Curriculum Structure for
Master of Science (Digital Society)
at
IIIT-Bangalore

Revised: 5th June 2018

International Institute of Information Technology Bangalore

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1 LEARNING TASKS AND ACHIEVEMENTS

The Master of Science (Digital Society) program aims to create a group of professional practitioners and researchers who possess a nuanced and multi-dimensional understanding of today's information age. It seeks to provide a rigorous and broad-based training in the design and development of digital technologies, issues pertaining to the management of complex digital systems and the policy challenges of deploying them. This training draws from computer science & engineering, data science, design, management, economics, sociology, political science and information science. Structured as a combination of coursework and an internship/thesis, the program will allow students to build a foundation for careers in the government, the corporate world, policy advocacy, academia and social enterprises. As part of the distinctive academic curriculum, students will find immense learning opportunities to work in multi-disciplinary peer groups of the kind they are increasingly likely to encounter in their careers.

This first major revision of the curriculum structure follows the recommendations of the M.Sc. (Digital Society) Program Review Committee 2017 which was approved by the IIITB Senate during its 60th meeting on 21st February 2018.

2 COURSES: CATEGORIES AND LEVELS

The core curriculum – two orientation courses and a set of eight courses during semesters 1 and 2 - will strengthen students' foundations in technological and social science approaches to understanding the digital. A series of five electives courses will provide students the option to specialize in one of the following three streams:[1]

1. Human-centred digital design
2. Data intensive digital design
3. Research and policy studies

Students who would like to design products and services are expected to be attracted primarily to streams 1 and 2, whereas those with a research or public policy bent might be amenable to stream 3. Specialisation will not be mandatory. However, should they choose to specialise in a stream, students will need to pick at least three of their five electives [both MSc (Digital Society) electives and others] in that stream.

3 CURRICULUM STRUCTURE: COMPONENTS AND CREDITS

The curriculum structure for this programme had emerged in 2015 after detailed discussions amongst the members of the curriculum drafting committee and with outside experts, and a study of similar programmes in premier institutions/universities in India and abroad. This revised curriculum too is based on extensive discussions of the M.Sc. (Digital Society) Program Review Committee and feedback from instructors and alumni of the programme in 2017. The salient points are given below:

[1] *Note: This will not be a formal specialization that is awarded to students, but merely a way to structure trajectories a bit more than at present based on the inputs of the curriculum review committee.*

- The period of the program will be two years.
- The total number of credits required to fulfil requirements of the program is 66.
- The broad content structure of the proposed program is summarized in Tables 1 and 2

Table 1: Overview of the curriculum

Program Orientation (2 weeks, 2 courses, 0 credits)
Programming Foundations (Satisfactory/Unsatisfactory) Social Science Foundations (Satisfactory/Unsatisfactory)
Term 1 (15 weeks, 18 credits, 5 core courses)
Digital Components of a Connected Society (4) Application Development for a Connected Society [2](2) Human Computer Interaction (4) Research Methods (Quantitative and Qualitative) (4) - *new* Technology and Society (4)
Term 2 (15 weeks, 16 credits, 3 core courses, 1 elective)
Technology in Development (4) ICT Policy and Regulation (4) Social Complexity and Systems Thinking (4) Elective I (4)
Term 3 (15 weeks, 16 credits, 4 electives)
Electives II, III, IV & V (4x4)
Term 4 (26 weeks, 16 credits)
Thesis/Internship (16)
Total Credits 66

Table 2: Credit distribution

	Proposed Credits	**%**
Core courses	30	45.5
Elective course credits	20	30.3
Internship/Thesis credits	16	24.2
Total credits requirement for M.Sc. (Digital Society)	**66**	**100**

[2] *Those with prior experience in building systems may choose to take the Enterprise Software Development course in lieu of this one.*

4 COURSEWORK

Core courses will provide students an understanding of technology fundamentals and a constructive critical lens to analyse how digital technologies work in the social world. All courses were specifically designed - and have now been revised - keeping in mind the needs of a heterogeneous student body and our experience teaching three cohorts of the programme. The goal will be to provide fundamentals to students from different backgrounds, without forcing them to repeat material they already know well. For the courses focused on technology, we do this by focusing on dimensions and cases of technology design and deployment, such as their scale and diversity of audience that even technology students are unlikely to have encountered. Similarly, for those with a social science background, the focus on digital technologies as the object of social analysis will set these social science courses apart. The course on Research Methods will enable all students to understand how to examine user needs and outcomes, and to evaluate the impact of ICTs.

All students will attend two courses - Programming Foundations and Social Science Foundations - during the Orientation weeks (on a Satisfactory/Unsatisfactory basis). Following that, they will be required to take eight core courses through semesters 1 and 2. The core courses offered during the Orientation weeks, and in semesters 1 and 2, will be foundational for all electives and streams in subsequent semesters. Moreover, some of the electives will build explicitly on specific core courses.

4.1 Program Orientation courses

Because we expect and welcome a heterogeneous student body with different disciplinary backgrounds, we propose a mandatory orientation of two weeks to prepare students to learn and work together in the following semesters. The orientation will have two components: Programming Foundations and Social Science Foundations.

Programming Foundations (2 weeks, 30 hours)
This course will introduce fundamental concepts of programming at an entry level. Following are the highlighted objectives of the course:
- An introduction to broad taxonomy of software systems in terms of their application and architecture
- Introduction to the building blocks of a computer program
- Design and implementation of software systems solving real-life problems

Social Science Foundations (2 weeks, 30 hours)
This course will provide students an overview of what is studied in the Social Sciences and its significance. The course will use exemplars from the various social sciences (economics, sociology, economics, and social psychology) to understand how social science is conducted, with what goals and how it contributes to understanding the social world, including in its use of digital technologies. The course will also train students in reading, writing and presenting social science research. While this course is titled “Social Science Fundamentals”, we believe that many of the skills these sessions introduce will stand students in good stead beyond their social science-based courses during their Masters, extending to all their courses and their thesis/internship period.

4.2 Semester I courses

Digital Components of a Connected Society (4 credits)
This course is intended to provide students with an understanding of the fundamentals of digital technologies and the key building blocks of digital solutions. The course will discuss how computers work, basics of data representation, communication, the internet, structure and working of large networks, and examples of how these combine and scale to enable complex digital solutions. We will also discuss the evolution and impact of selected technologies, as well as issues such as privacy and security related to these solutions.

Application Development for a Connected Society (2 credits)
This course introduces students to the theory and practice of tools for a connected society. This entails developing web and mobile applications using Javascript and Java. The course guides the students through the design and development of internet applications using common architecture elements and design patterns, with popular open-source frameworks and libraries. The course will also discuss relevant aspects of design thinking and human computer interaction (HCI) required for application development.
OR
Enterprise Software Development (2 credits)
Those will prior experience of building large digital systems may choose to take this course instead of Application Development for a Connected Society. In this course, a student will be exposed to the elements of enterprise software development with primary focus on web application development and mobile application development.

Human Computer Interaction (4 credits)
Initially concerned with how computing systems could be designed to be efficient and easy to use, the field of Human Computer Interaction (HCI) now engages with a wide range of issues, including ways in which interactive systems and their design can create enjoyment and pleasure or be part of social and political change. HCI practitioners increasingly find themselves at the forefront of studying broader concerns about interactions between humans and technology, then applying these understandings by translating them into design. It is through design that HCI seeks to transform, for example, social concerns or personal needs into new technologies and associated practices. This design process – methods and approaches to creating new forms of technology – will be the focus of the course. During the course, we will broadly be following the structure of a design project, engaging with a wide variety of theory and methods of HCI along the way. The course will primarily focus on human centered and participatory approaches to design, which have been recognized as crucial for technology interventions to be able to serve the needs of their users.

