u>

Optional Readings:

- Reimer, I. & Saerbeck, B. 2017. <u>Policy Entrepreneurs in National Climate Change</u> <u>Policy Processes.</u> *Environment and Planning C: Politics and Space*, 35(8), 1456–1470.
- Halpern, D. & Mason, D. (2015). Radical Incrementalism. Evaluation, 21(2), 143-149.
- Additional reading TBA
- <u>3. February 5</u>
- Rinfret et al., Chapter 3, Federalism and Intergovernmental Relations, pp. 45-70.
- Explore the website of the U.S. Government Accountability Office. gao.gov
- Kincaid, J. (2017). Introduction: The Trump Interlude and the States of <u>American Federalism.</u> State and Local Government Review, 49(3), 156-169.

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- Calo, Ryan, Artificial Intelligence Policy: A Primer and Roadmap. University of Washington School of Law. 19 Oct 2017. https://papers.ssrn.com/sol3/cf_dev/AbsByAuth.cfm?per_id=1042410
- Ward, K. C., Thompson, A. J., Iannacchione, B. M., & Evans, M. K. (2017). Crime, Laws, and Legalization: Perceptions of Colorado Marijuana Dispensary Owners and Managers. Criminal Justice Policy Review.

Optional Readings:

- Readings TBA
- <u>4. February 12</u>
- Rinfret et al., Chapter 4, Rulemaking and Regulations, pp. 71–94.
- Hagemann, R., Skees, J.H., and Thierer, Adam. Soft Law for Hard Problems: The Governance of Emerging Technologies in an Uncertain Future. *Colorado Technology Law Journal*. 17 (1): 37-130. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3118539
- Examine the Regulations.gov
- website Optional Readings:
- Hall, T. E. & O'Toole Jr., L. J. (2004). <u>Shaping Formal Networks Through the Regulatory Process</u>. *Administration & Society*, *36*(2), 186–207.
- Garmendia, C. A., Epnere, K., Bhansali, N. (2018). <u>Research Deviations in FDA</u>. <u>-Regulated Clinical Trials: A Cross-Sectional Analysis of FDA Inspection Citations</u>. *Therapeutic Innovation & Regulatory Science*.
- Reading TBA
- <u>5. February 19</u>
- Rinfret et al., Chapter 5, Economic Policy and Public Budgeting, pp. 95–124.
- Andrew Van de Ven, Ron Adner, Stephen Barley, Deborah Dougherty, Jane Fountain, Andrew Hargadon, Mark Kamlet, Beth Karlin, and Melissa Schilling.2017. "Increasing Benefits and Reducing Social Costs of Technological Innovations." *Behavioral Science & Policy*. 3(1): 93-103. https://behavioralpolicy.org/publications/past-issues/
- Examine the website of the Bureau of Labor Statistics
- Agrawal, A., Gans, J., and Goldfarb, A. The Obama Administration's Roadmap for AI Policy. Harvard Business Review. December 2016. https://hbr.org/2016/12/the-obama-administrations-roadmap-for-ai-policy
- Select Committee on Artificial Intelligence of the National Science & Technology Council. The National Artificial Intelligence Research and Development Strategic Plan: 2019 Update. June 2019. https://www.nitrd.gov/pubs/National-AI-RD-Strategy--2019.pdf

Optional Readings:

- Readings TBA
- 6. February 26
- Rinfret et al., Chapter 6, Crime and Public Policy, pp. 126-152.
- Examine the FBI: Unified Crime Reporting website <u>https://ucr.fbi.gov/crime-in-the-u.s</u>
- Cottrell, D., Herron, M. C., Rodriguez, J. M., & Smith, D. A. (2018). <u>Mortality, Incarceration, and African American Disenfranchisement in the Contemporary United States</u>, <u>American Politics Research</u>. Doi: <u>https://doi.org/10.1177/1532673X18754555</u>
- Additional Readings TBA



