

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

DRAFT VISION DOCUMENT

2020- 2030



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PROLOGUE

Vision document of any institute is a document to guide the institute to achieve the various goals based on the needs of the stakeholders. In continuation with vision 2020, the institute has framed vision 2030 document for its future realistic goal to emerge as a leading technical institute of the country and to establish a global recognition for the development of high-quality human & knowledge resource.

The objectives of this Vision Document have been aligned with National Educational Policy 2020, to make our country Atmanirbhar Bharat – a self reliant nation, to create skillful and knowledgeable human resource and to assist the nation with its continuous research towards sustainable development. The importance has also been given to achieve these goals with institute’s accountable and transparent ways.

The Vision 2030 document of NIT Raipur has been framed by reviewing the earlier Vision 2020 document and valuable feedbacks from its stakeholders - the students, employees and alumni through online surveys to tune it to the future need of the country.

The Vision and Mission statements, Core Values and specific roadmap for the institute for the next decade is briefed in this Vision 2030 document.

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GENERAL:

National Institute of Technology Raipur formerly Government Engineering College Raipur, situated in the capital of state of Chhattisgarh, has proven to be 'avant-garde' in the field of science and technology over the past decades in the central region. With sweet memory of foundation ceremony by our First President Hon'ble Dr. Rajendra Prasad on 14th September 1956, the institute started with two departments namely Metallurgical and Mining Engineering. The then Prime Minister Hon'ble Pt. Jawaharlal Nehru inaugurated the Institute building on 14th March 1963.

The status of Government Engineering College, Raipur had been recognized as National Institute of Technology by the Central Govt. with effect from 1st Dec. 2005 and was later elevated to an Institute of National Importance. Since then, the Institute had been working with a mission to support growth and promotion of industries and communities of the region.

The institute offers undergraduate degree courses in Architecture, Bio-Technology, Bio-Medical Engineering, Computer Science & Engineering, Civil Engineering, Chemical Engineering, Electrical Engineering, Electronics and Communication Engineering, Information Technology, Mechanical Engineering, Metallurgical and Materials Engineering and Mining Engineering.

The institute also offers two years M. Tech. program in Industrial Engineering and Management, Machine Design, Thermal Engineering, Structural Engineering, Water Resources Development and Irrigation Engineering, Chemical Engineering, Power System and Control, VLSI and Embedded System, Information Technology and three year post graduate courses in Applied Geology and Computer Applications (M.C.A.). Institute also offers Ph.D. programs in all the disciplines.

In addition to the engineering departments, the departments of Physics, Chemistry, Mathematics and Humanities and Social Science department provide all the necessary support to the degree offering courses. To hone up the skills of the students required in their specific fields, a separate Career Development Centre with verticals as Training, Placement, Innovation and Entrepreneurship has also been established. Further, the institute also offers certificate courses through its Continuing Education Cell to cater to the needs of the society in general.

The institute has continuously achieved new heights by improving its NIRF ranking with each passing year. It has significantly moved from 100-150 Rank band in 2017 to 81 in 2018, 74

in 2019 and 67 in 2020. The institute has also proven its strength in providing the necessary ecosystem for innovation by acquiring 4 star rating from MoE for the last two years. It has also attained a position in Band A in ARIIA(Atal Ranking of Institutions on Innovation Achievements) ranking in the central region.

ACHIEVEMENTS IN LAST DECADE AS PER VISION 2020

The objectives of Vision 2020 have been reviewed and the achievements in the last decade have been summarized below.

