



Global Initiative on Academic Network (GIAN) Program

Recycled Aggregates: Characteristics and Use in Concrete, incorporating Case Studies, Standards/Specifications and Environment Impact Considerations

[Online Mode]

28 November – 2 December 2022

**Department of Civil Engineering
Dr B R Ambedkar National Institute of Technology
Jalandhar – 144027, Punjab, India**

GIAN Program

The Ministry of Human Resource Development, Government of India has launched program titled 'Global Initiative of Academic Networks (GIAN)' in Higher Education aimed at tapping the talent pool of scientists and entrepreneurs, internationally to encourage their engagement with the Institutes of Higher Education in India so as to augment the country's existing academic resources, accelerate the pace of quality reforms and elevate India's scientific and technological capacity to global excellence. Global Initiative of Academic Networks program facilitates participation of high-quality international academicians/researchers for delivering short-term courses and programs in Indian institutions. More details on various GIAN courses are available at <http://www.gian.iitkgp.ac.in/>

The Institute

Dr B R Ambedkar National Institute of Technology (NIT), Jalandhar was established in the year 1986 as Regional Engineering College and was given the status of National Institute of Technology (Deemed University) by the Government of India on 17 October 2002 under the aegis of Ministry of Human Resource Development, New Delhi. The Ministry of Human Resource Development, Government of India has declared the Institute as 'Institute of National Importance' under the act of Parliament-2007. The Institute offers Bachelor of Technology (BTech), Master of Technology (MTech), Master of Science (MSc), Master of Business Administration (MBA) and Doctor of Philosophy (PhD) programs in several disciplines of

Engineering, Science & Technology and Management. The Institute has been ranked 49th in the NIRF ranking in the year 2021, an initiative of Government of India.

The Department

The Department of Civil Engineering offers BTech in the discipline of Civil Engineering ever since its inception in the year 1989. The department has been offering MTech Programme in Structural and Construction Engineering since 2004 and Geotechnical and Geo-environmental Engineering since 2017. The doctoral programmes in different specializations were started in the year 2006. The Department has also been selected as 'DST-FIST Sponsored Department' by the Ministry of Science and Technology, Government of India. The Department has established state-of-the art laboratories with sophisticated equipment for undergraduate courses and research work.

Overview of the Course

Concrete is highly diverse in nature among all other civil engineering materials which comprises different mix materials from country to country depending on its application. An unmatched investment in construction industry and rising needs of habitats in urban cities has shaped a hefty call of conventional building materials. The issue of sustainability is of key concern nowadays as huge amount of natural resources are used continuously for producing materials for concrete. As a consequence, the threat of depletion of natural resources has already been elevated which require an immediate action. The depletion of good quality aggregates along with the increase in aggregate requirement makes the availability of raw materials scarcer.

On the other hand, the construction industry in particular is notorious for the creation of vast amounts of waste. The latest scenario in construction industry is to use the alternative sources of construction materials which replace the use of new/raw materials in order to minimize the ecological and environmental effects. The speedy trend of modernization has led to the generation of debris from construction and demolition wastes. These wastes produced through construction and demolition throughout the world contemplates the significant annoyance where it contains many types of materials including concrete debris, steel, hazardous materials etc. So, handling of such debris has become one of the important issues in developed countries and it has become a global concern that requires sustainable solution. Moreover, the global anxiety about the reduction of carbon footprints is also playing a crucial role during the extraction process of aggregates. Civil engineers, researchers and scientists are looking forward to provide solutions to these critical issues. Based on these issues, the use of recycled aggregates in construction in structural grade concrete may yield as a mean of economic viability and environmental consciousness along with bulk reduction of waste materials. Therefore, in the current time, recycled

concrete aggregates (RCA) are being used for both structural and non-structural applications. It has been established that their use is feasible for commercial as well as residential purposes.

It is essential that the concrete industry across India and related organizations promote a consistent approach for utilization and recycling of construction and demolition wastes in the development of infrastructure and systems.

Objectives

At the end of the course, participant shall be able to:

- Understand the role of construction and demolition wastes in sustainable concrete construction, its potential and characteristics.
- Understand the influence of recycled aggregates on fresh, mechanical and deformation properties concrete.
- Understand recycled aggregates based self-compacting concrete and their effects on fresh and hardened properties.
- Understand the durability performance of recycled aggregates concrete in comparison with natural aggregates concrete in terms of resistance to physical and chemical attacks.
- Understand the environmental impact, standards and specifications relating to the use of recycled aggregates in concrete.
- Understand structural performance of concrete containing recycled concrete aggregates, both under static and dynamic loading with particular reference to flexural fatigue.