<u>7. March 4</u>

- Rinfret et al., Chapter 7, Education Policy, pp. 154–176.
- Additional readings TBA
- <u>8. March 11</u>
- Rinfret et al., Chapter 8, Civil Rights and Immigration Policy, p. 177–204.
- Additional readings TBA
- Biases in machine learning and datasets; Joy Buolamwini
- Canada, AI, and Immigration Policy

NO CLASS ON MARCH 18 - SPRING BREAK

<u>9. March 25</u>

- Rinfret et al., Chapter 9, Social Welfare and Health Care Policy, p. 205–233.
- U.S. GAO. Artificial Intelligence in Health Care: Benefits and Challenges of Machine Learning in Drug Development. GAO-20-215SP. Jan 21, 2020. 86 pages. https://www.gao.gov/products/GAO-20-215SP
- AI and Healthcare; healthcare disparities, AI, race, ethnicity and gender; health decision guidance system; AI and diagnostics

<u>10. April 1</u>

- Rinfret et al., Chapters 10, Environmental and Energy Policy, pp. 235–266.
- Additional readings
- 11. April 8 class presentations
- Rinfret et al., Conclusion: Public Policy, A Concise Introduction, pp. 268–278.
- Additional readings

12. April 15 - class presentations

NO CLASS ON APRIL 22 - HOLIDAY SCHEDULE

13. April 29 - Class presentations; course wrap-up



Course Title: Law & Citizenship Course Code: LS2104 Credit: 1 Course Instructors: Apurv Mishra

Overview:

You are a citizen. Which means you don't just possesses legal rights and responsibilities in relation to a particular government, but rather you are a member of one or more communities that you want to improve. Your communities may range from a block of houses or a single institution to the entire planet. The seminar on Law and Citizenship will equip you to fulfil this role of a public-spirited citizen. We will study issues that directly affect the lives of millions of citizens in context of accompanying legal frameworks. All these lectures are different but they all take the perspective of the citizen, draw on and enrich practical experience, and aim for a combination of facts, values and strategies that work in India.

The seminar focuses on the following three themes:

- I. Why You Matter: Rights and Duties of Citizens
- II. How to Matter: Advocacy on Boring and Unpopular Issues
- III. What Matters Now: Revisiting Citizenship in 21st century

Why You Matter: Rights and Duties of Citizens (4 hours)

- 1. A Lawyer, a Judge and a Politician Walk Into a Bar: Rights & Duties of Citizens
 - 1. Elections and a new definition of patriotism
 - 2. How the Emergency transformed the relationship between citizen and state
 - 3. Public Interest Litigations and RTI

How to Matter: Advocacy on Boring and Unpopular Issues (3 hours)

- 2. Rat Tails in Hanoi: How to Transform Good Ideas into Good Legislation
 - 1. How can citizens influence government policy
 - 2. Executive, Legislative and Constitutional interventions
 - 3. Acts vs. Rules

What Matters Now: Revisiting Citizenship in 21st century (3 hours)

- 3. The Curious Case of Yuvraj Singh and Sahaja Chowdary: Private Agreements, Public Consequences
 - 1. Contracts and trust in society
 - 2. Incorporation: the most powerful idea of the last millennium
 - 3. Contract negotiations: why 49 is better than 51
- 4. What do Naruto and Sophia Deserve: Re-examining Ideas of Citizenship, Liability and Property
 - 1. Digital Sovereignty and Citizenship in the age of Big Tech
 - 2. Aadhar case study

That Spiderman Quote: Don't Be an Irresponsible Citizen

S. No	Specifications	Marks
01	RTI Assignment	30
02	Quizzes	60
03	Attendance	10
	Total (100)	100



Course Title: Special Topics in Economics & Public Policy Course Code: EP2281 Credit: 1 Course Instructors: Santosh Mehrotra/Shubhasis Gangopadhyay

Overview:		
Format	Session	
Lecture &		
Open	Theme: Diagnostics of Unemployment; Job Creation	
Discussion		
	A chapter from his upcoming book with NITI Aayog Planning in the 20th	
Reading	<i>Century and Beyond.</i> This will focus on 8 suggestions for the manufacturing	
	strategy for India	
Group	The students will be divided into groups of 10 to discuss 2-3 strategies each	
Discussions	from the reading which will be facilitated by him.	
Presentations	Each group gives a 15-20 minute presentation based on their readings and	
& Conclusion	discussion which will be graded for the whole group.	

