

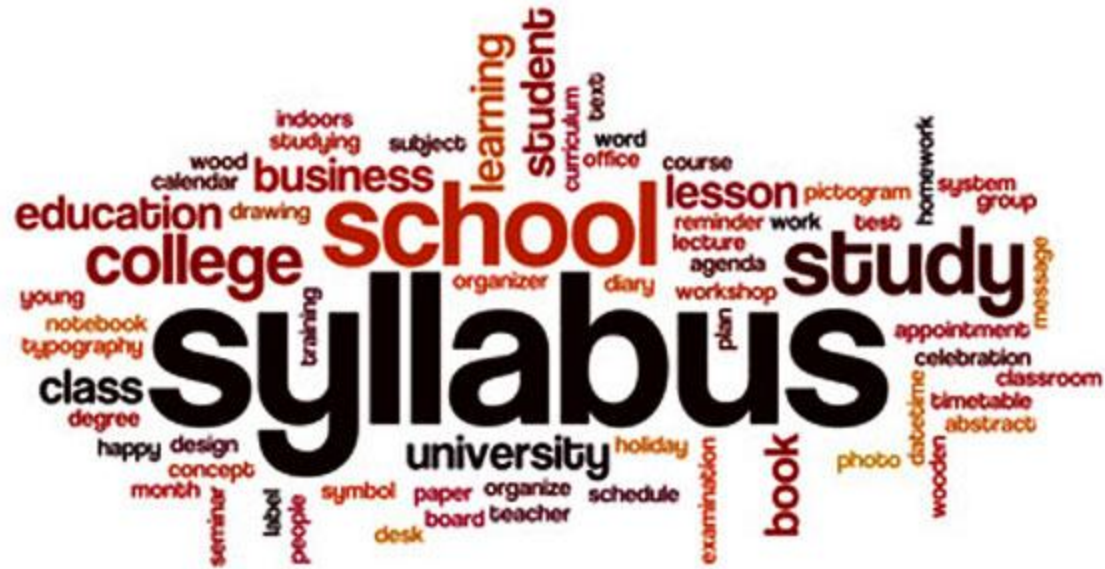


Neural Imaging and Signal Systems **(BT 640)**

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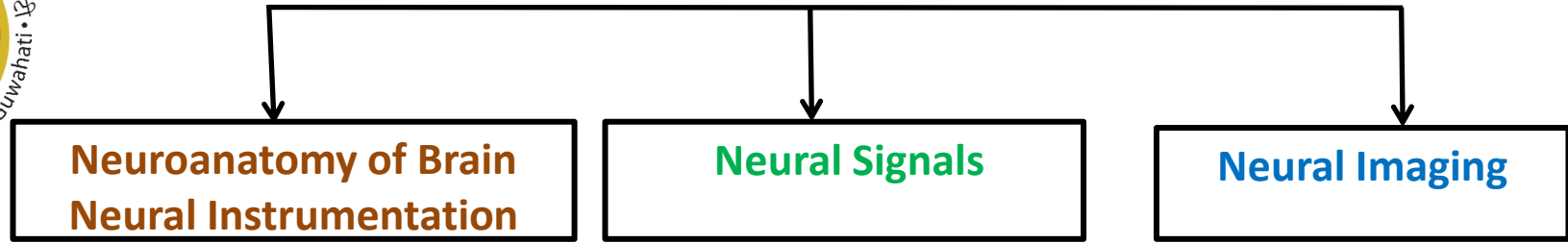
Website:<https://www.iitg.ac.in/cngupta/>

Ack: Few images are from Google





Course Syllabus



Neuroanatomy of brain, Generalized medical instrumentation system, transducers and measurement of physiological systems, calibration and standardization. Portable/Wearable neural monitoring devices.

Significance and common types of neural signals (like electroencephalogram (EEG), near infrared spectroscopy etc); EEG oscillations and its link to basic neurophysiology; With reference to neural signals (mean removal across channels/recordings, interpretation of standard deviation, normalization, variance, co-variance, correlation, signal to noise ratio, filtering); evoked potentials and cognitive applications, diseases of central nervous system and EEG, processing and feature extraction of EEG signals. practicalities of electroencephalogram measurement and experiment design. Introduction to brain computer interfaces and applications.

Introduction to magnetic resonance imaging in psychiatry and its neurobiology basis, contrasts, pixel versus voxel, resolution, image file formats, neuroanatomy of brain primer, univariate and multivariate analysis (with reference to schizophrenia, autism and alzheimer's), multimodal frameworks, software packages to analyse neural imaging data.

Reading



Text books

Mike Cohen. Analyzing Neural Time Series Data, Theory and Practice, 1st Edition, MIT Press, Jan 2014.

J.L.Semmlow. Biosignal and Medical Image Processing (Second Edition), CRC Press, Taylor and Francis Group, 2011.

Reference texts

Rajesh Rao, Brain-Computer Interfacing: An Introduction, Cambridge University Press, 2013.