Technology and Society (4 credits)
Technology can be studied in its different dimension as it comprises of facts, artifacts, know-how, processes and, last but not the least, contexts. The relationship between technology and society is an established field of study within the social sciences and humanities. Different disciplinary affiliations ranging from the sociology of scientific knowledge to science and technology studies, from the history of technology to the philosophy of technology, have analyzed this relationship. Together, such scholastic approaches touch upon wide-ranging and often complex facets of the relationship between technology and society. Leveraging examples of infrastructural technology, everyday use technologies, communication technologies and

digital technologies, this course provides a preliminary overview of these approaches across three aspects of technology. This course will serve a basic objective, that is, to demonstrate how the relationship between technology and society is mutually inclusive.

Research Methods (4 credits)
This course will provide an overview of the philosophical foundations of social science research methods. It will serve as a holistic introduction to modes of explanation and traditions of social inquiry that contribute to conceptual and methodological building blocks in the conduct of research. It will offer students a preliminary footing to appreciate the quantitative and qualitative traditions of research methods by assessing the strengths and limitations of each of the methods, the conditions under which each of the methods is used, the generalizability and purpose of each of the methods, as well as the ethical implications of doing research.

4.3 Semester II Courses

Social Complexity and Systems Thinking (4 credits)

Inconsistencies in managing the design and deployment processes in many social projects, especially those that seek to leverage the potential of digital technologies, lead to various issues not only with respect to time and cost overruns but also in terms of their missing critical considerations and viewpoints while setting desired objectives. Projects that deploy digital technologies for addressing the needs of large and diverse population groups are often found to exhibit properties of complex systems and, using their examples, this course introduces the students to different elements of complexity inherent in social and socio-technical systems, which can be used to model reality and design change processes using digital technologies in a better way/

Technology in Development (4 credits)

This course explores the multiplicity of social inequalities and the ways in which development thinking is linked to them in our contemporary digital society. Students will be trained to recognize and analyze social divides such as gender, caste, class, and region. The course will provide students a framework to examine how these divides have been progressively conceptualized and addressed with the trajectory of development discourse since post-war times as an example. While presenting a comprehensive analysis of different theories and practices of development, this course will focus on two dimensions: first, how are some of the classical inequalities and debates of development reproduced in the digital space and, second, how does the digital space give birth to new issues of contestation within the broader development discourse.

Information and Communication Technology Policy and Regulation (4 credits)

There is a paradigm shift in the ICT industry today due to convergence in various technologies and services, the ubiquity of the Internet, the emergence of app economy, the pervasiveness of social media and peer-to-peer networking, the intelligence of terminal devices and applications, and the voluminous data that is being collected by networks and networking firms. These pose challenges in the areas of privacy, security, market power, pricing, interconnection, radio

spectrum management, industry structure and Intellectual Property Rights. This course provides the theoretical and policy base for analyzing these issues.

Elective I (4 credits)

Starting with semester 2, students will be able to pick elective courses (one in semester 2 and four in semester 3). Additionally, if they so wish, they can choose to specialise in Human-centred Digital Design, Data-intensive Digital Design, or Research & Policy Study. As mentioned earlier, to specialise in a stream, at least three of a student's five electives will need to be from electives slotted under that stream. An indicative elective pool categorised by stream is captured in Table 3.

4.4 Semester III Courses

In Semester III, students will choose four electives

Electives II, III, IV and V (4x4 credits)

Same rules apply as for Elective I in the previous semester.

Table 3. Pool of electives for semesters 2 and 3, categorized by stream[3]

Human Centred Digital Design	**Data Intensive Digital Design**	**Research and Policy Studies**
• Advanced Qualitative Research Methods • Advanced Interface Design/HCI *(new)* • E-Governance Application Design • IT Product and Project Management • Smart Cities • Social Media Communication • Web Science	• Advanced Quantitative Methods/ Data Manipulation *(new)* • Data Analytics • Data Visualization • Geographical Information Systems • IT Product and Project Management • Introduction to Machine Learning *(new)* • Web Science	• Advanced Qualitative Research Methods • Advanced Quantitative Methods/ Data Manipulation *(new)* • Dynamics of the IT Industry • E-Governance Application Design • Political Economy of Location • Smart Cities • Social Media Communication • Techno-Economics of Networks

[3] *Note: An elective may appear in more than one stream; more electives may be added depending on future need and interest of students and faculty members.*

5 THESIS/INTERNSHIP (Semester IV)

The 4th semester will consist of a 26-week thesis/internship. Students will earn 16 credits upon its successful completion.

For the students pursuing Internship:

- Internships are six months (not less than five months) of supervised project work carried out at any of the relevant institutes in public, private and social sector or at academic institutions.
- The internship committee will ensure that mid-term feedback is collected for every student pursuing internship to ensure smooth progress towards completion.
- At the time of internship completion, the internship committee will also collect the certificate (satisfactory/unsatisfactory) from concerned persons at the organization. If the certificate is unsatisfactory, the institute internship committee will review the matter. If they agree with the certificate given, the student has to repeat the internship at the same or different organization. If the certificate is satisfactory, the student fulfils the requirements of internship.

For students pursuing the Thesis option, the following guidelines hold:

- There will be a thesis committee comprising the supervisor and at least two more faculty members. Members of this thesis committee will serve as thesis and oral examiners for each student pursuing the thesis option.
- The thesis style rules will be available on LMS for all thesis students to use.
- A soft copy of the thesis in .pdf format should be sent to the IIITB librarian a week before the final submission of thesis date according to the institute's calendar (which will be after the thesis oral exam). The librarian must officially approve the soft copy of the thesis before it is sent out to be printed or bound.
- This program will follow the existing academic calendar with fixed dates for the following tasks specific to thesis evaluation: constitution of thesis committee, submission of draft to the committee(s) (a week before the oral examination), a week dedicated for all the M.Sc. (Digital Society) thesis defence, date for submission of soft copy to the librarian, and a date for final submission of the hardbound thesis to the library.

APPENDIX: DESCRIPTION OF CORE COURSES

Program Orientation Courses

Course Name	**Programming Foundations**
Course Branch	M.Sc. (Digital Society)
Course Proposer Name(s)	Sujit Kumar Chakrabarti
Course Instructor Name(s)	Sujit Kumar Chakrabarti
Course Type	M.Sc. (Digital Society) Orientation
Credits	0
Area of Specialization (if applicable)	-
Grading Scheme	Satisfactory/Unsatisfactory
Pre-Requisites (where applicable, specify exact course names)	
None	
Course Description	
This course will introduce fundamental concepts of programming at an entry level. Following are the highlighted objectives of the course: - An introduction to broad taxonomy of software systems in terms of their application and architecture - Introduction to the building blocks of a computer program - Design and implementation of software systems solving real-life problems There are approximately 10 learning sessions of 3 hours each. Each such session is divided into two halves. The first half is a lecture, and the second half is a laboratory. The course concludes with a micro-project in software development done in a team (2-3 people). The participants will get about 10 hours (approximately the last 3 sessions) of development time to complete the project.	
Course Content	
<u>Introduction to Software Systems (1.5 hours)</u> Domain (Enterprise, embedded) Non-functional Requirements (Real-time, safety/business critical) Architecture	

Monolithic/distributed
client-server
networked
web-based
run-to-completion/reactive
Application (word-processor, email-client, browser etc.)/system (OS, DBMS, compiler)

Programming with Javascript (6 hours)
Basic features: expressions, instructions, variables
Control structures: if-else, loops

