CURRICULUM
&
ASSESSMENT
GROUP

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Contents

Futuristic Perspective of Curriculum Development and Assessment in Multidisciplinary Education

I. Introduction:

Curriculum development and aligned assessment mechanism is considered one of the major thrust areas of technical education system. The dynamics of curriculum and assessment is due to contextual changes at world of work. Since the beginning of 21st century, considerable efforts are made to design the curriculum that satisfies the contemporary needs of stakeholders. In India, designs of outcome based curriculum is of utmost important and widely popular, as almost every university and engineering institution is putting its sincere efforts to have innovative curriculum and assessment system in place.

National Education Policy – NEP 2020 has also envisioned about futuristic curriculum and assessment requirements in the era of digital learning and Industry Revolution 4.0. The need of hours is to develop capability and capacity to look into the innovations in the current curriculum and have sustainable models of curriculum development and assessment.

During 70's and 80's one of the major initiatives in TTTI Bhopal was establishment of Curriculum Development Centre (CDC) under Q.I.P. Scheme of Govt. of India. Curriculum development is one of the major thrust areas of technical education system. The department of Curriculum Development and Assessment Education (DCDAE) is formed with the merging of Curriculum Development Centre and Centre for Measurement and Evaluation including National Testing Services. The department is responsible for reforms in curriculum and assessment as per contemporary needs of stakeholders, Industry and society at large by undertaking sponsored and consultancy projects at state and national level. Curriculum development and assessment has been the major thrust areas of the institute since its inception.

Curriculum is a key driver of the entire instructional system encompassing teaching-learning and assessment sub-systems. Curriculum is the foundation of education and provides direction for instruction. Assessment is an integral part of instruction Curriculum Framework talks about National Education (NE), which is an important component of CCE. It aims to develop national cohesion, cultivate the instinct for survival as a nation and instil in our students, confidence in our nation's future.

The institutions and universities required to take initiatives for continual improvisation of curriculum and making them responsive and dynamic. The department will undertake innovative growth oriented projects of curriculum designs and evolving assessment system in multidisciplinary areas as envisaged in NEP-2020.

Curriculum redesign based on outcome based philosophy has already been experimented in the different states of western region in recent years. The same are being successfully implemented. The recent emphasis on International large scale assessments (ILSA) of educational achievements can be a valuable resource for studying global trends and evolving systems in education and among the educational practitioners, researchers,

policymakers, and the public at large. This would obtain a better sense of the status of their education systems for improvement and monitor learning progress.

II. Vision, Mission and Objectives:

Vision:

To be a dynamic department of excellence for reforms, research and innovative approaches in respect of **"Curriculum Development and Assessment**" covering multidisciplinary areas with focus on Technical Education.

Mission:

- Develop policies that establish guidelines and procedures to facilitate the design and delivery of needs based multidisciplinary curriculum and students' assessment practices.
- Support the client states, universities, boards and institutions in establishing and strengthening "curriculum monitoring and assessment systems and also design and development of curriculum" for ensuring quality in academic transactions and effect necessary changes in the institutions.
- Support and collaborate with the initiatives of apex bodies like MOE, AICTE, NBA etc. for quality assurance appropriate interventions of curriculum development and evaluation.
- Intensify curriculum and assessment related research in order to bring about appropriate and relevant reforms in multidisciplinary programmes including Technical Education & Training Systems.
- Develop and disseminate curriculum and assessment based Learning Resources (LRs)

Objectives:

- Design and experiment responsive models/approaches of curriculum and evaluation system to suit to the emerging needs of the country in technical education making it learner centered, flexible, modular, credit based with multipoint entry & exit features with multidisciplinary focus.
- Evolve research-based model/approach of multidisciplinary curriculum and assessment system designs as per contemporary needs of the society and user system.
- Establish high quality standards of multidisciplinary curriculum aligned to international accord, norms and criteria as per accreditations requirements.
- Provide professional development opportunities through short term and long-term programmes with focus on multidisciplinary curriculum design and delivery as per stakeholder's expectations.

