

# NATIONAL INSTITUTE OF ADVANCED STUDIES

## COURSE OFFERINGS

**Second Semester-January to April 2020**

### **School of Conflict and Security Studies**

**(1) Course title:** Global Politics: Contemporary World Affairs

**Subject/ discipline:** Interdisciplinary

**Level of course:** PhD Scholars

**Number of credits:** Four

**Type:** Lectures, Workshops, Presentations, Writings and Guest Lectures

**Name of the instructor:** Prof. D. Suba Chandran

**Probable starting date and schedule/ timings:** January 2020, Monday to Friday, 0900-1000 hrs

I

#### **Global Politics:**

*Contemporary World Affairs*

#### **An Introduction**

The course provides an introduction to contemporary world affairs. The primary objective of the course is two – first, to enhance the understanding of contemporary global developments, with an attempt to comprehend the larger picture. Second, to identify trends leading forecasts on contemporary world affairs.

The Course will also invite senior scholars within and outside NIAS – also from within and outside India to provide lectures on contemporary world affairs.

#### **Research Questions on Global Politics**

The course focus on providing an explanation, and expects the scholars to increase their understanding on the following:

1. **Contemporary World Order:** Policies of the US, China, EU and Russia and their implications on the global order
2. **Big Power Politics:** US-China, US-Russia, Russia-China, and India-China
3. **Regional Politics:** South Asia, Southeast Asia, East Asia, Middle East and Europe
4. **Maritime Order:** South China Sea, Indian Ocean, Arctic, Blue Economy etc
5. **Contemporary Global Issues:** Climate Change, International Trade, Outer Space, Nuclear Order etc

### **Special Focus on South Asia**

The Course aims to create an understanding from a South Asian perspective. Given the enormity of literature, primarily from an international perspective, there is a substantial gap in terms of approaching contemporary global issues from a South Asian perspective.

The course also aims to create a pool of scholars, thereby build capacity that would help the region in understanding issues of global politics, regional and international conflicts and also regional security in South Asia.

### **Enhancing Presentation Style & Writing Skills**

A common issue facing young scholars is the challenge of effective communication. This course aims to address the same in terms of building basic skills of research presentation.

On the basic research tools side, the course aims to pick up different contemporary issues and make presentations – oral and power point, with an objective to convert the same into short writings to be published in the Course Portal

### **Online Portal: Global Politics**

The Course will also have an Online portal managed by the Course Instructor, where the writings of the scholars on contemporary world affairs will be published on a regular basis.

### **What is expected?**

The scholars are expected to come prepared every day to the class with an update of contemporary global developments.

Scholars are expected to undertake the following:

- Short Notes to be published regularly as “Global Insights” in 400-500 words
- Take active part in preparing “The World This Week (TWTW)”, a weekly update
- One commentary on contemporary world affairs in 1000 words every month.
- Regular power point presentations on global politics
- Assist in preparing the Course Quarterly: *NIAS Quarterly on Contemporary World Affairs*
- Organise workshops and take part in them within NIAS and outside

## **II**

### **Course Outline**

#### **Global Politics: Identifying Contemporary Issues**

The course focuses on providing an explanation, and expects the scholars to increase their understanding on the following:

##### **1. Contemporary World Order:**

- Policies of Big Power: US, China, EU, Russia and India
- Institutionalism and World Politics: Role of International and Regional Organisations-

## **2. Regional Security:**

- South Asia
- Southeast and East Asia
- West Asia
- Europe
- Latin America
- Africa

## **3. Maritime Security:**

- South China Sea
- Indian Ocean
- Indo-Pacific
- Arctic
- Blue Economy

## **4. Science and Security:**

- Energy Politics
- Climate Change
- Outer Space
- Nuclear Order and Disarmament
- Cyber Security
- Drones and Internal Security

## **5. International Economy and Security:**

- Globalism and Economic Diplomacy: G7-G20 Summits
- International Economic and Financial Organisation- WTO, World Bank
- Trade and Conflict
- Regional Economic Integration

### **III Methodology**

#### **Daily Analysis**

The scholars will meet every morning to analyse the daily developments around the world. Each scholar would pick up a region and a set of international issues, and follow them on a daily basis.

Every session would involve a discussion of current developments for 60 minutes.