Software Design Basics (6 hours)
Modularisation and re-use
Functions
Designing reactive program with Javascript – Callbacks

Web Programming Project with Javascript (6 hours)
HTML, HTTP
Web-services, web-APIs, REST
Connecting with web-APIs using Javascript

Assessments (optional for Special Topics courses)

TBD

Text Book / References

1. Eloquent Javascript – Martin Haverbake
2. You Don't Know JS (Up and Going) – Kyle Simpson
3. Online resources

Course Name	**Social Science Foundations**
Course Branch	M.Sc. (Digital Society)
Course Proposer Name	Janaki Srinivasan
Course Instructor Name	Janaki Srinivasan, Usha Reddy, Radha Parikh
Course Type	M.Sc. (Digital Society) Orientation
Credits	0
Grading Scheme	Satisfactory/Unsatisfactory

Pre-Requisites (where applicable, specify exact course names)

NA

Course Description

In this 2-credit equivalent orientation course, we introduce (or reorient) the entering cohort of MSc Digital Society students to the Social Sciences. More specifically, our goal is to provide students an overview of what the Social Sciences seek to do, the significance of what they do and how they go about doing this work. While this course is titled "Social Science Fundamentals", we believe that many of the skills these sessions introduce will stand students in good stead beyond their social science-based courses during their Masters, extending to all their courses and their thesis/internship period.

Course Outcome

At the end of the course students, are expected to UNDERSTAND :

- what the Social Sciences seek to do
- the significance of what they do
- how social scientists go about doing this work
- Implications of the Social Sciences for the digital era

They are expected to DO:

- Learn from exemplars of social science research
- Read and write effectively in the context of social science research (introductory level)
- Communicate research in an interdisciplinary environment
- Integrate ethical decision-making in their work process

Course content

Over the two weeks of orientation, sessions will cover the basics of observing the social world and critical thinking, as well as deep reading, writing coherently, communicating one's ideas clearly and ethical decision-making.

We will begin with an outline of the types of questions that the various Social Sciences (covering Sociology, Psychology, Political Science, Economics and History) ask about the world. We will then discuss the implications and significance of such research for the 'Digital Society' we inhabit today Session 1). In Session 2, we will examine what it means to observe the social world, what do we see or not see about it, and how critical thinking help us see new things, actors, categories of behaviour etc.

Sessions 3-5 will examine the role of social science in Formulating Problems, in Designing Solutions and in Evaluating Solutions (especially in the context of evaluating how a technology/initiative works for different sections of population, differently than intended etc.). Throughout, we will use exemplar pieces of research from the various Social Sciences (as well as from interdisciplinary perspectives) to make our point. We will be using both technological and non-technological examples of 'problems' and 'solutions.' Classroom exercises will also be used to enhance understanding and higher order thinking (which might be different than what they have been accustomed to in UG.)

Following this overview (sessions 1-5), we will spend the rest of the course understanding how Social Science is "done" and the skills that you will need to successfully understand or conduct Social Science research, to deploy insights from such research to technology or policy design, and to communicate these insights to diverse audiences.

Session 1 Introduction to the Social Sciences

Session 2 Observing the Social World and Critical Thinking

Session 3 Social Science in Formulating Problems

Session 4 Social Science in Designing Solutions

Session 5 Social Science in Evaluating Solutions

Session 6 & 7 Reading skills (focused on enabling students to critically analyse the material and formulate questions based on the reading material)

Session 8 & 9 Writing (Structuring an essay, making an argument, referencing style)

Session 10 Communication and Ethics (Organizational communication, presenting research to different audiences, Ethical decision-making)

Assessments/Grading

Assessment will be based on a mix of reading and writing assignments, in-class activities and presentations.

Texts/References

This course will not use a single textbook, but draw on cases from various social sciences disciplines to arrive at its insights. A few books are, however, indicated below:

Banerjee, Abhijit and Esther Duflo. 2012. *Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty.* Public Affairs.

Berger, Peter. 1963. *An Invitation to Sociology. A Humanistic Perspective.* Anchor.

Headrick, Daniel R. 1981. *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century.* Oxford University Press.

Hogg, Michael A. and Joel Cooper. 2007. *The Sage Handbook of Social Psychology.* Sage Publications.

Maurer, Bill. 2015. *How would you like to Pay?: How Technology is Changing the Future of Money.* Duke University Press.

Mills, C. Wright. 1959. *Sociological Imagination*. New York: Oxford University Press.

Semester I Courses

Course Name	**Digital Components of a Connected Society**
Course Proposer Name(s)	T. K. Srikanth
Course Instructor Name(s)	T. K. Srikanth
Course Type	M.Sc. (Digital Society) I Semester Core
Credits	4
Grading Scheme	4-point scale: (A,A-,B+,B,B-,C+,C,D,F)
Area of Specialization (if applicable)	
Semester	Term I Academic Year: 2018-19
Pre-Requisites (where applicable, specify exact course names)	
None	
Course Description	
This course is intended to provide students with an understanding of the fundamentals of digital technologies and the key building blocks of digital solutions. The course will discuss how computers work, basics of data representation, communication, the internet, structure and working of large networks, and examples of how these combine and scale to enable complex digital solutions. We will also discuss the evolution and impact of selected technologies, as well as issues such as privacy and security related to these solutions. The course does not require knowledge of programming.	
Course Content	
Module 1: Computers and computing • Key enablers of the digital world: Universal digital representation, universal digital processor, universal digital communication, and universal digital data. • Computing machines and Computer Architecture: The von Neumann architecture. Evolution of processors and Moore's Law. Hardware abstractions. Memory hierarchy, cache, and operations. Performance improvements through parallelism, levels of parallelism. Module 2: Operating Systems, Virtualization and Languages	

- Abstractions provided by the OS. Virtualization of CPU's and other resources. Processes and virtual processors. Concurrency, synchronization and semaphores. Scheduling schemes, fairness and mutual exclusion with performance. Virtual memory. Overview of programming languages and programming paradigms.

Module 3: Data Modelling and Databases

- Introduction to data modelling
- Database systems and RDBMS
- Reliable storage.

Module 4: Communication - The Internet

- Performance characteristics of networks - bandwidth, latency, jitter, quality. Typical bandwidth and latency for a range of technologies. Types and scale of networks.
- Top-down view of the internet. Principle of layering and the 4-layer internet architecture. The end-to-end principle and building up reliability in end-to-end communication. Network delays, flow control and congestion control.
- Application layer protocols. Stateless protocols and client-server architecture over TCP.

Module 5: Internet and Security

- Evolution of security in the internet from a "group of mutually trusting users". Types of attacks. Requirements of secure communication. Message integrity and endpoint authentication.
- Cryptography. Common encryption mechanisms, symmetric keys, public key cryptography, hash functions. Message Authentication codes and digital signatures. SSL and HTTPS.
- Tracking on the internet, privacy and protection of information.

Module 6: Internet-based Applications and Services

- Architecture of internet-based digital platforms and services.
- Cloud and "X-as-a-service".
- Scale, security and performance.

Assessments

One mid-term exam and one final exam, assignments, plus class participation

References

- Brian Kernighan, D is for Digital.
- John L. Hennessy, David A. Patterson, Computer Architecture - A Quantitative Approach.
- Operating Systems: Three Easy Pieces, Remzi H. Arpaci-Dusseau and Andrea C.