- Extend support and consultancy services proactively to the technology universities and institutions such as governmental, autonomous, and private in the development, revision, modification, update of curriculum and assessment systems.
- Conduct research, snap studies, tracer studies, impact studies, stakeholder conference, search conferences etc. in order to ensure & support effective curriculum implementation and students assessment.
- Initiate and provide necessary academic support to MOE, AICTE, NBA, State Technical Education Systems on curriculum review, needs assessment & students assessment reforms.
- Develop and document appropriately curriculum and assessment related resources /monographs/guidelines/manuals/video programmes etc.
- Develop learning and assessment resources including MOOCs on various aspects of curriculum and students assessment.
- Accomplish the aims and objectives of National Resource Centre (NRC) established at the institute.
- Organise national and international conferences in the area of curriculum and assessment to share innovative practices for the benefits of stakeholders.

III. Philosophy:

The philosophy of Curriculum and Assessment is derived from Core Education Philosophy that takes care about experiences of mind, character or physical ability of an individual learner. This is what society needs in terms of knowledge, skills and values from one generation to another through higher level education in engineering and technology areas. On a broad prospective, curriculum gives general as well specific framework of learning outcomes of programme, courses, instructions and assessment system that is considered essential for learning and to achieve a level of certification for qualifications/ grade/standard of a particular field, area/discipline of study.

Curriculum development is an as planned, purposeful, progressive, and systematic process in order to have effective efficient educational system. Curricula of programmes are affected by the local needs and expectations of different stakeholders. Therefore, continuous efforts are needed to update in order to address the society's needs at large. The philosophy of curriculum design and assessment is to understand the various alternatives models and approaches being followed and practiced in the system and making relevant as per the contemporary needs of learners. Various model, approaches and type of curriculum are prevailing in the practice for UG/PG/Diploma programmes in engineering and technology areas .

Student assessment & evaluation is an integral part of curriculum, which should be aligned with pedagogy. Assessment makes a meaningful contribution to the fulfillment of the objectives/outcomes of educational curriculum. It allows students, teachers, and parents to monitor the learning undertaken by each student regarding their individual development. Assessment policy should be capable of providing consistent feedback to ensure learning by the students. The implementation of broad categories of assessments i.e. Assessment for Learning, Assessment of Learning, and Assessment as Learning are essentially needed in the context of outcome based curriculum and assessment with specific emphasis on the part of practical skills development and certification of achievements of learning outcomes.

Considering the philosophy of curriculum in general and specific to the engineering education, many approaches/methodologies/models are prevailing as per the needs of society and industries (figure-1).

- System approach (input process output)
- Discipline/subject centered curriculum
- Instructional objective based curriculum
- Skills based curriculum
- Competency based curriculum
- Outcome based curriculum.
- Customized/tailor made curriculum