| Review of Vision 2020 document | | |
|--------------------------------|---|--|
| Sr. No. | Objective | Achievements |
| 1. | Creating an environment to make teaching more learning centric rather than curriculum centric | <ul style="list-style-type: none"> - Institute has implemented Choice Based Credit System (CBCS) to provide more flexibility to the students by learning the subjects of their choices. - Curriculum has been modified and new subjects are introduced to meet the present day requirements of the industries and society. |
| 2. | To attract and retain highly qualified, talented, motivated staff | <ul style="list-style-type: none"> - Four recruitment drives has already been carried out for recruiting the best faculty since last decade. - One cycle has been carried out for recruiting non-teaching staff (technical and non-technical) and another cycle is underway. - Sustained efforts were made to retain the talented employees through resolving their grievances. |
| 3. | To focus not only on quality education but on total quality management | Institute has started various activities towards total quality management. Most notable among the various activities include the regular meetings of Quality circle, interaction with students in FIRE sessions (Free Informal Right to Express). |
| 4. | To provide the academic support facilities (Lab, Library, Internet) on continuous basis. | Annually a handsome amount is allocated towards the support facilities. The same has led to advanced laboratory facilities across all the disciplines, well established library and high end networking facilities. To provide the state of the art computing facility a separate computer center with super computer has also been established. |
| 5. | To develop industry institute interface for collaborative research, internship, and fellowship for PG programme | <p>Institute has signed 21 MOUs with institutes of higher learning and agencies mainly with the aim of</p> <ul style="list-style-type: none"> • Promoting the academic and research exchange • Promoting the interaction and collaboration between faculty, staff and students through visits and exchange programs, • Carrying out joint academic and research activities. |

VISION:

To be a leader in technical and management education in India and to establish a unique identity for the development of high-quality human and knowledge resource in diverse area of technology and management.

MISSION:

To mould young students into rational thinking **engineers/individuals** who are motivated by a passion for professional excellence driven by human values and proactively engaged in betterment of society.

CORE VALUES

Core values adopted by the Institute as enduring principles are Integrity, Excellence, Transparency and Accountability.

- **Excellence:** Institute is committed to maintain excellence in all its activities. External and internal audits/reviews lead the institute towards continuous improvement.
- **Integrity:** Teaching and research is carried out in an environment of academic freedom and honesty. Institute will thrive to the highest standards of ethics in all its activities.
- **Transparency:** Institute will function according to the defined procedures and rules, which will be known to all the stakeholders. All important information related to its functioning will be made available in public domain.
- **Accountability:** NIT Raipur being an Institute of National Importance is accountable about its functioning to all the stakeholders.

OBJECTIVES

1. **To broaden the academics and align the curriculum in the direction of National Education Policy (NEP) 2020.**
2. **To improve employability, entrepreneurship and innovation amongst the students as per the needs of industry and society at large.**

3. **To create a vibrant interdisciplinary research environment for achieving sustainable development.**
4. **To develop an environment friendly green campus equipped with the state of art infrastructure and amenities.**
5. **To attract and retain highly qualified, talented and motivated staff by improving the internal support system.**
6. **To enhance fund generation through fund raising from Alumni and other sources.**

The above derived objectives for the institute vision will be achieved through the active participation of different stakeholders in various domains. For attaining the same a roadmap is outlined.

1. UNDERGRADUATE EDUCATION:

Institute is presently offering undergraduate program in 12 disciplines. The institute continuously thrives to achieve the highest standards in education. The primary emphasis will be on providing holistic and multidisciplinary education that enables increased creativity and innovation, critical thinking capacity, problem-solving ability, teamwork, communication skills, in-depth learning and mastery of curricula across fields, enhanced social and moral awareness, while allowing general engagement and enjoyment of learning. Following actions will be taken to achieve these objectives.

- a. Institute will gradually adopt multi-disciplinary, choice based approach by providing all-round skills necessary to boost the professional knowledge, economy and welfare of society of 21st century, thereby growing into a research-intensive institute.
- b. Institute will provide a flexible learning structure with multiple entry and exit options, along with the provision for exchange of credits with recognized peer institutes or online courses as per the guidelines of NEP 2020.
- c. Institute will integrate the latest technologies in all spheres of education.
- d. Institute will arrange to maintain the necessary Student Teacher ratio for effective implementation of NEP 2020.
- e. Institute will initiate Online Certificate courses, Diploma courses, Degree Courses and Degree course by research as per the needs of society.