S. No	Specifications	Marks
01	Class Participation	15
02	Presentation	35
03	Assignments	50
	Total (100)	100



Course Title: Filmmaking- Using Creativity to Drive Action Course Code: LS2105 Credit: 1 Course Instructors: Aman Kaleem

Objective: To establish what is effective storytelling and how to do it.

Day 1| Duration 2.5 Hours

MODULE 1: Watching Films and what to see **Duration** : 60 Minutes

- 1. Showing sequence of the film Whiplash: reference to explain 'What is a character in a story'; how to identify a character in a story; 'how to select a character based on the theme of the story?'
- 2. These lead to a discussion on the difference of 'fictional story' and 'non-fictional story', where 2 sets of trailers are screened: 'Whiplash and Shaadi Sex aur Parivaar' to establish the difference between non-fictional and fictional work.
- 3. Invited participants to share examples of nonfiction and fictional work they have seen.

How do they identify the difference? (Interactive session)

Deliverables for the module: Interactive Q&A to identify the difference between fictional and non-fictional story frames and to identify the elements that differentiate fictional and nonfictional work.

MODULE 2 : What is an arch?

Duration: 90minutes

- 1. This module begins with the 'Spine Rule'. Here, the participants are explained how to build a story around a social issue by establishing a character, context, problem statement, intervention, and impact. This is followed by showing a social impact story of 'Ayush', a school going kid who followed the said rule. This is followed by a role-play exercise, where all the participants are divided into 4 groups, where they develop a story on 4 social issues and enact it, following the 'Spine Rule'.
- 2. This is followed by explaining the elements of how to capture a good frame. For this, we make the participants use their mobile phones to take pictures of other participants by applying the rules of capturing a good frame.
- 3. Next, we explain to the participants the concept of lighting to capture a good frame, followed by 'how to capture sound effectively'.

Outcome of the module: By the end of the module the participants will understand the difference between fictional and non-fictional narrative; technicalities of shoot (frame, light and sound); how to build a narrative using 'The Story Spine' tool.

Course work after day 1- Write a one page story



DAY 2 | Duration 5.5 hours

MODULE 4: 'Read your story?' Duration: 60 minutes

Objective: To invite participants' to read and analyse their story based on the parameters of effective storytelling shared in the previous 2 modules, what is interesting and relatable?

Outcome of the module: By the end of the module the participants will be able to apply the previously explained parameters to their favourite stories to understand how effective storytelling tools work to move people.

MODULE 5: What is Consent and Ethics when capturing a story? Duration: 40 minutes

Objective: To invite participants' to understand the protocols to be followed when capturing a story.

Outcome of the module: By the end of the module the participants will understand: what is consent; how to take consent; rule of thumb for shoots.

MODULE 6: How to shoot your story Duration: 40 minutes

Step 1. 'How to Shoot on Phone: the technicalities of a shoot'. Here we will describe the three components to be kept in mind while shooting on phone: Light, Sound, and Framing.

We will explain 'What is a frame?', followed by 'what does framing mean when shooting?'. What are the components that make a frame? How to select a suitable frame? Second, we will explain 'What does light mean when shooting?' (*Show a good frame and a bad frame: tell the difference*) Third, we will explain the 'role of light' in fictional narrative and non-fictional/documentary narrative.

MODULE 6: Shoot your story Duration: 60 minutes

Participants will be asked to create a short sequence on their phones with the discussed motion and framing techniques of 1 minute Screening of the film - 60 minutes

Q and A and Evaluation of the session by students 30 minutes

S. No	Specifications	Marks
01	Class Participation	20
02	Script	40
03	Film	40
	Total (100)	100