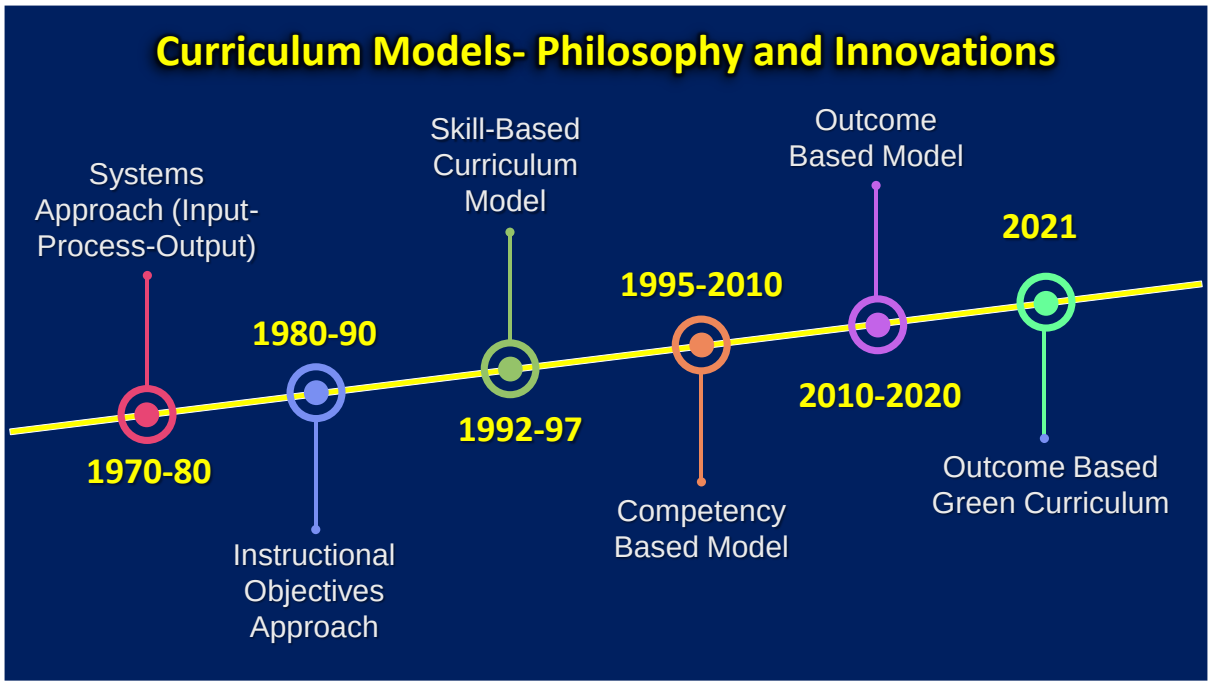

Figure-1: Curriculum Models-Philosophy and Innovations

IV. Processes of Curriculum Development:

Keeping in view the above philosophy of Curriculum and Assessment, curriculum development Centre (now DCDAE) continually improving the quality, effectiveness, efficiency and relevance of curriculum by establishing the collaborations and rapport with stake holders and industrial/field agencies by evolving different approaches of development of curriculum.

Major procedural strategies are generally adopted, such as-

- Identify the changes in job portfolio of industrial workforce/manpower.
- Identify potential areas for purposeful employment and higher studies.
- Developing and continuously updating skills/competencies profile bank.
- Evolving best suitable model/approach/strategy for new designs to develop curriculum.
- Developing, reviewing and revising curriculum of engineering and allied disciplines based on need analysis
- Evolving norms, standards and systems for curriculum design and implementation.
- Conduct of research for developing new models of curriculum development for engineering areas.
- Preparing schemes of assessment and evaluations.
- Validation of curriculum for quality assurance.
- Preparing LRs for implementation of curriculum accuracy to AICTE frame works.
- Introducing reforms in assessment and evaluation.

TTTI model of curriculum development (1975) is depicted below (figure 2):

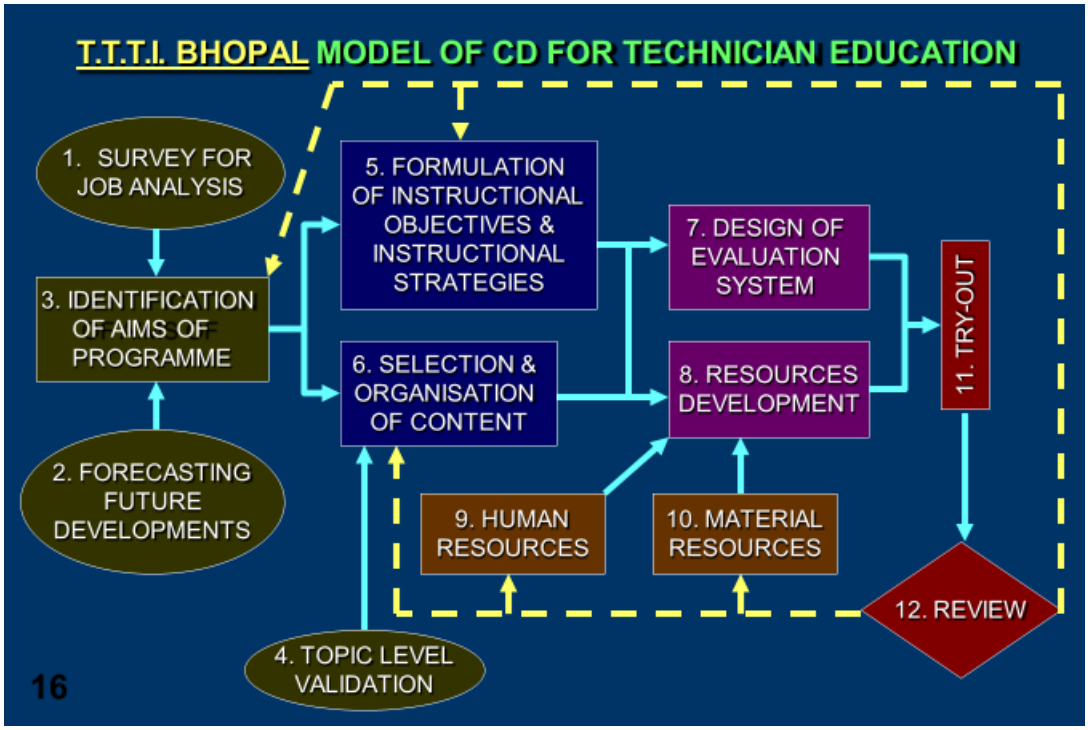

Figure-2 T.T.T.I. Bhopal Model of CD for Technician Education

The outcome based green curriculum model (2021-22) is depicted below:

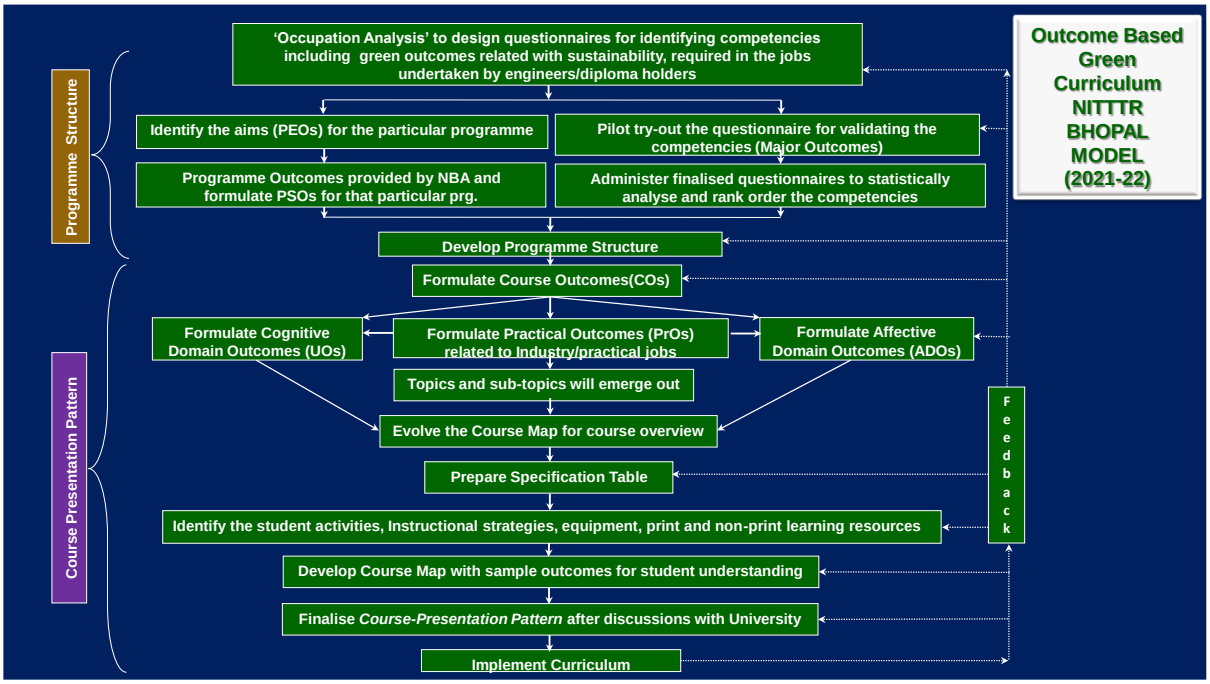

Figure-3 The outcome based green curriculum model (2021-22)

V. Innovations in Curriculum and Assessment in Past:

- Systematic and scientific need analysis for the design and development of curriculum.
- Developed different models of curriculum development.
- Use of rubrics for assessment of practical skills and attitudes. Sample rubrics prepared for project work, industrial training, seminar etc.
- Introduction of micro projects, assignments and practical work in each course so that complex outcomes at CO level can be assessed.
- Introduction of unit level outcomes/session outcomes (in addition to POs and COs) so that focused teaching and valid and reliable assessment is possible.
- Identification of courses and session outcomes (theory session/lab session) for each course covering outcomes in all the three domains (Cognitive, Psychomotor and Affective) of learning.
- Inclusion of variety of teaching learning method for instead of Lecture (L) Tutorial (T) and Practicals (P) in scheme of studies and assessment.
- Design of specific and meticulous scheme of studies and scheme of assessment for outcome based curriculum design and development.
- Emphasis on self employment and start ups by inclusion of courses such as entrepreneurship development, project management etc.
- Inclusion of higher order labs in the curriculum at higher semesters.