Kayvan Najarian, Robert Splinter. Biomedical Signal and Image Processing (Second Edition), CRC Press, Taylor and Francis Group, 2012.



Lectures/Coursework

Amalgamation of Neuroscience, Medical Image/Signal processing, Math and Programming

BIRDS EYE VIEW OF LECTURES



I. Total Lecture hours (40-42)

**Group Discussions
(2 hours)**

1.Groups of five students.
2.Select any topic from
syllabus

**Neuroanatomy of Brain
(2 Hrs)**

**Lectures
(28 Hours)**

**Neural Signals
(13 hours)**

**Python
Tutorials/Coding on
Theory taught
(8-10 Hours)**

**Last 2 lectures
Project Discussion/ Revision**

**Neural Imaging
(13 Hours)**

EVALUATION/GRADING (100 Marks)

MID SEM
(30 Marks)

Group Discussions
(20 Marks)

END SEM
(35 Marks Each)

Coding Project
(Given after Midsem)
(15 Marks)

Attendance requirement for endsem $> 85\%$



Concept of Group Discussion

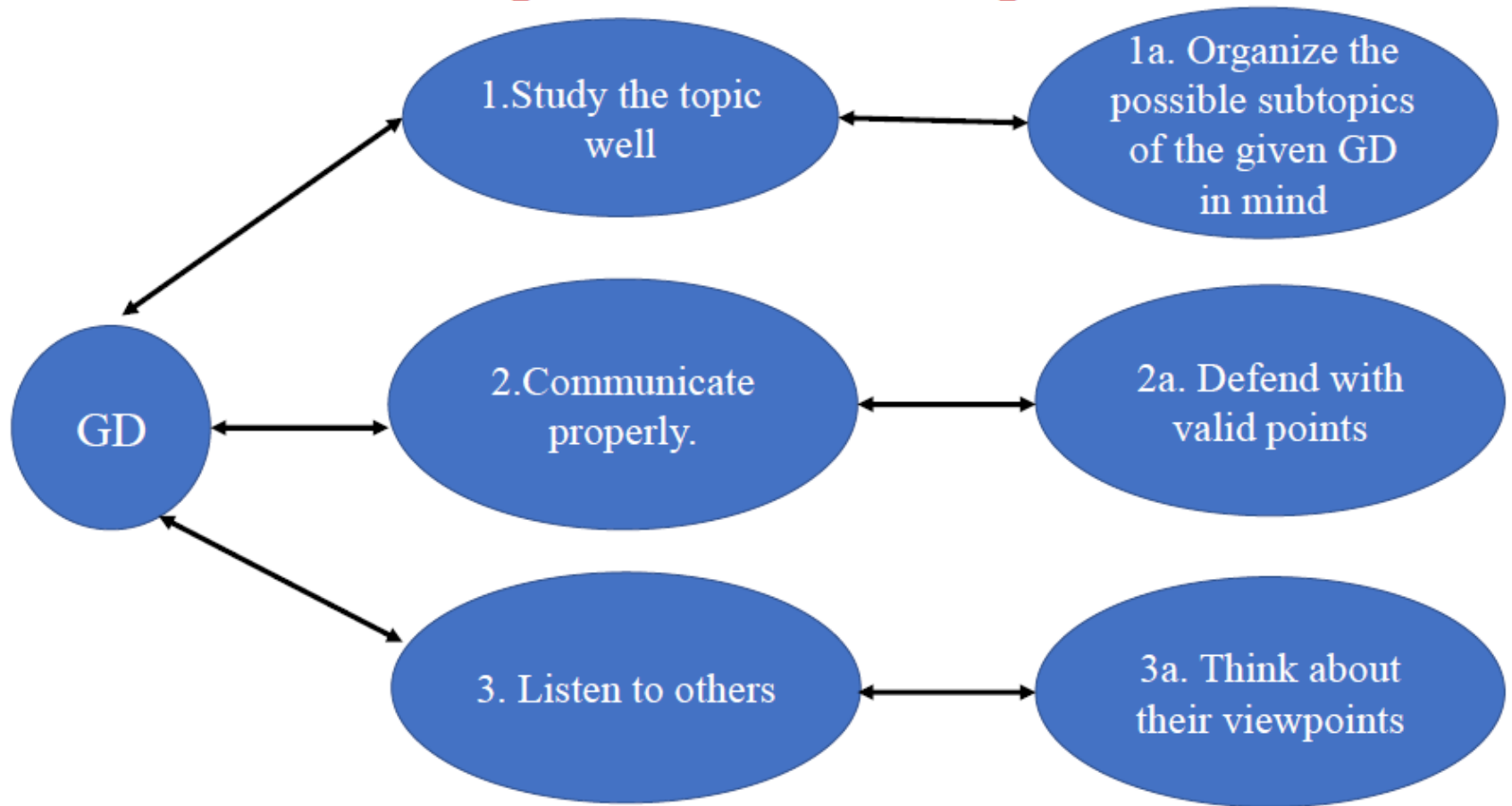
Any Idea?