Arpaci-Dusseau. www.ostep.org
- James F. Kurose, Keith W. Ross, Computer Networking: A Top-Down Approach

Papers, articles, lecture notes and other material provided during the course

Course Name	**Application Development for a Connected Society**
Course Proposer Name(s)	T. K. Srikanth and Jaya Sreevalsan Nair
Course Instructor Name(s)	Jaya Sreevalsan Nair
Course Type	M.Sc. (Digital Society) I Semester Core
Credits	2
Grading Scheme	4-point scale: (A,A-,B+,B,B-,C+,C,D,F)
Area of Specialization (if applicable)	
Semester	Term: I Academic Year: 2018-19

Pre-Requisites (where applicable, specify exact course names)

Basic knowledge of programming

Course Description

This course introduces students to the theory and practice of tools for a connected society. This entails developing web and mobile applications using Javascript and Java. The course guides the students through the design and development of internet applications using common architecture elements and design patterns, with popular open-source frameworks and libraries. The course will also discuss relevant aspects of design thinking and human computer interaction (HCI) required for tool development.

Course Content

The course has two modules, each of which has a theory and lab component:
Module 1: Understanding of Working of Internet-based and Mobile Applications

- Basics of programming in Java, Javascript, and Android
- Software architectures for web applications: Key building blocks and design patterns
- Design and implementation of a typical web application using popular server and client frameworks and databases, using HTML5/CSS, Javascript, SQL and Java as needed
- Design and implementation of a mobile app: cross-platform and hybrid frameworks, leveraging capabilities of a mobile (such as sensors and cameras).

Module 2: Understanding the User

- User behavior, and preferences in consumption of digital media and social networking

• User-centric/human computer interaction (HCI) design patterns in developing tools • Web content accessibility guidelines • User studies for web applications: designing and conducting
Assessments (optional for Special Topics courses)
One mid-term exam and one final exam, assignments, plus class participation
Text Book / References
Papers, articles, lecture notes and other material provided during the course.

Course Name	**Enterprise Software Development**
Course Proposer Name(s)	JayPrakash T L
Course Instructor Name(s)	JayPrakash T L
Course Type	Core for M.Sc. (Digital Society) Semester 1 students satisfying pre-requisites (can be taken instead of "Application Development for a Connected Society")
Grading Scheme	4-point scale (A,A-,B+,B,B-,C+,C,D,F)

Area of Specialization
(Choose by placing X against not more than two areas from the list)

X	Theory and Systems			Networking and Communication
	Data Science			Signal Processing and Pattern Recognition
	VLSI Design			General Elective

Pre-Requisites (where applicable, specify exact course names)

Prior permission of the instructor

Course Description

In this course, a student will be exposed to the elements of enterprise software development with primary focus on web application development and mobile application development.

Course Content

Topic 1: Fundamentals of Object-oriented Analysis and Design

- OO concepts
- Unified Modeling Language (UML)

Topic 2: Software Architectures

- Understanding large scale systems – MVC, Web architecture, REST, mobile architecture, and hybrid systems along with relevant concepts on reference and enterprise architecture.
- Understanding quality attributes
- Introduction to design and architectural patterns

Topic 3: Web application development

- MVC for Web - Twitter Bootstrap (rendering view), jQuery, Ajax (from jQuery) and servlets (controller), REST service, back-end model - MySql, Java programming and concepts of key value pair (like mongo DB – implemented using MySql)

Topic 4: Mobile application development

- Connectivity, security, online / offline modes, integration of sensors, location services, responsiveness.
- AngularJS and related frameworks

Assessments

1. Mid-term exam – 20%
2. End term exam – 30%
3. Mini Project – 50%

Text Book / References

1. Software Architecture in Practice by Bass and Clements, Addison Wesley.
2. Ajax - https://www.youtube.com/watch?v=f46WEeM8HTA
3. REST Services - https://www.youtube.com/watch?v=xkKcdK1u95s
4. Jquery Tutorial - https://www.youtube.com/watch?v=8mwKq7_JlS8

Course Name	**Human Computer Interaction**
Course Branch	M.Sc. (Digital Society)/iM.Tech./M.Tech.
Course Proposer Name(s)	Amit Prakash
Course Instructor Name(s)	Linus Kendall
Course Type	Core for M.Sc. (Digital Society) I Semester Elective for iM.Tech./M.Tech.
Course Level	Level 2
Credits (L:T:P) **(Lecture : Tutorial : Practical)**	Lecture (2)+ Tutorial (1)+ Practical (1) = 4 credits
Grading Scheme	A,A-,B+,B,B-,C+,C,D,F

Pre-Requisites (where applicable, specify exact course names)

NA

Course Description

Human Computer Interaction (HCI) is a wide-ranging, interdisciplinary field drawing on a wide variety of other fields such as computer science, design, media studies, cognitive science, sociology and psychology. Having initially been concerned with how computing systems could be designed to be efficient and easy to use, the field now engages with a wide range of issues. These include, for example, ways in which interactive systems and their design can create enjoyment and pleasure or be part of social and political change. As computing has become ubiquitous, so has HCI and its practices. Therefore, HCI practitioners increasingly find themselves at the forefront of studying broader concerns about interactions between humans and technology, then applying these understandings by translating them into design.

Design is central to HCI and accordingly in this course the design process will be our focus. It is through design – methods and approaches to creating new forms of technology – that HCI can transform, for example, social concerns or personal needs into new technologies and associated practices. During the course, we will broadly be following the structure of a design project. Throughout the design project's different phases, we will engage with a wide variety of theory and methods of HCI. Our focus will lie on screen based interfaces – but we will also consider other interaction modalities such as voice based interfaces. The primary design approach we will take focuses on human centred and participatory approaches. Increasingly, these approaches have been recognized as crucial for technology interventions to be able to serve the needs of its users. However, we will also discuss the limitations these have and when and where other design approaches may be suitable.

This course provides a foundation relevant to any student who will take part in technology design or implementation. While design is often thought of as part of specialized practice of

consultancies or internal design teams, in this course we will consider how design is part of any project that involves digital technologies. The methods and approaches taught can be used regardless of whether as part of a formal design process, or informally used in a technology implementation project.

At the end of this course, we will have gone through an entire design cycle to produce an evaluated prototype. For many contexts, this prototype will already represent a product that can be put into use by its intended users. In other contexts, this prototype would be the starting point from which the final implementation would be constructed. From this process, the students will have gained the necessary skills to create a design and translate it into a prototype that they can evaluate together with users. This would include the application of frameworks and tools for both low- and high-fidelity prototypes.

Considering the breadth of the field of HCI, there are many things that we will not cover as part of this course. We will not deeply engage with laboratory studies or detailed interface guidelines and standards, even though we will apply some throughout the course. Psychological models of cognition and memory or neurological and physiological models of sensory input will be referred to through additional readings for interested students, but not covered as part of the main course. The course will primarily concern itself with screen based interfaces and to some degree voice based. However, based on interest students can explore other modalities such as haptic or tactile interfaces, augmented and virtual reality, invisible interfaces, wearables or ubiquitous computing.

This course will link with other courses in the curriculum both showing how sociotechnical concerns can be translated to practice through the process of design, but also introduce students to how design itself is an increasingly important part of the political economy.

Course Outcomes

The course is intended as a basic introduction to human computer interaction for students with interdisciplinary backgrounds. It teaches the basic concerns, practices and methods of HCI, placing them in relation to other parts of their curriculum. It should provide students with understanding of a variety of methods, practices and principles in HCI. It should equip them to participate or even run a design project. The intended learning outcomes are:

- Apply appropriate methods – both involving users and not - to:
    - Study a specific user group or usage situation, using both literature and field methods
    - Formulate and communicate design opportunities, constraints and requirements from such a study
    - Design and critically evaluate different solutions to a design problem, drawing on HCI theory and practice, experience of the problem domain and user studies
    - Manifest designs through appropriate use of low and high-fidelity prototypes
    - Evaluate prototypes and designs
- Discuss the theoretical underpinnings of human computer interaction and their relevance to a given design task
- Identify broadly applicable design principles to a given design task in relevant domains

- Locate design activities in relation to other parts of software development and implementation practice
- Appreciate how socioeconomic concerns can be translated into practice through HCI via choice of method as well as designs
- Appreciate how HCI and design itself is a political act, and engages with the broader political economy.

