

## Global Navigation Satellite Systems and Applications



**Prof. Arun K. Saraf** is Ph. D. (Remote Sensing) from University of Dundee, United Kingdom. Presently he is working as Professor in the Department of Earth Sciences, Indian Institute of Technology, Roorkee, and teaches courses on Geographic Information Systems (GIS), Advanced GIS, Remote Sensing, Geomorphology etc. to under- and post-graduate students of Geological Technology and Applied Geology. He was also Head of Department of Earth Sciences between Jan. 2012 – Feb. 2015. He was first in the country to introduce GIS course to post-graduate students in the year 1990. In 1986, he was awarded “National Fellowship to Study Abroad” by Govt. of India for his doctoral degree. Further, in 1993 he was awarded “Indo-US S&T Fellowship” and worked in Goddard Space Flight Centre, NASA, USA for Post Doctoral Research. He has been also awarded “National Remote Sensing Award-2001” by Indian Society of Remote Sensing and “GIS Professional of the Year Award-2001” by Map India 2002 for his outstanding research contributions in the fields of Remote Sensing and GIS. Earlier, he has also been given several Khosla Research Awards and Prizes by then University of Roorkee. So far Prof. Saraf has published more than 100 research papers in journals of repute (ISI) and supervised 11 Ph.Ds. He was also Associate Editor of International Journal of Remote Sensing during 2003-2015. Through funding from DST, Min. of Earth Sciences, CSIR, Prof.

PRINCIPAL

G. Narayanamma Institute of  
Technology & Science (for women)  
(AUTONOMOUS)  
Shaikpet, Hyderabad - 500 104

Saraf has been able to establish and operating NOAA-HRPT Satellite Earth Station at IITR since Oct. 2002, first in any educational institute in the country. This Earth Station is still operational and acquiring data from NOAA-18 & 19 day-and-night. Further, recently Prof. Saraf have also recorded three NPTEL video courses on Introduction to Geographic Information Systems, Introduction to Remote Sensing and Digital Image Processing of Remote Sensing Data.

## COURSE TYPE

Elective

## COURSE LEVEL

Undergraduate

## COURSE LAYOUT

### WEEK-1: Introduction to Global Navigation Satellite System (GNSS)

How position is determined by the GNSS? (Part-I)  
 How position is determined by the GNSS? (Part-II)  
 How position is determined by the GNSS? (Part-III)  
 NAVSTAR - Global Positioning System

### WEEK-2: Global Navigation Satellite System (GLONASS)

BeiDou Navigation Satellite System (BDS)  
 Indian Regional Navigation Satellite System (IRNSS)  
 GALILEO  
 Quasi-Zenith Satellite System (QZSS)

### WEEK-3: Differential Global Navigation Satellite System (DGNSS)

REAL-TIME KINEMATIC (RTK)  
 Satellite Based Augmentation System (SBAS)  
 GNSS Errors  
 GNSS Correction Methods

### WEEK-4: Why altitude estimated by GNSS receivers is not very accurate

Global Navigation Satellite Systems (GNSS) Applications - I  
 Global Navigation Satellite Systems (GNSS) Applications - II  
 GNSS: Current Trends and Future  
 GNSS: Opportunities in India

## BOOKS AND REFERENCES

1. Awange, J. L., 2012. Environmental Monitoring using GNSS: Global Navigation Satellite Systems, Springer, London.
2. Bhatta, B., 2010. Global Navigation Satellite Systems: Insights Into GPS, Glonass, Galileo, Compass, and Others, BS Publications, New Delhi.
3. Grewal, M. S., Weill, L. R., Andrews, A. P., 2006. Global Positioning Systems, Inertial Navigation, and Integration, John Wiley & Sons, New York.

*[Handwritten Signature]*  
 PRINCIPAL  
 G. Narayanamma Institute of  
 Technology & Science (for women)  
 (AUTONOMOUS)  
 Shaikpet, Hyderabad - 500 104 3/4

4. Hofmann-Wellenhof, B., Lichtenegger, H., Wasle, E., 2008. GNSS – Global Navigation Satellite Systems, Springer, Verlag Wien.
5. Hofmann-Wellenhof, B., Lichtenegger, H., Collins, J., 2001. Global Positioning System Theory and Practice, Springer, Verlag Wien.
6. Tan, S., 2018. GNSS Systems and Engineering: The Chinese Beidou Navigation and Position Location Satellite, JohnWiley & Sons, Singapore

## CERTIFICATE

- The course is free to enroll and learn from. But if you want a certificate, you have to register and write the proctored exam conducted by us in person at any of the designated exam centers.
- The exam is optional for a fee of Rs 1000/- (Rupees one thousand only).
- **Date and Time of Exams: 29th September 2019** Morning session 9am to 12 noon; Afternoon Session 2pm to 5pm.
- Registration url: Announcements will be made when the registration form is open for registrations.
- The online registration form has to be filled and the certification exam fee needs to be paid. More details will be made available when the exam registration form is published. If there are any changes, it will be mentioned then.
- Please check the form for more details on the cities where the exams will be held, the conditions you agree to when you fill the form etc.

### CRITERIA TO GET A CERTIFICATE

- Average assignment score = 25% of average of best 3 assignments out of the total 4 assignments given in the course.
- Exam score = 75% of the proctored certification exam score out of 100
- Final score = Average assignment score + Exam score

### YOU WILL BE ELIGIBLE FOR A CERTIFICATE ONLY IF AVERAGE ASSIGNMENT SCORE $\geq 10/25$ AND EXAM SCORE $\geq 30/75$ .

- If one of the 2 criteria is not met, you will not get the certificate even if the Final score  $\geq 40/100$ .
- Certificate will have your name, photograph and the score in the final exam with the breakup. It will have the logos of NPTEL and IIT Roorkee. It will be e-verifiable at [nptel.ac.in/noc](http://nptel.ac.in/noc) (<http://nptel.ac.in/noc>).
- Only the e-certificate will be made available. Hard copies are being discontinued from July 2019 semester and will not be dispatched.



**PRINCIPAL**  
G. Narayanamma Institute of  
Technology & Science (for woman)  
(AUTONOMOUS)  
Shaikpet, Hyderabad - 500 104