- f. Institute will encourage opportunities for lifelong learning through Open and Distance Learning (ODL) resources and thereby preparing professionals in cutting edge areas like – Industry 5.0, Artificial Intelligence, 3D machining, Big Data analysis, Robotics and Automation, Machine Learning, Cyber – Physical systems, Genomics and Nanotechnology with important applications to health, environment and sustainable living.
- g. Institute will endeavor to provide opportunities to **SEDGs** (**Socio Economically Disadvantaged Groups**) to enable them to overcome the barriers in their path of learning.
- h. To make the knowledge more easily available to the wider spectrum of the society, the institute will also impart education in regional language i.e. Hindi.
- i. Institute will strive to strengthen all around development of students including suitable career guidance of students by providing finishing school training, entrepreneurship training, and supporting innovations to empower startup enthusiasts along with fulfilling their requirement for higher studies (PG, PhD, MBA etc.).
- j. Institute is also committed towards imbibing ethical values, keeping the mental and physical wellness of its students through regular Value Education and Yoga sessions in the curriculum.
- k. The facilities like Laboratories, Library, MIS system, Computing Facility, Internet Facilities will be significantly enhanced to make the latest and advanced facilities available for the students.

2. POSTGRADUATE EDUCATION:

Institute is presently offering 11 Post Graduate Program (PG) in different disciplines. To maintain the highest standards in these programs and establish global recognition of these programs following activities will be pursued.

- a. Institute will restructure the PG Program with more flexible and multidisciplinary curriculum as per NEP 2020 for generating employable human resource.
- b. Institute will provide suitable opportunities for placement, entrepreneurship and higher studies to post graduate students.
- c. Institute will provide all kind of financial support for conducting research in cutting-edge technologies.
- d. Institute will start integrated post graduate programs.

- e. Institute will start post graduate programs in Applied Sciences, Humanities and Social Science, Architecture and Planning, Bio Tech, BioMedical, Geotechnical Engineering, Computer Science, Electrical Engineering, Metallurgical and Material science and in Mining disciplines.

3. RESEARCH AND CONSULTANCY:

NIT Raipur, being an institute of national importance contributes to the advancement of knowledge in emerging areas through high quality research. Research efforts pursued at NIT Raipur are focused towards advancement of knowledge and development of society. To attain global recognition in research, and to provide the required testing and consultancy services, the institute will be adopting following action plans:

- Institute will provide opportunities to faculty members for up-skilling and re-skilling their knowledge base.
- Institute will support its students and faculty members to improve the research culture by organizing various training programs like guidance for research proposal preparation, patent filling, technology transfer, etc. Necessary seed grant projects will also be sanctioned in this regard.
- Institute will provide the necessary administrative and financial support to its faculty members and students in proposing and executing their research /consultancy projects and presenting their work in National and International Conferences, Workshops, Symposiums of repute.
- Institute will encourage faculty members and departments to receive more research grants from different funding organization and will encourage national and international Collaborations with premier institutes/agencies.
- Institute will assist and motivate its faculty members for patent filing and paper publication through appropriate recognition/award.
- Institute will attract highly motivated and qualified researchers as PhD scholar, Project Assistant, Project Associate, Research Associate, and post-doctoral fellows both from India and abroad.
- Institute will enhance the research environment by initiating Post – Doc Fellowship Programs.

- Institute will also provide suitable career opportunity to Research Scholars by strengthening the present activities of CDC.
- Institute will provide financial support for acquiring cutting edge research equipment to support the testing and consultancy services provided by the departments.
- Institute will motivate the faculty members to provide testing and consultancy services by framing suitable policies.
- To stay updated and ahead in science, social science, architecture, engineering and management, the scholars and faculty members of various disciplines are engaged in cutting edge research. Few of these areas are identified as thrust areas of research for the present decade.

| S. No. | Discipline | Thrust Areas of Research |
|--------|-------------------------|--|
| 1. | Applied Geology | <ul style="list-style-type: none"> • Structural Geology & Economic Geology • Petrology, Geochemistry & Engineering Geology • Hydrogeology & Environmental Geology • Geospatial Technology |
| 2. | Architecture | <ul style="list-style-type: none"> • Architecture and Settlement Patterns • Building Sciences, Urban Engineering and Management • Environmental and Sustainable Development • Building Economics and Sociology |
| 3. | Bio-Medical Engineering | <ul style="list-style-type: none"> • Biomedical signal and image processing and analysis • Biomechanics and bio-microfluidics • Medical Device Innovation & Entrepreneurship • Cognitive neuroscience |
| 4. | Bio-Technology | <ul style="list-style-type: none"> • Nano sensors and Nano biosensors for medical application • Bioprocess optimization • Antimicrobial drug design |
| 5. | Chemical Engineering | <ul style="list-style-type: none"> • Membrane fabrication and applications • Nano materials and nano composite • Industrial Waste management and value addition • Food processing |
| 6. | Chemistry | <ul style="list-style-type: none"> • Analysis and Removal of toxicants in environmental samples (Air, Water, Soil etc.) • Synthesis, Characterization and Applications |

