

Plot No.1 (A), CNI Complex, Patia, Bhubaneswar – 751024, Odisha, India.

[AFFILIATED TO BPUT, ODISHA]

www.coeb.ac.in

### DEPARTMENT TO CIVIL ENGINEERING

### AD. COURSE

Course Titles: Introduction to Engineering Seismology

Branch: Civil Engineering

Programme: B.Tech

Year of Student: 3rd Year

**Course Objective:** 

1. Know the basics of earthquake engineering

2. Develop an insight into mechanics of earthquake, hazards and its consequences and also covers earthquake measurement and instrumentation.

3. Able to understand earthquake hazard and know seismic optional of the region and better way of

estimating the future seismic hazard.

4. Know the Concept of Intensity and Magnitude; different earthquake scales. Seismic instruments, earthquake data and interpretation of seismic data.

### **SYLLABUS**

**Total Lecture Hours: 36** 

Module –I 8 Hours

Introduction: The Wave Equation, The Momentum Equation, The Seismic Wave Equation, Plane Waves, Polarizations of P and S Waves, Basic seismological theory, waves on a string, stress and strain, seismic waves. Snell's law, General Plane Wave, Plane wave reflection and transmission. Dispersion in seismic surface waves.

Module –II 8 Hours

Normal modes of the earth, Investigation of Earthquake Source Properties with Normal Mode Data, Basic normal mode theory, Refraction seismology- P-wave refraction, S- wave refraction, Two Horizontal Layers, Two Layer Dipping Model, Reflection seismology- Reflection Seismic Method, Direct and refraction ray travel times, Dipping layer, Seismic waves in a spherical earth- Body waves, Primary waves, Secondary waves, Surface waves, Rayleigh waves, Love waves, Stoneley waves.

Module –III 12 Hours

Body wave travel time studies: Amplitude variation along the Earth's surface, Amplitude variation along Interface Inside the Earth for P and S waves. Anisotropic earth structure-Seismic anisotropy, Deformation experiments and rheology, Anisotropic models. Attenuation and Anelasticity-Coherency and Green's Functions, Data and Signal Processing, Phase Velocity, Attenuation Coefficients, One-Dimensional Phase and Q Model Inversion.

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8 Hours Module -IV

Earth's Layers: Crust, Mantle, and Core, Most Abundant Elements of the Earth, Seismic Discontinuities. Earthquake focal mechanisms, Moment Tremor- Introduction, Applications, Features. Brief on Earthquake geodesy and hazard monitoring. Estimation of source parameters, geological investigations and historical record of earthquakes, Seismology and Plate tectonics, Convergent margins, Seafloor spreading, lithosphere.

### **Course Outcomes:**

After successfully completing the course, students will be able to

CO1: Explain how earth processes create hazards to life and property;

CO2: Understanding all facts of earthquake hazards, will be able to quantify different earthquake hazards and its effects (e.g. site effects, liquefaction, landslides etc) using different methods, which facilitate in planning new structures/project and retrofit old buildings and infrastructures

CO3: Describe the quantification of earthquake size: Concept of Intensity and Magnitude; different earthquake scales. Seismic instruments, earthquake data and interpretation of seismic data and

seismic hazard estimation with examples.

CO4: Get better understanding of earthquake hazard and know seismic optional of the region and better way of estimating the future seismic hazard.

### **Text Books**

1. Seth Stein and Michael Wysession, "An Introduction to Seismology, Earthquakes and Earth Structure", , Wiley-Blackwell Publisher, 1st edition,2008

2. Havskov, J. and Alguacil, G. Springer, Netherlands, "Instrumentation in Earthquake Seismology",

Springer publisher, 2<sup>nd</sup> edition, 2016.

3. Bozorgnia, Y. and Bertero, "Earthquake Engineering - From Engineering Seismology to Performance - Based Engineering "CRC Press Washington, 2004.