Who Should Attend

- Academicians, Researchers and Students
- Design Engineers and Architects
- Contracting Engineers
- Ready Mixed Concrete Suppliers
- Precast Concrete and Materials Suppliers
- Formwork Designers
- Highway Authorities and Designers
- Trade Associations

Course Faculty

Professor R K Dhir OBE is an internationally acknowledged scholar and practitioner in concrete science, technology and construction. He is Emeritus Professor, University of Dundee, Visiting Professor, Trinity College Dublin, Honorary Professor of Concrete Engineering, University of Birmingham and Director of Applying Concrete Knowledge.



He is the founding Director of Concrete Technology Unit, which he established in 1988 at the University of Dundee and developed it into a £15m internationally acknowledged Centre of Excellence. His approach to research has been visionary, enabling him to achieve a meaningful dissemination of research to practice, which won him several prestigious awards, including The Order of the British Empire. He was the President of the Concrete Society UK, 2009-2010. For more information, please use the following link:
<https://www.birmingham.ac.uk/staff/profiles/civil/dhir-ravindra.aspx>

Professor S P Singh is a Professor in the Department of Civil Engineering,

Dr B R Ambedkar National Institute of Technology, Jalandhar, India. He specialises in fatigue behaviour of concrete composites, concrete technology, recycling of materials in concrete and earthquake resistant design of concrete structures. He has more than 29 year experience of teaching, working closely with the construction Industry in India as well as undertaking consultancy and research and development work. In addition, he has developed a state of the art Concrete Research Laboratories, including controlled natural out-door carbonation testing facility at his parent Institution. He is a Member of RILEM Technical Committee 273 RAC: Structural Behaviour and Innovation of Recycled Aggregate Concrete. He is a Fellow of Institution of Engineers (India), Member of American Concrete Institute (ACI) and American Society of Civil Engineers (ASCE). For more information, please use the following link:



https://www.nitj.ac.in/index.php/nitj_cinfo/Faculty/23

Dr Kanish Kapoor is an Assistant Professor in the Department of Civil Engineering,

Dr B R Ambedkar National Institute of Technology, Jalandhar, India. He earned his Doctorate from Department of Civil Engineering, National Institute of Technology Jalandhar.

His research work is focused on the reuse and recycling of Construction and Demolition waste and industrial by-products in cementitious materials. Over last five years, he has published many international journal and conference papers. He has been responsible for research projects based on pervious concrete incorporating waste plastics and beneficiated recycled aggregates. He is Life Member of Indian Concrete Institute (ICI). For more information, please use the following link:



https://www.nitj.ac.in/index.php/nitj_cinfo/Faculty/121

Dr Navdeep Singh is an Assistant Professor in the Department of Civil Engineering, Dr B R Ambedkar National Institute of Technology, Jalandhar, India. He earned his Doctorate from Department of Civil Engineering, National Institute of Technology Jalandhar.



His research work is focused on the reuse and recycling of Construction and Demolition industrial by-products in cementitious materials. Over last five years he has published many international journal and conference papers. He has been responsible for research projects based on use of fly ash in Self Compacting Concretes. He is- Life Member of Indian Concrete Institute (ICI). For more information, please use the following link:

https://www.nitj.ac.in/index.php/nitj_cinfo/Faculty/123

Tentative Course Schedule

Day-1 [Monday, 28 November 2022]		
Lecture -1	Prof R K Dhir	Sustainable Construction; Concrete as Construction Material; Role and Significance of Concrete's Constituent Materials; Potential and Challenges of developing sustainable Concrete.
Lecture-2	Prof R K Dhir	Construction, Demolition and Excavation Waste (CDEW) and its Use as Recycled Aggregate (RA) in Concrete; Types of Recycled Aggregates, Characteristics, Classification, Standards and Specifications.
Lecture-3	Prof R K Dhir	Recycled Aggregate (RA), Use of RA in Fresh Concrete and Effects: Consistence (Workability), Stability (Bleeding and Segregation) Properties, Finishability and Air Content.
Tutorial-1	Prof R K Dhir	Aggregate Characterization; Distinguish between Natural Aggregates (NA) and Recycled Aggregates (RA); Mixing and Testing of Fresh Concrete; RA Effects over full Range of RA Type, content and strength Grade of Concrete.
Day-2 [Tuesday, 29 November 2022]		
Lecture - 4	Prof R K Dhir	RA Concrete, Strength Development Properties: Compressive, Tensile and Flexural. Effect of (i) RA Content, (ii) Design Strength; (iii) Impact Loading and (iv) Resistance to High Temperatures.
Lecture - 5	Prof R K Dhir	Deformation Properties: RA use effect on Load-Dependent Deformation Properties (Elastic Modulus and Creep) and Load-Independent Deformation Properties (Shrinkage, Expansion and Thermal Movement) of concrete.
Lecture - 6	Prof S P Singh	Structural Performance of Concrete Containing Recycled Concrete Aggregates, Both Under Static and Dynamic Loading, with Particular Reference to Flexural Fatigue.
Tutorial - 2	Prof R K Dhir/Prof S P Singh	Strength, Deformation Properties and Structural Performance of Concrete: Effect of Using RA and its Consequences in Practice and Possible Construction Industry Reaction.