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| | | <p>of nanoparticles and Nano composites</p> <ul style="list-style-type: none"> • Carbon dioxide sequestration • Crystal Engineering (Magnetic and sorption materials) • Heterocyclic compounds for Biological interest (Drug designing, DNA binding, etc.) |
| 7. | Civil Engineering | <ul style="list-style-type: none"> • Seismic Base Isolation and Displacement based earthquake resistant design of structures • Mine Overburden dump stability • Design, Analysis and Performance evaluation of pavement materials • Environmental Impact assessment and Environmental Audit • Remote Sensing and GIS based decision based support systems • Role of Hydrology in Smart City development |
| 8. | Computer Application | <ul style="list-style-type: none"> • Computer Networks and Securities; • Artificial Intelligence & Machine Learning; • Internet of Things, Cloud Computing, Decision Making & Decision Support Systems, Mobile Computing; • Combinatorial optimization problems and heuristic & Metaheuristic techniques; • Soft Computing; • Information Security, Data Science. |
| 9. | Computer Science | <ul style="list-style-type: none"> • Machine Learning and Pattern Recognition • Big Data Analytics • Cybersecurity • Internet of Things |
| 9. | Electrical Engineering | <ul style="list-style-type: none"> • Cyber Physical System • Electric Vehicle and Charging Station • Energy Storage • Artificial Intelligence and IoT Applications • Smart Grid |
| 10. | Electronics and Communication Engineering | <ul style="list-style-type: none"> • Advanced VLSI, Circuits, and Devices • Advanced Digital Signal and Image Processing • Cryptography, Network Security and Multimedia Security/Forensic • Adhoc and Infrastructure based Communication Networks |

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| | | <ul style="list-style-type: none"> • RF and Microwave Computer-Aided Design for MW Circuits and Devices |
| 11. | Information Technology | <ul style="list-style-type: none"> • Artificial Intelligence and its application in smart computing, Cloud Computing and resource scheduling • Data Science and Block-chain Technologies • Internet of Things and Industrial applications • Security and Privacy issues in state-of-the-art networks. • Wireless and Mobile Computing • Computer Vision and Augmented Reality/ Virtual Reality |
| 12. | Mathematics | <ul style="list-style-type: none"> • Mathematical biosciences using rough sets • Algebra and Linear algebra • Mathematical modelling using Ecology • Operational research and Cryptology • Fluid dynamics and Sampling Theory |
| 13. | Mechanical Engineering | <ul style="list-style-type: none"> • Composites and Smart materials • Heat Transfer in Fins and Solar collector • Stresses around singularities • Logistics and SCM in Industry 4.0 • CFD Analysis in Pipe Flow, Slurry Flow |
| 14. | Metallurgical and Materials Engineering | <ul style="list-style-type: none"> • Design and Synthesis of New materials like Biosensor materials, Electrochromic (EC) materials, novel thin film materials, Advance high temperature and Structural material, Renewable Energy Materials, Lightweight composite materials, Compositionally complex alloys (CCA) or high entropy alloys (HEA) etc. • Ab Initio Calculations based Materials Design • To develop new metal casting technology and Metal joining techniques for similar and dissimilar alloys. • Develop energy saving alloys for power transportation. |
| 15. | Mining Engineering | <ul style="list-style-type: none"> • Slope Stability of open pit highwalls, waste dumps & flyash open-pit mine voids • Rock mass characterization for design of various mine structures in rock mass • Rock blasting • Mine waste utilization • Rock excavation |