#### **Regular Presentations and Writing**

Once a week, the students will make a presentation on a contemporary theme. Based on the presentation, students will be writing short notes/commentaries.

#### **Guest Lectures and International Faculty:**

Academics, Think Tankers, former government officials will be requested to take guest lectures on specific subjects.

**Assessment:** Assessment would be based on class presentations (50 percent) and writings (50 percent)

**(2) Course title: Governance in Maritime and Space**

**Subject/ discipline:** Security

**Level of course:** PhD

**Number of credits:** Two

**Type: (lecture, seminar, guided reading, etc):** Seminars and Guided Reading

**Name of instructor(s):** Prof. D. Suba Chandran

**Brief description (150 words):** The course will focus on two major themes - maritime governance and space governance. On both the themes, the course will look at the following: institutions of governance, instruments of governance, policies and positions of leading countries, global and regional legislations, contemporary issues and a few case studies.

The course will involve select lectures, led by D. Suba Chandran, along with guest lectures by Prof Shailesh Nayak and Prof Rajaram Nagappa. A few scholars from outside will also be invited to deliver lectures. The scholars are expected to make presentations, write short notes on the issues and submit a paper as a part of the course.

**Probable starting date and schedule/ timings:** Wednesdays, 1130-1300 hrs

## School of Humanities

**(1) Course Title: Topics in Information Theory, Chaos & Causal Learning**

**Subject/Discipline:** Mathematics

**Level of Course:** Advanced

**Number of Credits:** Two (Contact hours: 2+1 hrs/week)

**Type:** Lectures, Guided Reading, Term Project and Student Presentations

**Course Instructor:** Dr. Nithin Nagaraj, Associate Professor, Consciousness Studies Programme, NIAS, Email: nithin@nias.res.in

**Brief Description:** In 1948, Claude Shannon ushered us in to the 'Information Age' by formulating a mathematical theory of communication where he gave a rigorous mathematical definition of 'Information'. In this course, we will cover the basic ideas of Shannon's Information Theory and Coding Theory (Entropy, Mutual Information, Channel Capacity, Noiseless Source Coding and Noisy Channel Coding Theorems). We will introduce the fascinating world of Deterministic Chaos and its links with Information and Coding and recent developments in Chaos-inspired Machine Learning. Inferring causal relationships between processes, systems, and time series is finding diverse applications in physics, climatology, neuroscience, scientific measures of consciousness and in AI. We will study causality testing methods and principles of causal learning. Is there a link between Information, Chaos and Causality?

**Pre-requisites for registering:** Basics of linear algebra, probability theory is a must. Since the papers that will be discussed are quite mathematical in nature, the student is expected to be comfortable with mathematical thinking and arguments. Term project will involve writing computer programs, hence familiarity with programming in MATLAB/Python/C/C++ is a must. Auditing this course is not allowed.

**Expected Student Workload:** 2 hours of in-class lectures/guided reading/discussion every week. Apart from this, the student is expected to spend at least 5-6 hours every week in reading research papers/books, writing computer programs, working out mathematical arguments/proofs and practicing mathematical writing.

**Course Duration:** January – May 2020 (starting date: TBA)

**Topics for Discussion:** Introduction to Mathematical thinking, reasoning and mathematical writing; principles of mathematical modelling; basics of Information & Coding Theory, principles of popular data compression algorithms; complexity measures for time series analysis; basics of nonlinear dynamics/chaos theory – 1D & 2D chaotic maps, flows, fractals, chaos based computing, chaos inspired machine learning; causality testing methods such as Granger causality, Transfer Entropy and Compression-Complexity Causality; causal stability and chaotic synchronization, causality in scientific measures of consciousness such as Causal Density and

Network Causal Activity; ladder of causation, causal inference and causality in machine learning/AI.

### **Assignments & Evaluation Criteria:**

Reading assignment of research articles, book chapters, journal papers; In-class interactions and discussions, individual and group presentations; Critical analysis and writing a term report on a research topic/project. Evaluation will be based on all of the above.

### **Reading List:**

This is not a complete list, but only indicative. Full list will be provided in class.