### Digital Learning Resources

Course Name	Introduction To Engineering Seismology		
Course Link	http://nptel.ac.in/courses/105108076/		
Course Instructed	Prof. Anbazhagan Panjamani, Department of Civil Engineering IISC Bangalore		

### **Evaluation Criteria**

Mandatory attendance of 75% for each student.

Conduction of two internal assessments and students has to secure 50% marks in each assessment.

Certificates will be awarded to each student fulfilling the above criteria.

Design and Developed By Mr. Biswa Ranjan Tripathy and Mr. Pradeepta Kishore Dehury

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### DEPARTMENT OF CIVIL ENGINEERING COLLEGE OF ENGINEERING BHUBANESWAR

Plot No.1 (A), CNI Complex, Patia, Bhubaneswar – 751024, Odisha, India.
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### NOTICE

### Add On Certificate Courses 2020-2021

Ref No: COEB/CIVIL/2020/37

Date: 06/09/2020

It is for the information of all the students of 3<sup>rd</sup> /5<sup>th</sup> /7<sup>th</sup> semester B.Tech that the Department of Civil Engineering is going to start the following Add-on courses for Academic year 2020-2021 in ON\_LINE Mode. All the students are instructed to enroll their names for the following courses on or before 12/09/2020. The classes will be commenced from 14/09/2020. The students can contact their respective co-coordinators for enrollment and further detail.

Sl No.	Name of Add-on Course	Semester	Duration in Hrs	Name of Course Co- ordinators
1.	Earth Science for Civil Engineering	3 <sup>rd</sup>	36	Mrs. Nibedita Sahoo
2.	Introduction To Engineering Seismology	5 <sup>th</sup>	38	Mrs. Salini Patra
3.	Water Economics And Governance	7 <sup>th</sup>	40	Ms. Sipra Mallick

The class timing will be from 5.30 pm to 7.30 pm.

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Civil Engineering De

Copy to:

- 1. Office of the Registrar for kind Information.
- 2. Office of the Principal for kind information.
- 3. Departmental Notice Board.
- 4. Guard File

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### COLLEGE OF ENGINEERING BHUBANESWAR (COEB) ADD-ON COURSE

### STUDENT ENROLLMENT SHEET

Name of the Department: CIVIL ENGINEERING

Course Title: Introduction To Engineering Seismology

ONLINE MODE Academic Year: 2020-2021 Semester: 5th

Student's Declaration/Undertaking

1. I do hereby undertake to participate in the above mentioned add on course.

2. I do hereby, promise to abide by the admissible rules and regulations, concerning discipline, attendance, etc. of the department, and also to follow the Code of Conduct prescribed for the students of the Institute, as in force from time to time

	from time to time.		D
Sl. No.	Registration No.	Name of the Student	Remarks by the Course Coordinator
1	1801219014	ARJITA NARAYAN	
2	1801219024	BADAL KUMAR MOHAPATRA	
3	1801219029	BIBHAS KUMAR SETHI	
4	1801219052	DIPTI RANJAN MAHALIK	
5	1801219054	GIRISH CHANDRA MAJHI	
6	1801219069	KUMAR SOURAV	
7	1801219070	KUMAR SOURAV	
8	1801219077	MANISH KUMAR VERMA	
9	1801219096	PRABHAT KUMAR SRIWASTAV	
10	1801219102	PRATIK PRASUN	
11	1801219105	PRINCE KUMAR	Certified that the Enrollment Sheet is prepared
12	1801219117	RAKESH KUMAR MALIK	by taking the consents of the students to enroll
13	1801219125	SANATHA KUMAR NAYAK	themselves in this Certificate Course (Add-On)
14	1801219133	SAROJ KUMAR NAYAK	to be conducted in Virtual Mode (ON-LINE)
15	1801219152	SOUMYA RANJAN DAS	during the Pandemic COVID'19 through the
16	1801219184	ABHISEK NAYAK	link to be provided by the department.  They have also gone through the declaration/
17	1801219185	ABINASH PRADHAN	undertaking to be strictly abide by them during
18	1801219186	ALINA ROUT	the course period.
19	1801219187	ALOK KUMAR PARIDA	Course Coordinator
20	1801219188	AMAN SRIVASTAVA	(Signature with Seal)
21	1801219189	AMARESH GAYA	Salini Pata
22	1801219190	ANIL KUMAR MEHER	Lauring
23	1801219191	ARNAPURNA MALLIK	(0/8/6)
24	1801219192	ARUN KUMAR MISHRA	
25	1801219193	ASHMITA MISHRA	6000
26	1801219194	ASWINI KUMAR RAY	OTAN
27	1801219195	BANAMALI PRADHAN	
28	1801219196	BIBHUTI SETHI	
29	1801219197	BISHNU PRASAD BEHERA	7
30	1801219198	CHANDAN KUMAR SWAIN	7
31	1801219199	CHANDRA SHEKHAR NAYAK	
			n/ = 0