- Use of various innovative instructional and implementation strategies like PBL, case based learning methods & promoting use of online recourses for developing higher level of cognitive, psychomotor and affective domain abilities , analytical, creative and critical abilities.
- Integration of emerging technologies such as AI, ML, AR, VR, IOT, data science and analytics etc. appropriately.
- Implementation of some of the courses through Online/MOOC courses to enhance self learning and lifelong learning abilities.
- Focus on development of advanced knowledge & specific skills required for IR 4.0 through proposed Centre of Excellence (COE), industry supported labs and professional core and elective courses.
- Inbuilt mechanism for regular up gradation of curriculum by involving all stake holders and education auditors to keep pace with latest technology courses and global trends.
- Introduction of multi point entry and exit system
- Inclusion of student centered activities like seminars, surveys, interviews of practicing professionals in each course to cope up with the requirement of outcome attainment.
- Integration of industrial training /internships in semester gaps and capstone project (major project) in each programme.
- Inclusion of Mandatory Audit courses on environment, ethics, Indian culture and civilization for overall development of scholars as per AICTE and NEP guidelines
- Institutional evaluation project for Gujarat state
- Comprehensive Scheme of Assessment for Gujarat state
- Formative Evaluation Project under World Bank Assisted Project for strengthening technician education
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Some of the curriculum interventions and innovations are depicted in figure 4

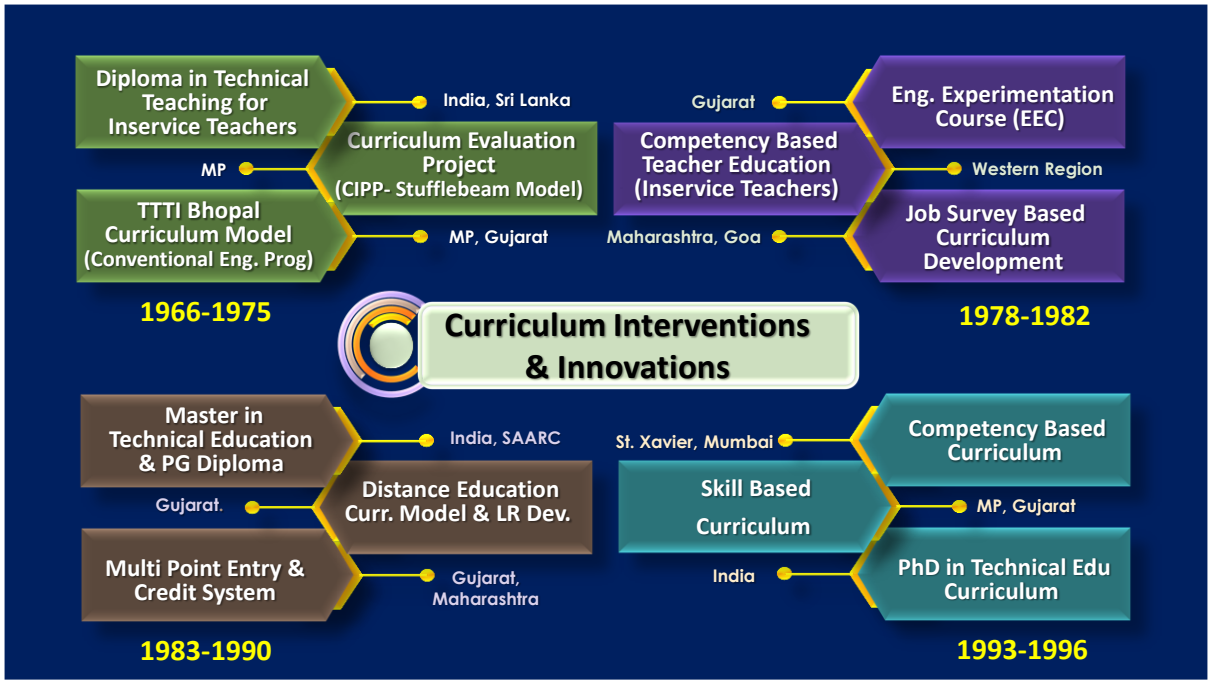

Figure-4 Curriculum Interventions & Innovations (1983-1990)