1. MacKay, D. J. (2003). *Information theory, inference and learning algorithms*. Cambridge university press.
2. Shannon, C. E. (1948). A mathematical theory of communication. *Bell system technical journal*, 27(3), 379-423.
3. Shannon, C. E. (1949). Communication in the presence of noise. *Proceedings of the IRE*, 37(1), 10-21.
4. Zhang, C., Bengio, S., Hardt, M., Recht, B., & Vinyals, O. (2016). Understanding deep learning requires rethinking generalization. *arXiv preprint arXiv:1611.03530*.
5. Faure, P., & Korn, H. (2001). Is there chaos in the brain? I. Concepts of nonlinear dynamics and methods of investigation. *Comptes Rendus de l'Académie des Sciences-Series III-Sciences de la Vie*, 324(9), 773-793.
6. Korn, H., & Faure, P. (2003). Is there chaos in the brain? II. Experimental evidence and related models. *Comptes rendus biologies*, 326(9), 787-840.
7. Czanner, G., Sarma, S. V., Ba, D., Eden, U. T., Wu, W., Eskandar, E., ... & Brown, E. N. (2015). Measuring the signal-to-noise ratio of a neuron. *Proceedings of the National Academy of Sciences*, 201505545.
8. Tishby, N., Pereira, F. C., & Bialek, W. (2000). The information bottleneck method. *arXiv preprint physics/0004057*.
9. Almeida, J., Peralta-Salas, D., & Romera, M. (2005). Can two chaotic systems give rise to order?. *Physica D: Nonlinear Phenomena*, 200(1-2), 124-132.
10. Bucolo, M., Caponetto, R., Fortuna, L., Frasca, M., & Rizzo, A. (2002). Does chaos work better than noise?. *IEEE Circuits and Systems Magazine*, 2(3), 4-19.
11. Abbott, D. (2001). Overview: Unsolved problems of noise and fluctuations. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 11(3), 526-538.
12. Nagaraj, N., & Sahasranand, K. R. (2016, June). Neural signal multiplexing via compressed sensing. In *Signal Processing and Communications (SPCOM), 2016 International Conference on* (pp. 1-5). IEEE.
13. Peters, J., Janzing, D., & Schölkopf, B. (2017). *Elements of causal inference: foundations and learning algorithms*. MIT press.
14. Marblestone, A. H., Wayne, G., & Kording, K. P. (2016). Toward an integration of deep learning and neuroscience. *Frontiers in computational neuroscience*, 10, 94.

15. Kathpalia, A., & Nagaraj, N. (2019). A Novel Compression Based Neuronal Architecture for Memory Encoding. In International Conference on Distributed Computing and Networking (ICDCN '19).
16. Balakrishnan, H. N., Kathpalia, A., Saha, S., & Nagaraj, N. (2019). ChaosNet: A chaos based artificial neural network architecture for classification. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 29(11), 113125.
17. Kathpalia, A., & Nagaraj, N. (2019). Data-based intervention approach for Complexity-Causality measure. *PeerJ Computer Science*, 5, e196.
18. Kocarev, L., Galias, Z., & Lian, S. (Eds.). (2009). *Intelligent computing based on chaos* (Vol. 184). Springer.
19. Ditto, W. L., Murali, K., & Sinha, S. (2007). Chaos computing: ideas and implementations. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 366(1865), 653-664.
20. Pearl, J., & Mackenzie, D. (2018). *The book of why: the new science of cause and effect*. Basic Books.

**(2) Course Title:** GIS for spatial data visualization and analysis

**Course Instructor(s):** Dr. M.B.Rajani, Amit Mukherjee, Harini Santhanam and  
Asmita Mohanty

**Course level:** Beginners

**Credit Hours:** Three

**Course Description:**

GIS is a powerful tool for organizing, visualizing and analysing any data which has a geo-spatial component. It therefore has applications in a variety of domains. This course will emphasize the applications of GIS for various applications. It will discuss several applications, with lectures by instructors, focusing on methodologies and resulting outcomes. Students will receive guidance to undertake a course project, where they must investigate spatial components of data in their chosen domains. Participants have to bring their own laptops for lab component. The software necessary can be freely downloaded, and usage will be demonstrated. **Course will start in 2<sup>nd</sup> week of Jan 2019.**