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### COLLEGE OF ENGINEERING BHUBANESWAR (COEB) ADD-ON COURSE

### STUDENT ENROLLMENT SHEET

Name of the Department: CIVIL ENGINEERING

Course Title: Introduction To Engineering Seismology

Semester: 5th Academic Year: 2020-2021 ONLINE MODE

Student's Declaration/Undertaking

- 1. I do hereby undertake to participate in the above mentioned add on course.
- 2. I do hereby, promise to abide by the admissible rules and regulations, concerning discipline, attendance, etc. of the department, and also to follow the Code of Conduct prescribed for the students of the Institute, as in force from time to time.

Sl. No.	Registration No.	Name of the Student	Remarks by the Course Coordinator
32	1801219200	CHELIN MOHANTY	
33	1801219201	CHINMAYA KUMAR SETHY	
34	1801219202	DEBADATTA MALLIK	
35	1801219203	DEEPANJALI JENA	
36	1801219204	DIBYA RANJAN BEHERA	
37	1801219205	DIPTEEMAYEE DAS	
38	1801219206	ELORA PRIYADARSINI	
		SATAPATHY	
39	1801219207	HAREKRISHNA BOHIDAR	
40	1801219208	JITENDRA KUMAR PARIDA	
41	1801219209	KALANDI GIRI	
42	1801219211	LIPSA JAYASINGH	
43	1801219212	LOPAMUDRA DALABEHERA	Certified that the Enrollment Sheet is prepared
44	1801219213	MAHESWAR BINDHANI	by taking the consents of the students to enroll
			themselves in this Certificate Course (Add-O to be conducted in Virtual Mode (ON-LINE during the Pandemic COVID'19 through the link to be provided by the department.  They have also gone through the declaration undertaking to be strictly abide by them during the course period.  Course Coordinator  (Signature with Seal)