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| 16. | Physics | <ul style="list-style-type: none"> • Optics and Photonics: Luminescence, Radiation dosimetry • Semiconductor thin film technologies, Solar cells (CdTe/CdS and Perovskite solar cells) • Thermoelectrets, Nitride Superlattices, Nitride HFETs • Plasmonic and Graphene Biosensors |
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4. INSTITUTE SOCIAL RESPONSIBILITY

Being an institute of national importance, NIT Raipur realizes its responsibility towards the society and the region. To satisfy the needs of the society, Institute will focus on the following broad areas:

- a. Institute will use its resources and knowledge base for Rural development in line with the Unnat-Bharat Abhiyan of the government and also in implementing various social welfare schemes.
- b. Institute will provide a platform to promote entrepreneurship awareness and innovation locally.
- c. Institute will provide social awareness about local and national problems and to find possible technological solutions.
- d. Institute will provide skill development programs for rural and persons from underdeveloped areas of the region.
- e. Institute will support other institutions of Chhattisgarh by sharing its resources and knowledge.
- f. Institute will participate in Ek Bharat Shrestha Bharat Abhiyan for cultural exchanges with other NITs.

5. INSTITUTE INFRASTRUCTURE:

Developing and maintaining a planned infrastructure is a key element for the success of any academic institute. NIT Raipur is presently functioning from the existing premises of the erstwhile Government Engineering College. Looking at the needs of a centrally funded Institute of National Importance, additional 204.08 acres of land has been provided by Chhattisgarh state government for a second campus at Rakhi- Bharenga village. Infrastructural development activities will be carried out in the two campuses, the existing campus and second campus.

a. **Existing Campus:** The existing campus spread over 99 acres of land is presently catering to the needs of existing students. Looking at the growth in almost all the disciplines due to increased intake of students in UG, PG and PhD, more amenities in the existing campus needs to be developed. Following infrastructure is proposed to be developed in the existing campus:

- Early completion of 48 quarters for group B & C employees.
- Construction of Sewerage Treatment Plant
- Replacement of old water supply lines and construction of overhead water tanks.
- Vertical expansion to accommodate enhanced intake at Main Building, at Girls Hostel and at Architecture Block
- Construction of New Sports Complex
- Construction of Space for Yoga Classes
- Renovation of Barrack Block for additional Class rooms and Laboratories
- Renovation of NCC Office and Store
- Plantation and maintenance of Campus towards green campus with wider uses of Solar Energy.
- Beautification and maintenance of existing garden spaces

b. **Second Campus:** Master plan for the second campus has already been approved by Board of Governors. Eight disciplines for UG, PG and Ph.D. have been proposed in the second campus in three phases. Second campus will have all the modern amenities with academic and residential blocks. The infrastructure in the new campus will be developed during the present decade. The major infrastructural facility chalked out for the institute in the second campus are:

- i. Construction of separate hostels for boys & girls to accommodate all UG, PG and PhD students within the campus.
- ii. Construction of Open auditorium with seating capacity of 2500 persons and a covered sound-proof auditorium/hall with seating capacity of 1000 persons.
- iii. Institute will enhance the medical facilities by developing a mini hospital with 24 hrs. emergency services and in-patient services of 10 beds
- iv. Construction of Faculty and non-teaching/supporting staff quarters.
- v. Construction of separate residential quarter for Director, Registrar, Dy. Registrar.
- vi. Construction of Girls common room.
- vii. Establishment of central library with global data bank.

- viii. Construction of student activity center having a multipurpose hall, reading room, indoor game facility, music room etc.
- ix. Construction of sport center with gymnasium and Food courts with 24 x 7 services.
- x. Institute will move towards sustainable and self-sufficient green energy solutions
- xi. Construction of rain harvesting systems to enrich the ground water level of the region.

6. CAREER DEVELOPMENT:

A separate Career Development Centre is established with four verticals i.e. Placement cell, Training and Internship cell, Entrepreneurship Cell and Innovation Cell. Each of the cells has its own responsibilities to fulfill the various requirements of the individual students.

a. Placement Cell: Placement cell is one of the most important verticals under CDC. The Placement Cell of the Institute has been set up to look after the Industry-Academia interface. It regularly interacts with reputed organizations for the campus placements and internship drives for the students of the Institute.