Course Content

Module 1: Introduction. What's in an interface: evaluating existing designs. Cognitive, sensory models. (Week 1)

Module 2: Human-centred design, user research, methods, analysis and presentation. Personas & scenarios, design workshops, story boards. Contextual design. (Weeks 2-5)

Module 3. From personas and scenarios to design concept. Translating needs, desires, socio-economic concerns into designs. Accessibility and inclusion. Participatory design. (Weeks 6-9)

Module 4: Prototyping – hi- and low-fidelity. Design principles and heuristics. Toolkits. (Weeks 10-13)

Module 5: Implementation, evaluation and design communication. Relationship with software development and implementation. (Weeks 14-15)

Wrap Up: Closing: The political role of design. (Week 16)

Assessments

- Class attendance, (5%)
- Mid-term written paper and presentation (15%), 1000 word hand-in, plus oral presentation on topic covered in the first half of the course.
- Group activities and workshops (45%), participation in workshops and activities throughout each stage of the design process.
- Project, presentation and written hand in (35%), final project assignment conducted throughout the course, completion of evaluated prototype, write-up and presentation of project. Each person needs to attend at least one of the other group's presentations.

References

- The primary textbook for the course will be the Encyclopaedia of Human Computer Interaction, freely available https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed.
- Other material will be articles for reading before each lecture, academic articles and excerpts from textbooks. Additionally, videos and other material will be assigned to lectures as required.
- Each week will consist of one session with a more theory oriented discussion before which readings need to be completed, and one practical session or workshop which will require.

Course Name	**Research Methods**
Course Branch	MSc (Digital Society)
Course Proposer Name(s)	Balaji Parthasarathy, Preeti Mudliar
Course Instructor Name(s)	Balaji Parthasarathy, Preeti Mudliar
Course Type	Core for M.Sc. (Digital Society) I Semester
Course Level	Level 1
Credits (L:T:P) **(Lecture : Tutorial : Practical)**	Lecture (3)+Tutorial (1)= 4 credits
Grading Scheme	(A,A-,B+,B,B-,C+,C,D,F)
Pre-Requisites (where applicable, specify exact course names)	
None	
Course Description	
This course will provide an overview of the philosophical foundations of social science research methods. It will serve as a holistic introduction to modes of explanation and traditions of social inquiry that contribute to conceptual and methodological building blocks in the conduct of research. It will offer students a preliminary footing to appreciate the quantitative and qualitative traditions of research methods by assessing the strengths and limitations of each of the methods, the conditions under which each of the methods is used, the generalizability and purpose of each of the methods, as well as the ethical implications of doing research.	
Course Outcomes	

At the end of this course, following are expected outcomes.

The student is expected to UNDERSTAND:

- Understand different epistemological approaches to research
- Understand the process and conduct of research
- Understand how to match particular methodologies to the theoretical framework and research problem
- Understand quantitative and qualitative methods of doing research

The student is expected to DO:

- critically appreciate the use and implementation of different methodologies in research
- design, implement and report a research project

Course Content

Module 1: Philosophy of science

- Knowledge and Explanations
- Causality and Inferences

Module 2: Sampling

Module 3: Quantitative traditions

- Social statistics
- Survey methods
- Experimental design

Module 4: Qualitative traditions

- Fieldwork
- Observations
- Interviews

Module 5: Research Design

Module 6: Research Ethics

Module 7: Other Contexts

- Content Analysis
- Discourse Analysis

Module 8: Transcribing and analysing Data

Module 9: Writing and presenting research

Assessment/Grading

Suggested assessment criteria:

- Weekly Online Reflection Posts – 10 %
- Research Paper Reviews – 15 %
- Research Spotlight Presentations – 20 %
- Mini-assignments – 15%
- Project – 25%
- Class Participation – 10 %

References

The following is a list of required references:

Geertz, Clifford (1973). The Interpretation of Cultures. New York: Basic Books Inc.

Hine, Christine (2005) Virtual Methods: Issues in Social Science Research on the Internet. Oxford; New York: Berg.

Jones, Steve (1999) Doing Internet Research: Critical Issues and Methods for Examining the Net. Thousand Oaks, CA: Sage.

Markham, Annette and Nancy Baym. (2009) Internet Inquiry: Conversations about Method. Thousand Oaks, CA: Sage.

Miles, M. B., & Huberman, A. M. (1994). Qualitative data analysis: An expanded sourcebook. Thousand Oaks, CA: Sage.

Wolcott, H. F. (2002). Sneaky kid and its aftermath: Ethics and intimacy in fieldwork. Walnut Creek, CA: Alta Mira Press.

Wolcott, H. F. (1994). Transforming qualitative data: Description, analysis, and interpretation. Thousand Oaks, CA: Sage.

Warren, C.A.B. & Karner, Tracy X. (2005). Discovering qualitative methods: Field research, interviews, and analysis. CA: Roxbury Publishing Company.

Course Name	**Technology and Society**
Course Branch	M.Sc. (Digital Society)/iM.Tech./M.Tech.
Course Proposer Name(s)	Bidisha Chaudhuri
Course Instructor Name(s)	Bidisha Chaudhuri
Course Type	Core for M.Sc. (Digital Society) I Semester Elective for iM.Tech./M.Tech.
Course Level	Level 2
Credits (L:T:P) **(Lecture : Tutorial : Practical)**	Lecture (3)+ Tutorial (1)= 4 credits
Grading Scheme	A,A-,B+,B,B-,C+,C,D,F

Pre-Requisites (where applicable, specify exact course names)

NA

Course Description

Technology can be studied in its different dimension as it comprises of facts, artifacts, know-how, processes and last but not the least contexts. The relationship between technology and society is an established field of study within the social sciences and humanities. Different disciplinary affiliations ranging from the sociology of scientific knowledge to science and technology studies, from the history of technology to the philosophy of technology, have analysed this relationship. Together, such scholastic approaches touch upon wide-ranging and often complex facets of the relationship between technology and society. Leveraging examples of infrastructural technology, everyday use technologies, communication technologies and digital technologies, this course provides a preliminary overview of these approaches across three aspects of technology. This course will serve a basic objective, that is, to demonstrate how the relationship between technology and society is mutually inclusive.

The objective of this course is to understand the complex and multi-dimensional nature of the technology-society relationship. Using a variety of examples and analyses, this course shows on one hand, how technology both embodies and reproduces society through a complex interplay of technical, social, economic, political, professional and cultural factors and on the other hand, it questions the "disruption" rhetoric of technological change by showing how development of technology is historically contingent.

Course Outcomes

By the end of the course students are expected to Understand and Know:

- Theoretical insights, current discourses and key concepts relating to the study of

technology within social sciences and humanities
- The link between a concrete problem of technology and its interpretation and manifestation in the wider social context.

Students are expected to DO:

- Critically appraise non-deterministic ways of thinking about technology.
- Comprehend the need to understand the context of technology design and use.

Course Content

The course is divided into three modules.