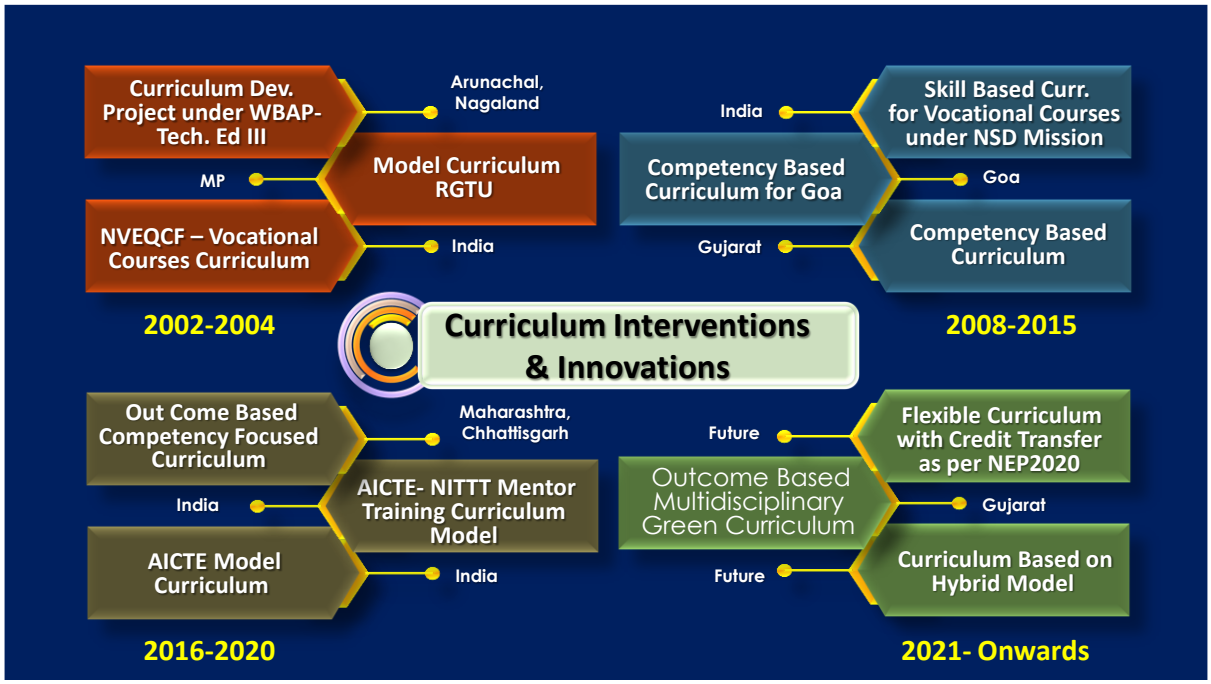

Figure-5 Curriculum Interventions & Innovations (2016-2020)

Some of the achievements in the area of examinations/assessments/testing since WRI to TTTI to NITTTR (1966 to 2021) are depicted below:

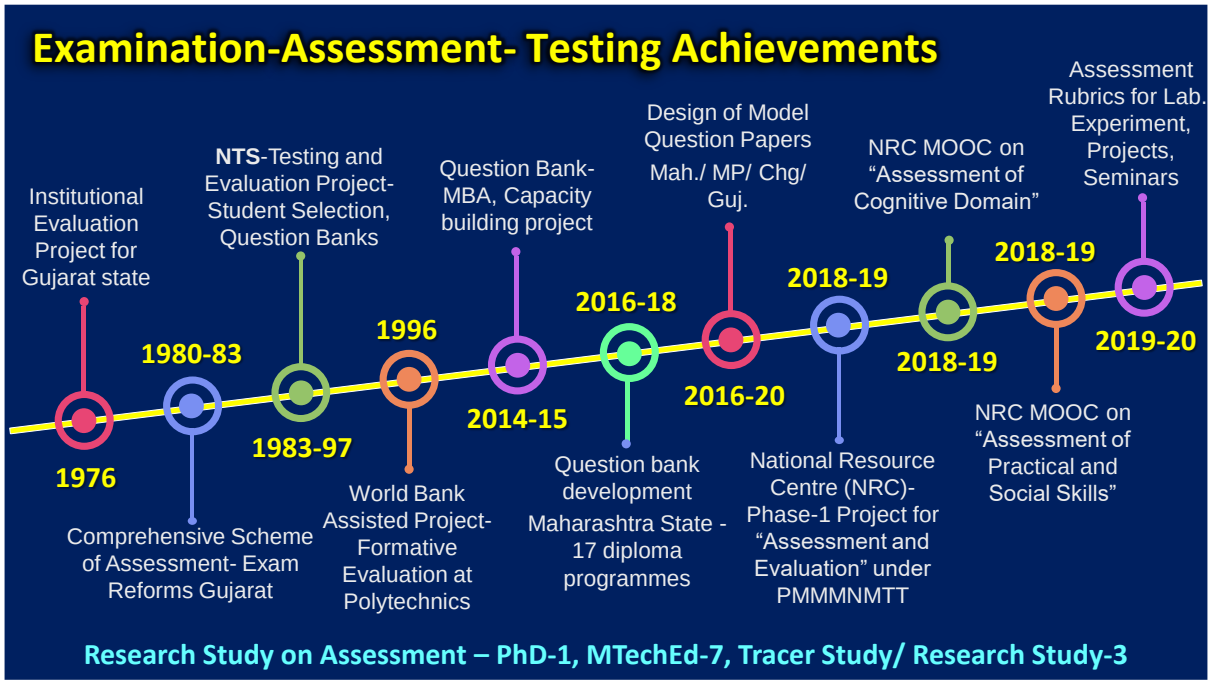

Figure-6 Examination-Assessment-Testing Achievements

Some of the consultancy projects related to assessment is given below:

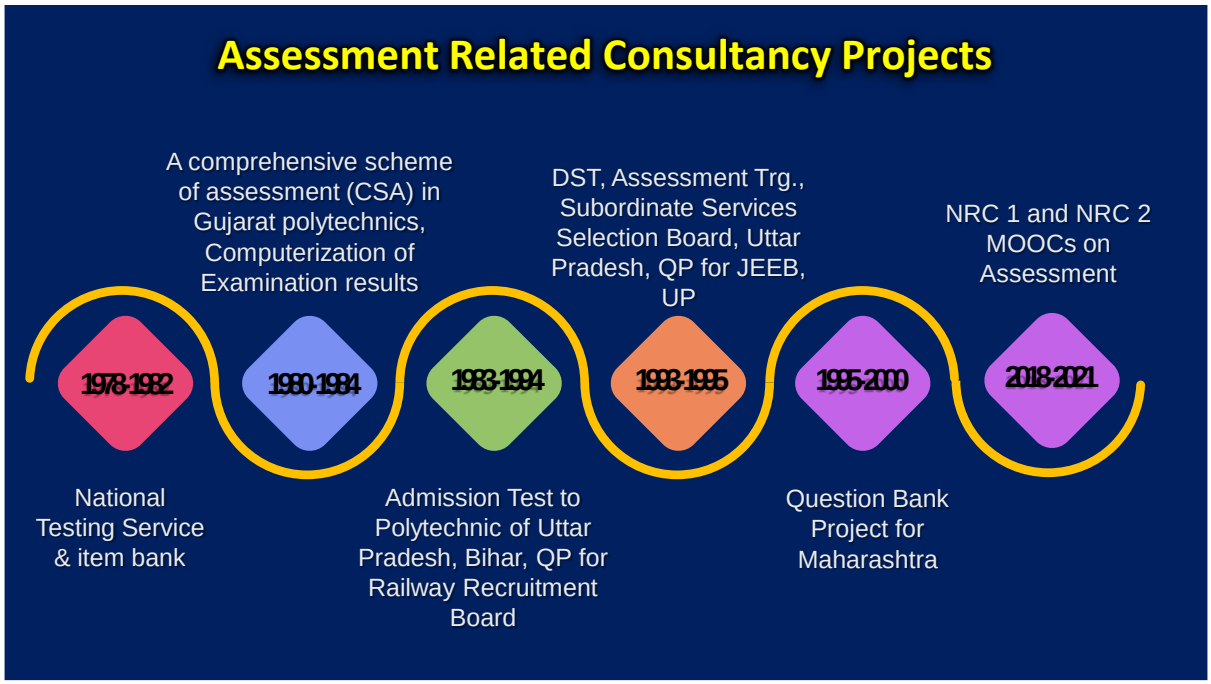

Figure-7 Assessment Related Consultancy Projects

VI. Futuristic Curriculum Reforms:

The future agenda for curriculum and innovations in engineering education is to empower individual learner, assuring high quality of education and pave way to develop learning society tuned to the contemporary needs of the industry and stakeholders.