Session	Topic	Instructor
1	Remote sensing: basics and concepts -1 (EMR, Sensor, image parameters, image products)	M.B.Rajani
2	Remote sensing: basics and concepts - 2	M.B.Rajani
3	GIS basics and concepts -1 (Projections, datum, georeferencing, errors)	M.B.Rajani
4	GIS Practical-1 (Georeferencing image/ non-image data and GPS)	Asmita Mohanty
5	GIS Practical-2 (Georeferencing image/non-image data and GPS)	Asmita Mohanty
	Applications	
6	Environmental - 1	Harini Santhanam
7	Environmental - 2	Harini Santhanam
8	Environmental - 3	Harini Santhanam
9	Strategic Studies - 1	Amit Mukherjee
10	Strategic Studies - 2	Amit Mukherjee
11	Strategic Studies - 3	Amit Mukherjee
12	Geomorphology and Geology - 1	Asmita Mohanty
13	Geomorphology and Geology - 2	Asmita Mohanty
14	Applications: Cultural and societal - 1	M.B.Rajani
15	Applications: Cultural and societal - 2	M.B.Rajani
16	Course project presentation	

Those who are interested may please write to: mbrajani.nias@gmail.com

**Evaluation:**

Attendance 10%

Class participation 20%

Course project 70%

**(3) Course Title: Knowing, Experiencing and Being: Methods, Applications and Philosophies inspired by Phenomenology, Collective Intelligence, and Reflective Capabilities**

**Course Instructor(s):** Prof. Sangeetha Menon

**Credit Hours:** Three

**Course Description:**

Click below for details. Send in your applications (Google form) latest by **16 January 2020**, to enroll.

<https://docs.google.com/document/d/1KsQAJ1mgptwtGCsYQX7CwV5lyCtnPQTDhJcHjYoIWtU/>

Applications will be selected based on the aptitude of the applicant, and also on a first come first served basis. Limited seats available.

**Starting date: 23 January 2020 (every Thursday, from 2 to 5 pm).**

**(4) Course Title:** Introduction to the Philosophy of Social Science

**Subject/Discipline:** Social Sciences

**Level of Course:** Ph.D.

**Number of credits:** Three

**Type:** Lecture

**Name of instructor:** Dr. Tarun Menon

**Brief description:**

The social sciences – due to their relative youth as formal disciplines, and the complexity of their subject matter – continue to be sites of extensive conceptual and methodological debate. This course is intended to provide a contemporary introduction to some of the most central and prevalent debates, as well as equip students with tools to explore the theoretical literature further and intervene effectively in the conceptual arena. The focus of the course will be on different conceptions of explanation in social science – explanation through causal mechanisms, interpretation and hermeneutic explanation, rational choice explanation, functional explanation, and reductive explanation, among others. In addition, the course will address the much-discussed question of objectivity in the social sciences; in particular, we discuss the dispute between constructionists and realists about the social world, and the role of ethical and political values in social research.

**Probable starting date and schedule/timings:** January to April 2020

# SCHOOL OF NATURAL SCIENCES AND ENGINEERING

## (1) Course title: Integrated Water Resources Management

**Subject/ discipline:** Environmental Science, Engineering and Management

**Level of course:** Beginner, intermediate (Pre-doctoral, Doctoral)

**Number of credits:** Two

**Type:** Lecture and seminar

**Name of instructor(s) :** Dr. Harini Santhanam (harini@nias.res.in)

### **Brief description (150 words) :**

The present course is designed to offer a holistic perspective of the scientific, socio-economic and legal frameworks to manage water resources under an integrated resources model. The skill sets that will be imparted to the students will include an understanding of diverse water-based projects, their current statuses and challenges and modelling selected environmental characteristics of water bodies. Further in-depth understanding of the environmental and hydrological characteristics of water resources will provide the capability to derive inter-relationships, which is critical in planning for sustainable management. The course will also include small student projects, through which the students can demonstrate their hands-on skills as futuristic water practitioners. The tools required for the analyses can be freely downloaded (R and QGIS) or available (MATLAB).