Module 1: Introduction – History and Overview (Weeks 1-2)

The first module is an introduction to the field, and presents a history of "technology", and technology studies. It begins with views on what technologies are, how they can be defined and how the concept of technology and its meaning evolved historically. The following section in this module introduces the field of Science and Technology Studies (STS), by presenting an overview of how the technology and its relationship with society is analysed within different scholastic traditions.

Module 2: Approaches to study the relationship between technology and society – Determinism, Social Construction, Materiality & Neutrality (Weeks 3-12)

The second module takes up these traditions in some details to present approaches that study the relationship between technology and society. In doing so, we focus on four major themes: Determinism, Social Construction, Materiality and Neutrality. Each theme represents a distinct way of looking at the technology-society relationship and how do these approaches respond to each other.

Module 3: Issues around use of technology (Weeks 12-15)

The third module covers wide-ranging issues that surround use and/or non-use of technology in various shape and forms such as e-waste, repair, privacy, security, data and many more. It concludes by discussing the ethics surrounding the use of technologies, the social shaping of their use, and their implications while tying it back to the different approaches discussed earlier in the course.

Wrap Up: Week 16

Assessments

We will expect students to have read assigned reading material and come to class prepared to discuss this material.

Class attendance will count for 6% of the grades.

Individual Reading Response (14%): Students will be required to present at 2 sessions of reading responses (out of 15 pre-designated sessions). These will be short responses to questions that test whether students have read assigned material and made an effort to engage with it in preparing for class. Students' participation in 3 of the reading responses (selected by the student) will be graded for 7% each.

Participation in four group activities (4x10%): This will take the form of storyboard-based group assignments conducted at the end of each of the three modules of instruction. Student groups will be presented storyboards ahead of time and asked to present their ideas in class on the designated activity day. These storyboards may include texts as well as audio visual mediums.

Writing (40%): Two Term Papers - one 750 words paper (10%) before mid-term break and one 3000 words paper (30%) before end-term break will have to be submitted. Topics for these papers will be discussed in the class well in advance.

References

Books (selected chapters):

- Avgerou, Chrisanthi, Claudio Ciborra and Frank Land. The Social Study of Information and Communication Technology: Innovations, Actors and Contexts. Oxford University Press, 2004
- Bauchspies, Wenda K. et al. Science, Technology, and Society: A Sociological Approach. London: Blackwell, 2006
- Bijker, W.E. Of Bicycles, Bakelites and Bulbs: Toward a Theory of Sociotechnical Change. MIT Press, 1997
- Feenberg, Andrew. Between Reason and Experience: Essays in Technology and Modernity. MIT Press, 2010
- MacKenzie, Donald, and Judy Wajcman. The social shaping of technology. Open University Press, 1999
- Mucha, Janusz and Katarzyna Leszczyńska (ed.) Society, Culture and Technology at the Dawn of 21st Century, UK: Cambridge Scholar Publishing,
- Olsen, Jan Kyrre Berg, Stig Andur Pedersen, Vincent F. Hendricks (eds.) A Companion to the Philosophy of Technology. Willey-Blackwell, 2012
- Sismondo, Sergio. An Introduction to Science and Technology Studies. London: Blackwell, 2010

Journal Articles:

- Barley, Stephen R. "What can we learn from the history of technology?." Journal of Engineering and Technology Management 15.4 (1998): 237-255
- Bijker, W.E. Of Bicycles, Bakelites and Bulbs: Toward a Theory of Sociotechnical Change. MIT Press, 1997
- Bromley, D. Allan. "Science, technology, and politics." Technology in Society 24.1

(2002): 9-26

- Marx, Leo. “Technology The Emergence of a Hazardous Concept” Technology and Culture, 51(3), July 2010, pp. 561-577
- Winner, Langdon. "Upon opening the black box and finding it empty: Social constructivism and the philosophy of technology." Science, Technology, & Human Values 18.3 (1993): 362-378

Additional readings will be circulated as and when required.

Semester II Courses

Course Name	**Social Complexity and Systems Thinking**
Course Branch	M.Sc. (Digital Society**)**
Course Proposer Name	Amit Prakash
Course Instructor Name	Amit Prakash
Course Type	Core for M.Sc. (Digital Society) II Semester
Credits	4 credits
Grading Scheme	A,A-,B+,B,B-,C+,C,D,F
Pre-Requisites (where applicable, specify exact course names)	
NA	
Course Description	
Inconsistencies in managing the design and deployment processes in many social projects, especially those that seek to leverage the potential of digital technologies, lead to various issues not only with respect to time and cost overruns but also in terms of their missing critical considerations and viewpoints while setting desired objectives. Projects that deploy digital technologies for addressing the needs of large and diverse population groups are often found to exhibit properties of complex systems and, using their examples, this course introduces the students to different elements of complexity inherent in social and socio-technical systems. Students will be introduced to different systems thinking methodologies that have been found useful in resolving various aspects of the aforesaid complexity. This will then be used to provide insights into a few relevant methodologies considered useful to model and manage such systems. Conceptual frameworks and practices involved in the engineering and management of IT projects draw largely from theoretical positions developed in the discipline of systems engineering, related largely to requirements specification, system architecture and design processes are also introduced to students to enable them to work on a high-level design specifications/Request for Proposal (RFP) document for initiatives that seek to bring a desired set of changes in complex social situations using digital technologies.	
Course Outcome	

At the end of the course students, are expected to UNDERSTAND :

- Constituents of complexity in social and socio-technical contexts (including heterogeneity, hierarchy, near-decomposability/redundancy, self-adaptation and emergence).
- Nature of complex social problems (especially, wicked problems/messy situations as opposed to tame/benign problems)
- Significance of diverse perspectives while framing engineering and management challenges and approaches, particularly those related to requirements engineering and project management in large/complex IT projects.
- Fundamentals of systems thinking approaches and their applications.

They are expected to DO:

- Identify different components of a social/ socio-technical system and their inter-relationships.
- Reconcile priorities and negotiate changes considered desirable and feasible.
- Apply systems thinking concepts, in general, and soft systems methodology, in particular, to model social/socio-technical complexity.
- Draft requirement specifications and high-level system design documents that can lead into RFPs in case of external procurement.

Assessments/Grading

Students will be assessed based on their participation in class discussions, submission of written assignments and class presentations and performance in quizzes and exams. The proposed weightage for various components is as follows:

- Class participation: 10%
- Class presentation: 10%
- Quizzes/Assignments: 20%
- Project (drafting a design specifications/RFP document for a social change using digital technologies): 35%
- End-term Exam: 25%

Course content/ References *(indicative)*

Background: Revisiting *(traditional)* software engineering and project management approaches (4-5 sessions)

- Bergman, M., King, J. L., & Lyytinen, K. (2002). Large-scale requirements analysis revisited: the need for understanding the political ecology of requirements engineering. *Requirements Engineering*, *7*(3), 152-171.
- Boehm, B.W. and Ross, R. (1989). Theory-W software project management: principles and examples. *IEEE Transactions on Software Engineering,* 15(7), 902-916.
- Atkinson, R. (1999). Project management: cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria. *International journal of project*

management, *17*(6), 337-342.

- Koskela, L. J., & Howell, G. (2002). The underlying theory of project management is obsolete. In *Proceedings of the PMI Research Conference* (pp. 293-302). PMI.
- PMI (2017). *Agile Practice Guide.* Project Management Institute, Inc. USA.
- Boehm, B. (2006, May). A view of 20th and 21st century software engineering. In *Proceedings of the 28th international conference on Software engineering* (pp. 12-29). ACM.
- Boehm, B. (2006). Some future trends and implications for systems and software engineering processes. *Systems Engineering*, *9*(1), 1-19.