Day-3 [Wednesday, 30 November 2022]		
Lecture - 8	Prof S P Singh	RA Self-Compacting Concrete (SCC), RA Effects on Fresh (consistence and stability) and Hardened Concrete (strength, deformation and durability) Properties.
Lecture-9	Prof R K Dhir	Durability of RA Concrete: Effect on its Permeation Properties and Physical Properties, Eventually Leading to the Formation of Cracks in Concrete, and to Generally Lowering the Resistance of Concrete.
Lecture-10	Prof R K Dhir/Dr Navdeep Singh	Resistance of RA Concrete to Various Chemical Attacks: Sulphate Attack, Thaumassite, Alkali-Silica Reaction, Acid Attack and Chlorided/Carbonation Induced Corrosion of Steel Reinforcement
Lecture-11	Dr Navdeep Singh/Dr Kanish Kapoor	Discussion of Large Volume of data Obtained for Carbonation of RA and NA Concretes Exposed to Natural and Sheltered Environment.
Day-4 [Thursday, 1 December 2022]		
Lecture-12	Prof R K Dhir	Consideration of (i) Standards and (ii) Specifications and (iii) Environmental Impacts Relating to the Use of RA in Concrete.
Lecture-13	Prof R K Dhir	Appropriate Use of Recycled Aggregates and Sustainable and Durable Concrete Construction.
Lecture-14	Dr Kanish Kapoor	Mix Design of Recycled Aggregates Concrete for Structural Applications and Durability.
Tutorial-3	Prof R K Dhir/Prof S P Singh	Sustainability, Sustainable Construction and Use of RA in Concrete. Brief Summary and Discussion of the Main Points of the Course.
Day-5 [Friday, 2 December 2022]		
Lecture-17	Prof R K Dhir/Prof S P Singh	Case Studies Covering a Wide Range of RA Applications in Concrete Construction and lessons to be learn from them.
Lecture-18	Prof R K Dhir	Availability of RA; Sources/Generation of Construction and Demolition Waste, Barriers to Recycling Waste in the Construction Industry.
Lecture-19	Prof R K Dhir	Processing of Recycled Aggregates; Benefits of Selective Demolition, Environment Impact of CDEW Processing, Production and Collection of CDEW, Recycling Plants.
Tutorial-4	Prof R K Dhir/Prof S P Singh/Dr Navdeep Singh/Dr Kanish Kapoor	Overview of the Course Coverage and the Lessons to be learnt; Questions/Answers Session and Closing Remarks with Salient Points.

Registration Process

Step-1: One Time Web (Portal) Registration-

The candidates are advised to visit GIAN Website using the link: <https://gian.iitkgp.ac.in/GREGN/index> and create Login User ID and Password. Fill up the blank registration form and do web registration by paying Rs. 500 online through Net Banking/Debit/Credit Card. This provides the candidate with life-time registration to enroll in any number of the GIAN courses offered. Those candidates, who have already enrolled at the GIAN portal, need not register again.

Step-2: Course Registration (Through GIAN Portal)-

Log in to the GIAN portal with the user ID and Password created. Click on “**Course Registration**” option given at the top of the registration form. Select the Course titled *‘Recycled Aggregates: Characteristics and Use in Concrete, incorporating Case Studies, Standards/Specifications and Environment Impact Considerations’* from the list and click on ‘**Save**’ option. Confirm your registration by Clicking on ‘**Confirm Course**’. *The Course Coordinator will shortlist you and you will get an email in this regard. Once you are shortlisted, please move to Step-3 below.*

Step-3: Course Fee and Payment

After GIAN Registration, the Course Fee is to be paid online in the account of NIT Jalandhar, the details of which are given below:

Course Fee

Faculty of Academic Institutions: Rs. 2000

Students: Rs. 1000

Participants from Industry: Rs. 2500

Account Details

Bank: Canara Bank

Account Name: Global Initiative on Academic Networks (GIAN)

Account Number: 2945101004688

IFSC Code: CNRB0002945

SWIFT: CNRBINBBBMC

The Course Fee covers the course materials and access to all the sessions. The participants should pay registration fee through online mode (NEFT/IMPS) and fill in the transaction ID/details in the Google Form using the link given in Step-4.

Step-4: Registration

After online payment of Course Fee, please **fill in and submit** the Google Form using the following link to register for the Course. **Please copy and paste into the browser if it does not work.**

https://docs.google.com/forms/d/e/1FAIpQLSf6ZckNpgZi-Edeg-GC9J9Fvsfp_ie2JWbprD2ZV9XS7EXGvA/viewform

The last date for registration is Friday, 26 November 2022. **Please register using the google form given above.** The link for the course shall be provided (Microsoft Teams/Google Meet/Zoom) by Friday, 26 November 2022.

Course Coordinators

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