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### Programme: B.Tech in Civil Engineering Duration: 38 has Name of the Course: Introduction To Engineering Seismology 15 22 19 4 12 18 17 16 Signature of the Course Coordinator REGISTRATION 1801219014 1801219069 1801219054 1801219024 1801219117 1801219105 1801219070 1801219052 1801219029 1801219102 1801219077 1801219125 1801219096 1801219133 1801219188 1801219187 1801219186 1801219185 1801219193 1801219192 1801219152 1801219191 1801219189 1801219184 1801219195 1801219194 1801219190 **BIBHAS KUMAR SETHI** BADAL KUMAR MOHAPATRA ARJITA NARAYAN KUMAR SOURAV GIRISH CHANDRA MAJHI DIPTI RANJAN MAHALIK MANISH KUMAR VERMA KUMAR SOURAV PRATIK PRASUN PRABHAT KUMAR SRIWASTAV RAKESH KUMAR MALIK PRINCE KUMAR SANATHA KUMAR NAYAK ABHISEK NAYAK SOUMYA RANJAN DAS ALOK KUMAR PARIDA ALINA ROUT ABINASH PRADHAN SAROJ KUMAR NAYAK AMAN SRIVASTAVA ARNAPURNA MALLIK ANIL KUMAR MEHER AMARESH GAYA **ASHMITA MISHRA** ARUN KUMAR MISHRA **BANAMALI PRADHAN** ASWINI KUMAR RAY Academic Year: 2020-21 NAME OF THE STUDENT COLLEGE OF ENGINEERING BHUBANESWAR (COEB) DEPARTMENT OF CIVIL ENGINEERING STUDENT ATTENDANCE SHEET ADD ON/CERTIFICATE COURSE OCH IN OCH IN 8 8 0 0 B D D Date: Date & Signature of the Student 0 0 Semester: P 5th Date: 0 4 Q D P D 0 H P 7 Sheet No. P ONLINE MODE J 0 0 0 4 College of Engineering Bhubaneswar mode (ON-LINE) because of the remarks P-Present and A-Absent The attendance is taken with the course is conducted in virtual Course Coordinator (Siganture Certified that this Certificate Pandemic COVID-19. Salini Patro for the students. Remarks with Seal)



DEPARTMENT OF CIVIL ENGINEERING ADD ON/CERTIFICATE COURSE

Signature of the Course Coordinator 40 42 39 38 35 34 Duration: 28/25
SL. REGISTRATION 29 NO. Name of the Course: Introduction To Engineering Seismology Programme: B.Tech in Civil Engineering 1801219212 1801219209 1801219208 1801219207 1801219206 1801219213 1801219211 1801219204 1801219203 1801219205 1801219198 1801219197 1801219196 1801219202 1801219200 1801219201 1801219199 MAHESWAR BINDHANI KALANDI GIRI LOPAMUDRA DALABEHERA LIPSA JAYASINGH JITENDRA KUMAR PARIDA HAREKRISHNA BOHIDAR SATAPATHY ELORA PRIYADARSINI DIPTEEMAYEE DAS DIBYA RANJAN BEHERA CHINMAYA KUMAR SETHY DEEPANJALI JENA DEBADATTA MALLIK CHELIN MOHANTY CHANDRA SHEKHAR NAYAK CHANDAN KUMAR SWAIN BISHNU PRASAD BEHERA BIBHUTI SETHI Academic Year: 2020-21 NAME OF THE STUDENT STUDENT ATTENDANCE SHEET 0 D B 0 0 0 0 D 4 6 5 Date & Signature of the Student Semester: G t to 5th 0 Date: Sheet No. 0 ONLINE MODE mode (ON- LINE) because of the remarks P-Present and A-Absent The attendance is taken with the College of Engineering Bhubaneswar B Course Coordinator (Siganture course is conducted in virtual Certified that this Certificate Pandemic COVID-19. for the students. with Seal) PRINCIPAL Remarks