### **Course outline:**

#### **1. Scientific framework for monitoring water resources**

- a. Ecosystem perspectives for water and sustainable use
  - i. Types of natural ecosystems: freshwater, brackishwater, coastal and marine, wetlands
  - ii. Man-made ecosystems: diversions, wastewater reuse and recirculation
  - iii. Values, functions
- b. Assessment of water quality and anthropogenic stressors
- c. Hydrological, hydraulic and geological considerations
- d. Identifying watershed characteristics for management
- e. Modelling water resources – statistical, empirical and energy models

#### **2. Case studies of interesting projects with both success and failures**

- a. Irrigation projects
- b. Hydropower projects

- c. River interlinking projects
- d. Coastal and marine resources management
- e. Integrated lake basin management

### **3. Principles, rules and framework for water governance**

- a. International framework: Helsinki rules, Berlin rules, UN convention of 1997
- b. Principles and additional rules
- c. Water policy for India – constitutional and legal frameworks

### **4. Sustainable water management**

Roles and performances of agencies and programmes:

- a. National programmes and agencies
- b. Global programmes
- c. Non-governmental organisations and citizen science approaches

### **5. Student project on water ecosystem management and presentation**

- a. Select aquatic system – river/lake/coastal lagoon/man-made systems for Indian scenario
- b. Perform multi-parameter analyses
- c. Derive net ecosystem benefits and impacts
- d. Derive interventions-based model and/or simplistic numerical sustainable management model

**Tools needed:** R, QGIS, MATLAB

#### **Evaluation:**

Attendance : 5%  
Assignment : 25%  
Exams : 30%  
Project : 25%  
Presentation : 15%

# SCHOOL OF SOCIAL SCIENCES

## (1) Course Title: Perspective and Processes of Education

**Course Instructor: Shalini Dixit and Anitha Kurup**

**Number of Credits : Two**

**Mode of Teaching:** Reading Course

**Course Description:** The course focuses upon building understanding of theories and Processes of education. The course intends to give a broad view on both social and psychological process of receiving knowledge, processing, retaining and reproducing/ recreating knowledge and applying all this in the day-to-day life.

### **Learning Objectives:**

At the end of the course work the takers should be able to:

- Understand the principles of various approaches to education
- Be able to draw from philosophy of education to understand current social educational arrangements
- Apply critical understanding of educational theories to find solutions towards educational reform

### **Pre-requisites for registration/auditing:**

Observation and sensitivity towards human conditions

### **Expected Student Workload:**

Students will have 2 hours lecture/contact hours each week, along with 5 hours for reading, exploring, thinking reflecting and writing.

### **Course Outline**

**Philosophy of Education:** This section will discuss major philosophical approaches to idea of education. The course will introduce the progressive Indian and Western thoughts on Education. For example, Tagore, Gandhi, Krishnamurthy and Gijubhai Badheka and others from Indian Context; and tradition of Rousseau, Montessori, Dewey etc from western.

**Perspectives on Learning and Cognition:** This section looks at major learning theories such as Skinner, Bandura, Piaget, Vygotsky, Bruner and Cole. Taking a critical look at how some of these theories have influenced the major teaching-learning practices, possibilities of a shift in the practices will be discussed.

**Construction of Knowledge and context of Education:** This section will discuss the process of knowledge construction, bringing in the different philosophies and processes of education. This section aims at developing understanding of equality, authority and conflict in the process of education.

Rogoff, B (2003) *The Cultural Nature of Human Development*. Oxford University Press

Cole, M; Engestrom, Y. and Vasquez, O (1997) *Mind Culture and Activity*. Cambridge University Press

Corner D J. *An introduction to Philosophy of Education*

Dewey John, *The child and the curriculum*, University of Chicago Press: Chikago

Sykes, Marjorie (1988). *The Story of Nai Taleem: Wardha*

Bruner, J S (1996) *Culture of Education*. Cambridge, MA: Harvard University Press

Frere, P. *Pedagogy of Opressed*

Kumar, K (1997) *What is Worth Teaching*, Orient Longman: New Delhi

Olson, David. (2003) *Psychological Theory and Educational Reform*. Cambridge University Press

Lawrence Erlbaum, Mishra, G and Mohanty, A. K (2002) *Perspectives on Indigenous Psychology*, New Delhi: Concept

Pathak.A (2002) *Social Implications of Schooling. Knowledge, Pedagogy and Consciousness*: Rainbow Publishers: New Delhi

Moore, A (2002) *Teaching and Learning: Pedagogy, Cutticulum and Culture*. London: Routledge

Montessori, Maria (1991). *The Absorbent Mind*, H Holt and Co. New Delhi

*Ethnic Minority Identity: A social Psychological Perspective*. Oxford Clarendon Press

By Lave and Wenger (1991): *Situated Learning: Legitimate Peripheral Participation*. Cambridge University Press