The prime objective of the cell is to provide each and every student, the best possible opportunity to thrive in their career with a competitive pay package. To achieve this, the cell will connect with broader base of employers within the country and abroad. The distinguished alumni pool of the institute will be engaged in this regard.

b. Entrepreneurship Cell and Innovation Cell: The explicit aim of these cells are to provide the necessary direction for initiatives in Innovation and Entrepreneurship to empower startup enthusiasts, accelerate the startup ecosystem in the region and contribute toward the national empowerment efforts to improve the quality of life of its citizens through innovation led growth and creating jobs.

These cells aim to create more Startups and Entrepreneurship opportunities for students (UG, PG, PhD) and faculties in-line with the National Innovation and Startup Policy 2019, MoE Innovation Cell.

The above will be achieved by providing the necessary ecosystem and support system in the institute.

c. Training Cell: It aims to support each and every graduate student in identifying a suitable career option by offering necessary trainings for soft skill development, resume drafting, preparation for the interviews and by providing discipline wise career information. This

integrative approach will help in grooming students to build self-confidence in managing their job search and expectations, and to set reasonable/achievable goals.

The above aim will be achieved by integrating various brainstorming sessions, training sessions along with various tests such as psychometric tests, employability tests, and diagnostic tests from initial stages of studies.

7. SYNERGY WITH ALUMNI:

Any institute is majorly recognized by its alumni. NIT Raipur also feels proud about the contribution of its alumni in building the nation and society at large. A strong collaboration with the Alumni will not only help the students in planning their future career growth but also contribute in improving their employability. The institute plans to have better association with its strong alumni base.

This will be achieved through regular interaction with alumni association. An institute level committee will be framed to achieve the objectives. The institute will also work closely with the alumni association to identify probable employers. Department faculty members will interact with the alumni to organize interactive sessions with the existing students. To recognize the achievements of Alumni, institute will constitute Distinguished Alumni Awards.

8. GOVERNANCE:

Effective and transparent governing system is essential for growth of the institute. The institute is committed to provide complete transparency in all its activities. For effective and transparent governance, Management Information System (MIS) and Automation will be effectively used in all the domains of administration. All Procurement related activities will be done through e-tendering. All efforts will be made to achieve paperless and an environment friendly working.

9. HUMAN RESOURCE RECRUITMENT & DEVELOPMENT

NIT Raipur is has been consistently making efforts for inducting the required number of faculty members. In this regard, Institute will make hard and sincere efforts to fill up all the vacancies in faculty and non-faculty positions and will also work towards getting approval from ministry towards proportionate faculty and staff positions. Institute will also take care of the

professional development of faculty and non-faculty members of the institute. To achieve these objectives following action plan is proposed.

- a. Sincere efforts will be made to maintain the student teacher ratio as 12:1, by conducting recruitments drives at regular cycles. Attempts will also be made to get additional faculty and staff positions to maintain the ratio.
- b. Provisions will be made for appointing visiting faculty, distinguished honorary faculty and distinguished chairs from industries/organizations.
- c. Faculty members will be sponsored for qualification improvement and skill improvement wherever necessary. Efforts will be made to open QIP center at NIT Raipur for Ph.D.
- d. Supporting technical and administrative staff will be periodically sponsored for training in new technological domains and working methods.
- e. Suitable modality for Post Graduate courses will be designed for the existing Supporting technical and administrative staff.

10. RESOURCE GENERATION

Dreaming big and achieving infrastructural objectives of global standards demands extensive financial support. Institute aims to raise the fund from external and internal resources. Part of the fund generated will be reserved separately to be used as per the institute policies.

- a. **Internal Resources:** Fund will be generated by providing testing, training and consultancy services in addition to the student fees.
- b. **External Resources:** Fund will be generated from alumni, external donations, and from CSR activities of industries in and around Chhattisgarh. This will be achieved through regular interaction with the alumni and nearby industries.

11. EPILOGUE

The vision document Vision 2030 will be implemented in phase wise manner with the support of all stakeholders. The progress will be reviewed periodically (after every three years) in order to take appropriate actions. This vision document will help in the substantial growth of NIT Raipur and will in turn help the society, the region and the country at large.

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