### Name of the Course: Introduction To Engineering Seismology Programme: B.Tech in Civil Engineering Duration: 38 has 10 18 14 12 17 16 C 19 Signature of the Course Coordinator 1801219014 REGISTRATION 1801219029 1801219052 1801219069 1801219054 1801219024 1801219102 1801219105 1801219096 1801219077 1801219070 1801219186 1801219185 1801219184 1801219117 1801219187 1801219152 1801219133 1801219125 1801219191 1801219190 1801219189 1801219188 1801219192 1801219195 1801219194 1801219193 ARJITA NARAYAN BIBHAS KUMAR SETHI BADAL KUMAR MOHAPATRA GIRISH CHANDRA MAJHI DIPTI RANJAN MAHALIK MANISH KUMAR VERMA KUMAR SOURAV KUMAR SOURAY PRABHAT KUMAR SRIWASTAV SAROJ KUMAR NAYAK SANATHA KUMAR NAYAK RAKESH KUMAR MALIK PRINCE KUMAR PRATIK PRASUN SOUMYA RANJAN DAS ALINA ROUT ABHISEK NAYAK ABINASH PRADHAN ALOK KUMAR PARIDA AMARESH GAYA AMAN SRIVASTAVA Academic Year: 2020-21 ARNAPURNA MALLIK ANIL KUMAR MEHER ASWINI KUMAR RAY BANAMALI PRADHAN **ASHMITA MISHRA** ARUN KUMAR MISHRA NAME OF THE STUDENT COLLEGE OF ENGINEERING BHUBANESWAR (COEB) DEPARTMENT OF CIVIL ENGINEERING STUDENT ATTENDANCE SHEET ADD ON/CERTIFICATE COURSE 8 Date & Signature of the Student Semester: 5th D Sheet No. ONLINE MODE College of Engineering Bhubaneswar mode (ON- LINE) because of the remarks P-Present and A-Absent The attendance is taken with the course is conducted in virtual Course Coordinator (Siganture Certified that this Certificate Pandemic COVID-19. Salini Passa for the students. Remarks PRINCIPA with Seal



DEPARTMENT OF CIVIL ENGINEERING ADD ON/CERTIFICATE COURSE

29 28 Name of the Course: Introduction To Engineering Seismology NO. Duration: 38has Programme: B.Tech in Civil Engineering 1801219198 1801219197 1801219199 1801219196 REGISTRATION CHANDRA SHEKHAR NAYAK BISHNU PRASAD BEHERA CHANDAN KUMAR SWAIN BIBHUTI SETHI Academic Year: 2020-21 NAME OF THE STUDENT STUDENT ATTENDANCE SHEET Date: Date: Date & Signature of the Student Semester: 5th Date: Date: 20/4/20 5/19/20 Date: Sheet No. ONLINE MODE Remarks

remarks P-Present and A-Absent mode (ON- LINE) because of the The attendance is taken with the course is conducted in virtual Certified that this Certificate Pandemic COVID-19. for the students.

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JITENDRA KUMAR PARIDA

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CHINMAYA KUMAR SETHY

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CHELIN MOHANTY

Course Coordinator (Siganture with Seal)

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Signature of the Course Coordinator

### Name of the Course: Introduction To Engineering Seismology NO. Programme: B.Tech in Civil Engineering 10 20 19 14 ر د 18 17 5 22 16 26 Signature of the Course Coordinator REGISTRATION 1801219014 1801219024 1801219052 1801219029 1801219070 1801219054 1801219125 1801219117 1801219102 1801219077 1801219069 1801219105 1801219133 1801219096 1801219152 1801219189 1801219188 1801219187 1801219186 1801219184 1801219195 1801219193 1801219192 1801219185 1801219194 1801219190 1801219191 ARJITA NARAYAN BADAL KUMAR MOHAPATRA GIRISH CHANDRA MAJHI DIPTI RANJAN MAHALIK BIBHAS KUMAR SETHI KUMAR SOURAY KUMAR SOURAV MANISH KUMAR VERMA PRATIK PRASUN PRABHAT KUMAR SRIWASTAV SANATHA KUMAR NAYAK RAKESH KUMAR MALIK PRINCE KUMAR SAROJ KUMAR NAYAK SOUMYA RANJAN DAS ALINA ROUT ABINASH PRADHAN ABHISEK NAYAK ALOK KUMAR PARIDA AMARESH GAYA AMAN SRIVASTAVA ARNAPURNA MALLIK ANIL KUMAR MEHER ASHMITA MISHRA ARUN KUMAR MISHRA Academic Year: 2020-21 BANAMALI PRADHAN ASWINI KUMAR RAY NAME OF THE STUDENT COLLEGE OF ENGINEERING BHUBANESWAR (COEB) DEPARTMENT OF CIVIL ENGINEERING STUDENT ATTENDANCE SHEET ADD ON/CERTIFICATE COURSE Date: 0 P Date: Date & Signature of the Student Date: Date: Semester: 5th Date: Date: Sheet No. ONLINE MODE Date: mode (ON-LINE) because of the remarks P-Present and A-Absent The attendance is taken with the course is conducted in virtual Course Coordinator (Siganture Certified that this Certificate College of Engineering Bhubaneswar Pandemic COVID-19. for the students. Remarks with Seal) PRINCIPAL