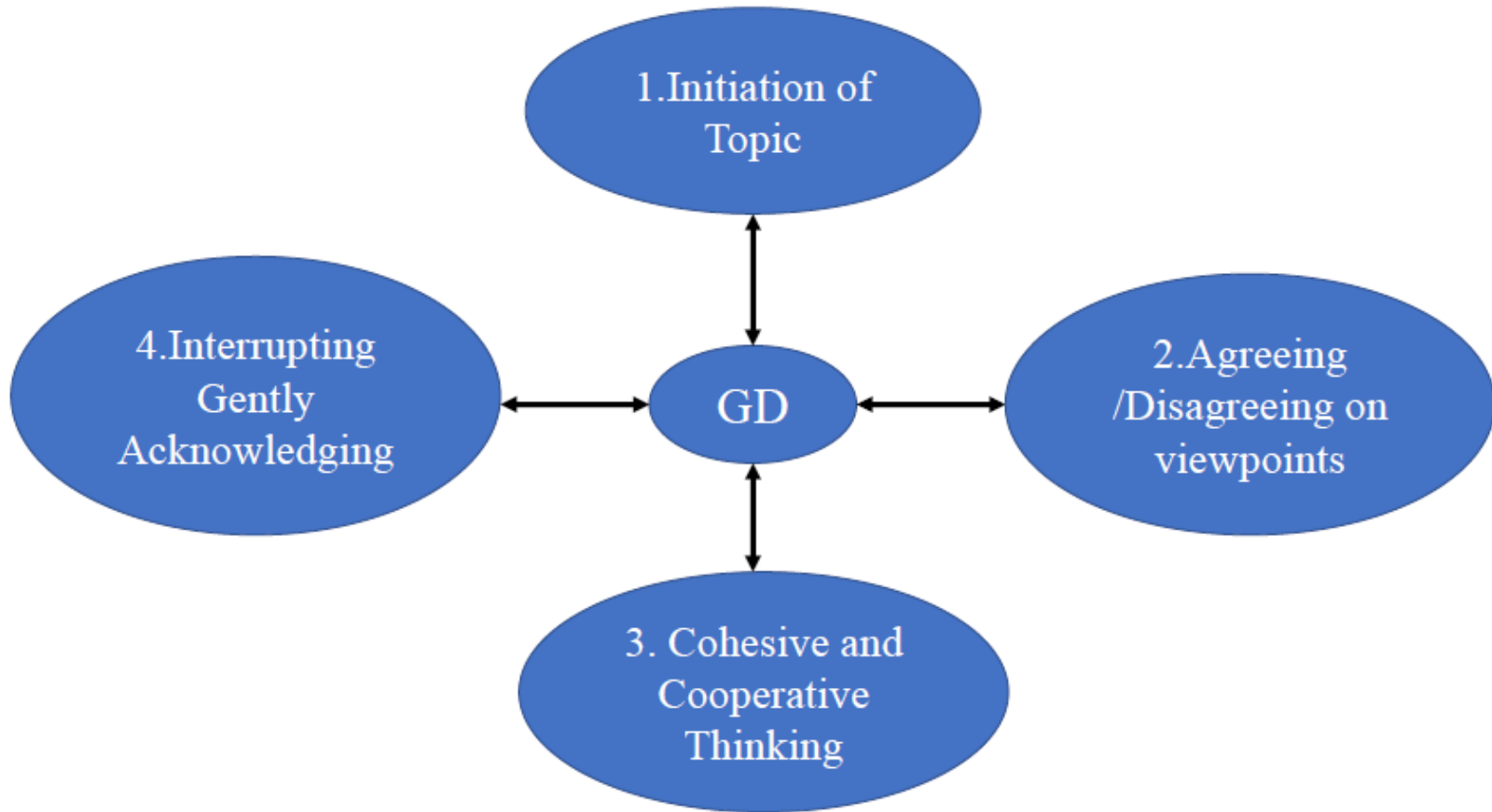
GD Implementation

- **Groups (Each consisting of 4 students)**
- **30 mins for each group.**
- **One page write up (In format of research paper)**
- **Let me know the Topics and Preference of days by mid sem break**

Group Discussion (Deciphered)



Group Discussion (Flow)





Suggestions of Possible Topic

- Glial Cells
- Sleep EEG
- Filter Design
- Prefrontal Cortex
- Butterworth Filter
- Anything you like from Syllabus or Related 😊



Purpose of doing this course?



Job Market

- MS/PhD/Postdoc positions in Universities
- Industry R&D Engineers/Scientists
 - @ GE Medical Research
 - @ Siemens
- Data Analytics Jobs (Flipkart, Amazon, Snapdeal)



Gentle Reminders

- Please be on time to classes...Rain or shine we will try to start on time.
- Late Submission of Assignments will attract penalty



Lets Start with Quick Intro

Please let me know your:

Name:

Dept/Degree:

BTP/MTP/PhD project briefly(if known):

What you think you will learn in this course



Questions are Welcome 😊

Ready to Listen to your Suggestions 😊