Complexity, social problems and the nature of inquiry (5-6 sessions)

- Nero's Guests [Documentary]. Retrieved from https://www.youtube.com/watch?v=4q6m5NgrCJs
- Simon, H. A. (1962). The architecture of complexity, *Proceedings of the American Philosophical Society*, Vol. 106, No. 6. (Dec. 12, 1962), pp. 467-482.
- Tan, J., Wen, H.J. & Awad, N. (2005). Healthcare and services delivery systems as complex adaptive systems. *Communications of the ACM*, Vol. 48 No. 5, pp. 36-44.
- Vincent, R. (2012). Insights from complexity theory for the evaluation of development action: Recognizing the two faces of complexity. *IKM Working Paper No. 14*, IKM Emergent Research Programme, European Association of Development Research and Training Institutes (EADI), Germany. www.eadi.org
- Rittel, H. & Webber. M.(1984). Planning problems are wicked problems. *Developments in Design Methodology. New York: John Wiley & Sons*, 135-144.
- Head, B. W. (2008). Wicked problems in public policy. *Public Policy*, Vol. 3 No. 2, pp. 101-118
- Iivari, J., Hirschheim, R., & Klein, H. K. (1998). A paradigmatic analysis contrasting information systems development approaches and methodologies. *Information Systems Research*, *9*(2), 164-193.
- Hirschheim, R., & Klein, H. K. (1989). Four paradigms of information systems development. *Communications of the ACM*, *32*(10), 1199-1216.

Systems approaches; socio-technical systems (7-8 sessions)

- Von Bertalanffy, L. (1972). The history and status of general systems theory. *Academy of Management Journal*, *15*(4), 407-426.
- Mingers, J., & White, L. (2010). A review of the recent contribution of systems thinking to operational research and management science. *European Journal of Operational Research*, *207*(3), 1147-1161.
- Mumford, E. (2000). A socio-technical approach to systems design. *Requirements Engineering, 5: 125-133*
- Mumford, E. (2006). The story of socio-technical design: reflections on its successes, failures and potential. *Information Systems Journal, 16: 317-342*
- Baxter, G. & Sommerville, I. (2011). Socio-technical systems: From design methods to systems engineering. *Interacting with Computers, 23: 4-17*.
- Checkland, P. B., & Casar, A. (1986). Vickers' concept of an appreciative system: a systemic account. *Journal of Applied Systems Analysis*, *13*(3), 3-17.
- Reynolds, M (2011). Bells that still can ring: systems thinking in practice. In: Tait,

Andrew and Richardson, Kurt eds. *Moving Forward with Complexity: Proceedings of the 1st International Workshop on Complex Systems Thinking and Real World Applications.* Litchfield Park, AZ: Emergent Publications, 327–349.

- Reynolds, M., & Holwell, S. (2010). Introducing systems approaches. In *Systems approaches to managing change: A practical guide* (pp. 1-23). Springer London.
- Infinite Vision [Documentary]. Retrieved from https://www.youtube.com/watch?v=MA5Dzlf7JEE

Soft systems methodology (6 sessions)

- Checkland, P. (1985). Achieving'desirable and feasible'change: an application of soft systems methodology. *Journal of the Operational Research Society*, 821-831.
- Checkland, P., & Poulter, J. (2010). Soft systems methodology. In *Systems approaches to managing change: A practical guide* (pp. 191-242). Springer London.
- Checkland, P. (2000). Soft systems methodology: a thirty year retrospective. *Systems Research and Behavioral Science*, *17*, S11-S58.
- Rose, J., & Haynes, M. (1999). A soft systems approach to the evaluation of complex interventions in the public sector. *Journal of Applied Management Studies*, *8*(2), 1-19.

Field visits/ drafting of a RFP document (6-8 sessions)

Course Name	**Technology in Development**
Course Branch	M.Sc. (Digital Society)/iM.Tech./M.Tech.
Course Proposer Name(s)	Janaki Srinivasan
Course Instructor Name(s)	Janaki Srinivasan
Course Type *(Select one)*	Core for M.Sc. (Digital Society) II Semester Elective for iM.Tech., M.Tech.
Course Level *(Select one)*	
Credits	4 credits
Grading Scheme	4-point scale (A,A-,B+,B,B-,C+,C,D,F)

Pre-Requisites
(where applicable, specify exact course names)

None

Course Description

This course explores how technologies and the digital space shape a multiplicity of social inequalities in contemporary society. Students will be trained to recognize social divides rooted in gender, caste, race, class, and region, and understand how these divides have been progressively conceptualized and addressed. The course will focus on two dimensions of social divides in the digital era: first, how classical inequalities and debates about them are reproduced in the digital space and, second, how the digital space might open up opportunities to challenge these divides. A majority of the course will be focused on examining these themes with the example of socio-economic divides and the trajectory of development thinking since the 1950s.
We will then use concepts from development thinking to analyse the production and use of digital artifacts and platforms to understand how they have been used to reinforce and challenge socio-economic divides. This course will serve as a crucial bridge for students to pursue electives such as E-Governance, Smart Cities, Digital Technologies for Healthcare, Advanced Research Methods

Course Outcomes

At the end of this course, following are expected outcomes.
The student is expected to UNDERSTAND and KNOW:

- Types of social divides, and their roots in gender, class, caste, race and region
- Theories of development and contemporary debates around them
- A range of ICT innovations that have been developed and deployed since the 2000s in

education, health, agriculture, finance and governance

The student is expected to DO:

- Apply understanding of social divides to the reproduction and contestation of social divides in the design, deployment and use of digital technologies
- Conduct secondary research of significant depth on a given geography, sector and ICTD initiative

Course Content

Introduction to class
Module 1: Divides, Digital and Social (4 sessions)

- Theories of information society and digital divides
- Introduction to studying divides using the example of development theory and practice

Module 2: Theories and critiques of Development (8 sessions, 1 essay discussion session)

- Overview of the multiple meanings and goals of 'development' and how these have been contested by various actors at different points in history
- Differentiating between 'little d' and 'Big D' development, and how they shape each other
- Classical theories explaining capitalism (little d development) and the role of technology in each
- Outlining the eras of interventional Development since WWII (Big D development) and the role of technology in each: Modernization approach, Dependency Theory, Washington Consensus and the Neo-Liberal Turn, Post-Development Critiques
- Insights from history and a framework to study digital technologies in development:
    - Identifying role of state vs. market
    - understanding efficiency vs. equity implications of various development models and metrics
    - learning to see role of structures and agency

  in how technological initiatives work

Module 3: ICT for D (8 sessions, 1 essay discussion session)

- The role of devices, points of access and standards in ICTD interventions
- Cases of ICT deployment in education, finance, health, agriculture
- Analysing what is assumed and obscured, role of state and market, of structure and agency in each case
-

Module 4: ICTs in 'little d' development (5 sessions, 1 essay discussion session)

- The commoditization of land, labour and knowledge as part of the capitalist development of ICT industries
- Dissent in the digital era

Module 5: Wrap-up (2 sessions)

- Bring together threads from earlier modules to discuss alternative ways of thinking about the use of ICTs in the current conjecture of d/Development

Assessments / Grading

Assessment criteria:

1. Class participation - 5%
2. Reading responses – 10%
3. Leading class – 10%
4. Essays (3) – 75%
    a. Examining a chosen country's development models – 15%
    b. Examining the development planning and priorities of a specific sector in that country- 25%
    c. Examining an ICT initiative targeted at above sector in chosen country – 35%

Text Book / References

There is no single prescribed textbook for this course. Students will rely on lecture notes and assigned readings (excerpted from books or articles, a few of which are mentioned below)