DEPARTMENT OF CIVIL ENGINEERING ADD ON/CERTIFICATE COURSE

STUDENT ATTENDANCE SHEET

Signature of the Course Coordinator 44 40 30 29 Name of the Course: Introduction To Engineering Seismology Programme: B.Tech in Civil Engineering 1801219213 1801219212 1801219209 1801219206 1801219211 1801219208 1801219207 1801219205 1801219201 1801219199 REGISTRATION 1801219202 1801219200 1801219198 1801219204 1801219197 1801219196 801219203 MAHESWAR BINDHANI KALANDI GIRI LOPAMUDRA DALABEHERA LIPSA JAYASINGH JITENDRA KUMAR PARIDA HAREKRISHNA BOHIDAR SATAPATHY ELORA PRIYADARSINI DIBYA RANJAN BEHERA DEBADATTA MALLIK DIPTEEMAYEE DAS DEEPANJALI JENA CHINMAYA KUMAR SETHY CHELIN MOHANTY CHANDRA SHEKHAR NAYAK CHANDAN KUMAR SWAIN BISHNU PRASAD BEHERA BIBHUTI SETHI Academic Year: 2020-21 NAME OF THE STUDENT 0 I 0 Date & Signature of the Student Date: Date: 12/19/12 Semester: 5th 0 8 Date: Sheet No. Date: ONLINE MODE remarks P-Present and A-Absent mode (ON- LINE) because of the The attendance is taken with the Course Coordinator (Siganture 20 College of Engineering Bhubaneswal course is conducted in virtual Certified that this Certificate Pandemic COVID-19. for the students. with Seal) Remarks PRINCIPA



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## Oertificate of Completion

2020-21
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Course-Coordinator

X.

Principal

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## Oertificate of Oempletion

has successfully completed the ADD-ON Course titled.	of Civil Engg.	This is to certify that Mr./Ms.
e ADD-ON Course titled	sen	PRINCE KUMAR
Introduction To Engineering Seismology	_semester_Fifthbearing registration number1801219105	
gy	801219105	student of the Department

conducted at College of Engineering Bhubaneswar in the academic year 2020-21

TRUE COPY

Course-Coordinator

Principal

PRINCIPAL College of Engineering Bhubanesi

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## Opritificate of Oompletion

conducted at College of	has successfully complet	of Civil Engg.	This is to certify that Mr./Ms.
conducted at College of Engineering Bhubaneswar in the academic year 2020-21	has successfully completed the ADD-ON Course titledIntroduction To Engineering Seismology	semester Fifth bearing registration number 1801219117	Ms. RAKESH KUMAR MALIK , student of the Department

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Course-Coordinator

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Principal



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## Oertificate of Completion

has successfully completed the ADD-ON Course titled	of Civil Engg.	This is to certify that Mr./Ms
le ADD-ON Course titledIntroduction To Engineering Seismology	semester Fifth bearing registration number 1801219125	SANATHA KUMAR NAYAK, student of the Department

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conducted at College of Engineering Bhubaneswar in the academic year 2020-21

Course-Coordinator

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Principal

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## Oertificate of Completion

has successfully completed the ADD-ON Course titled	of Civil Engg.	This is to certify that Mr./Ms
ADD-ON Course titledIntroduction To Engineering Seismology	semester Fifth bearing registration number 1801219133	SAROJ KUMAR NAYAK, student of the Department

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conducted at College of Engineering Bhubaneswar in the academic year 2020-21

Course-Coordinator

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Principal

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