- Webster, Frank. 2006. *Theories of the Information Society.* London; New York: Routledge.
- W. W. Rostow, 1960. *The Stages of Economic Growth: A Non-Communist Manifesto* Cambridge: Cambridge University Press.
- Andre Gunder Frank. 1966 'The Development of Underdevelopment,' *Monthly Review* (18): pp. 17-31.
- Easterly, William R. 2002. *The Elusive Quest for Growth: Economists' Adventures and Misadventures in the Tropics.* Reprint edition. Cambridge, Mass.: The MIT Press.
- Escobar, Arturo. 1995. *Encountering Development: The Making and Unmaking of the Third World*.
- Warschauer, Mark and Morgan Ames. 2010. "Can One Laptop Per Child Save the World's Poor?" *Journal of International Affairs* 64(1)
- Morawczynski, O. 2009. "Exploring the usage and impact of ''transformational'' mobile financial services: the case of M-PESA in Kenya." Journal of Eastern African Studies 3(3): 509-525
- Francis, E., Blumenstock, J., & Robinson, J. (2017). *Digital Credit: A Snapshot of the Current Landscape and Open Research Questions*. Working Paper 516, The Bureau for Research and Economic Analysis of Development
- Jensen, Robert. 2007. "The Digital Provide: Information (Technology), Market Performance, and Welfare in the South Indian Fisheries Sector." *The Quarterly Journal of Economics* 122 (3): 879–924.
- Gandhi, Rikin; Rajesh Veeraraghavan; Kentaro Toyama, and Vanaja Ramprasad. 2007. "Digital Green: Participatory video for agricultural extension." In IEEE

Proceedings of Information and Communication Technologies and Development, 2007: 1-10.

- Bhatia, A and Bhabha, J. 2017. "India's Aadhaar scheme and the promise of inclusive social protection." *Oxford Development Studies Vol. 45 (1),* pp. 64-79.
- Chan, Jenny, Ngai Pun, and Mark Selden. 2013. "The politics of global production: Apple, Foxconn and China's new working class." *New Technology, Work and Employment* 28, no. 2: 100-115.
- Upadhya, Carol. 2007. "Employment, Exclusion and 'Merit' in the Indian IT Industry." *Economic and Political Weekly*: 1863-1868.
- Jessop, Bob. 2007. Knowledge as a fictitious commodity: Insights and limits of a Polanyian perspective. In *Reading Karl Polanyi for the twenty-first century: Market economy as political project.* Palgrave, Basingstoke, pp. 115-134.
- Bonilla, Yarimar, and Jonathan Rosa. 2015. "# Ferguson: Digital protest, hashtag ethnography, and the racial politics of social media in the United States." *American Ethnologist* 42, no. 1: 4-17.
- Vie, Stephanie. 2014. "In defense of "slacktivism": The Human Rights Campaign Facebook logo as digital activism." *First Monday* 19, no. 4.
- Evans, Peter. 2010. "Is it labor's turn to globalize? Twenty-first century opportunities and strategic responses." *Global Labour Journal* 1, no. 3.

Complete syllabus and readings available at https://iiitbcourses.wordpress.com/home/digital-and-its-discontents/digitaldiscontents2018/syllabus/

Course Name	**Information and Communication Technology Policy and Regulation**
Course Branch	MSc (Digital Society)
Course Proposer Name(s)	V.Sridhar
Course Instructor Name(s)	V. Sridhar
Course Type	Core for M.Sc. (Digital Society) II Semester ITS/ HSS Elective for iM.Tech. (4th year) and M.Tech. (1st year)
Course Level *(Select one)*	Level 1
Credits (L:T:P) **(Lecture : Tutorial : Practical)**	4 credits
Grading Scheme	(A,A-,B+,B,B-,C+,C,D,F)

Pre-Requisites
(where applicable, specify exact course names)

None

Course Description

There is a paradigm shift in the ICT industry today due to convergence in various technologies and services, the ubiquity of the Internet, the emergence of app economy, the pervasiveness of social media and peer-to-peer networking, the intelligence of terminal devices and applications, and the voluminous data that is being collected by networks and networking firms. These pose challenges in the areas of privacy, security, market power, pricing, interconnection, radio spectrum management, industry structure and Intellectual Property Rights. This course provides the theoretical and policy base for analysing these issues. The course is divided in to the following areas:

1. Telecommunications regulation
2. Internet policy and regulation
3. Regulation of the App Economy
4. Intellectual Property Laws and Regulation
5. Digital Finance Regulation

Course Outcomes

At the end of this course, the student is expected to UNDERSTAND and KNOW:

1. Regulatory aspects of telecom: interconnection, universal services, pricing, ex-ante vs. ex-post
2. Convergence of telecom and Internet and associated regulatory and policy implications: net neutrality
3. Privacy and security issues in ICT and associated regulatory and policy implications; best

International practices, cyber laws and practices
4. Intellectual Property Rights/ Copyrights/ data protection laws and regulation;
5. Digital currencies and exchanges; Bitcoin economy; laws and regulations of digital finance.

The student is expected to DO:

- Critically review comparative policy analysis
- Prepare regulatory and policy regulatory guidelines
-

Course Content

Telecommunications Regulation

1. Theory and principles of regulation
2. Regulatory institutions and processes
3. Competition regulation: monopoly and oligopoly structures, market dominance, antitrust
4. Price regulation: ex-ante and ex-poste, tariff regulation: ceiling and floor; predatory pricing, tying
5. Interconnection regulation: mobile termination, international settlements
6. Universal service regulation: definition of universal service, universal service levies, funding options, types of schemes
7. Scarce resource regulation: spectrum allocation and assignment, pricing and methodology of assignment. Optimal use and flexible use of radio spectrum, spectrum fragmentation vs. consolidation
8. Open access regulation

Internet Policy and Regulation

1. Infrastructure Commons and Economics
2. Internet governance: multi-stake holder community model
3. Regulation and governance of Domain Name Systems
4. Quality of Service/ Experience regulation of data services
5. Net Neutrality Regulation
6. Cyber and Information security policies
7. Content regulation: Digital TV, Internet

Regulation of the App Economy

1. Over-The-Top services and the associated “light touch” regulation
2. E-Commerce taxonomy: Associated regulations
3. Sharing and Peer-to-Peer economy and associated regulations
4. Regulatory arbitrage versus social benefits
5. Implications for tax, investment, privacy, and labour policies
6. Policies on start-ups across countries and best practices
7. Privacy and data protection principles and associated regulation
8. General Data Protection Regulation of the European Union and its impacts
9. Artificial Intelligence and Machine Language: Impact on public policy

Intellectual Property Laws and Regulation

1. Intellectual Property Rights: patents, copyright, trademark. Trade secret, domain names
2. Cross licensing, pooling, trolls
3. Standard Essential Patents and FRAND conditions
4. Patent Law: cross country comparison
5. Open source versus proprietary software

Digital Finance Regulation

1. Taxonomy of digital finance: Digital currency, wallets, Fintech, payment gateways, crypto currencies
2. Properties and functions of money: comparison of crypto currency and Gold against money, Regulatory issues in Crypto currencies

Text Book / References

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- Sridhar, V. (2012). Telecom Revolution in India: Technology, Regulation and Policy. New Delhi, India: Oxford University Press, ISBN-13: 978-0-19-807553-0; ISBN-10: 0-19-807553-7.
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- Telecommunications Regulation Handbook. (Ed.) Colin Blackman and Lara Srivastava.
- Chuen, David Lee. (2015). Handbook of Digital Currency. Academic Press.
- Selected papers from Communications of the CACM, Review of Network Economics, and Telecommunications Policy will be given for class discussions.