Keeping in view of the achievement and gaps from expectations of world of work and the NEP-2020, The NITTTR Bhopal would focus the future curriculum on following -

1. Redesign the curriculum and assessment framework for **Multidisciplinary and a holistic education.** Curriculum will provide directions for Industrial Revolution 4.0. The sample model curriculum document with the **blurring of boundaries between the different discipline/ programmes** under Engineering, Technology, Humanities, Social Science, General Sciences, Management, Pharmacy, Vocational Education, General Education etc. under the umbrella of HE will be prepared.
2. Develop sample model curriculum for diploma and engineering with **multidisciplinary and flexible approach.**
3. Develop **different models of Curriculum Development & Assessment system** in line with NEP: 2020.
4. Design of **curricular framework aligned to NSQF** for mobility/flexibility Across General and Vocational Education.
5. Designing **curriculum for online programmes and virtual university** and autonomous institutions.
6. **Integrating emerging technologies** (AI, ML, AR, VR, IoT, renewable energy, Quantum Computing Business analytics etc.) appropriately in the **multidisciplinary curriculum**.
7. Promoting **use of technology platforms such as SWAYAM/DIKSHA** for online training of teachers and teaching- learning.
8. Evolve **Learner Centric Flexible and imaginative curricular structures** with combination of disciplines by introducing flexibility in curriculum by way of introducing **Multi-Point Entry & Credit System (MPECS) and Multi-Point Entry ,Exit & Credit System (MPEECS)** and creating new possibilities for life-long learning. Establishing system for Recognition of prior learning and awarding credits.
9. **Support MOE in Policy formation** related to curriculum
10. Build strong **synergic partnerships with industry and stakeholders** for designing need based curriculum of engineering programmes in multidisciplinary context.
11. Undertake **research on manpower skills trend analysis** for future curriculum development & innovations.
12. **Network with resources institutions nationally and Globally** for standardization of Engineering curricular models and assessment practices.
13. Establish **labour market skills bank in different areas** for the benefits to the institutions and industry and benchmarking.
14. Develop **Outcome/skills aligned Learning Resources (LRs)/material** for MOOCs and SWAYAM learning platforms.

15. Offer **consultancy for designing customized curriculum**, its implementation mechanisms and assessment.
16. Promote **researches on curriculum and assessment innovations**, its implementation and impact.
17. Evolve **policy frameworks and guidelines to evaluate** curriculum at institute /university level.
18. Develop **consensus about curriculum reforms/innovations** through national consultative meets/symposiums/search conferences and seminars.
19. Undertake **research to develop, review and modify curriculum** to match the needs of industry/ to make pass outs employable/self employed.
20. Undertake **outcome-based curriculum redesign projects** for diploma and degree programmes at national level.
21. **Impact study of adapted curriculum** on the performance of diploma pass outs of programmes offered in polytechnics in India.
22. **Internationalization of engineering** education curriculum matched with **Global and Local Standards/Practices of engineering education.**
23. Enhance **Pedagogical intervention** in Curriculum Development and Implementation.
24. Prepare for **Lifelong Learning, learning for Sustainable Development, Metacognition and personalized learning models.**
25. Undertake **research in outcome-based assessment and examination systems**.
26. **Integrated Development** of future engineering man power. Development of humanistic, ethical, constitutional and universal human will be considered an integral part of a holistic education. Inclusion of co-curricular and extracurricular activities, counselling support to ensure physical, psychological and emotional well-being of each individual.
27. AI & ICT based **curriculum** development, implementation and assessment.
28. Harnessing **ICT and digital technologies** for curriculum aligned learning and development. Use of **blended learning** for teaching learning.
29. **Web based and digital curriculum** design.
30. Online and offline integration of **digital assessment tools**.
31. Undertake research based on **multidisciplinary work in academia, government, and industry.**
32. Envisioning the **fusion of advances in artificial intelligence (AI), robotics, the Internet of Things (IoT), 3D printing, genetic engineering, quantum computing,** and other technologies applicable in multidisciplinary/cross section of the programmes.
33. Emphasizing the **development of learning outcomes** for cognitive, psychomotor and affective domain.
34. **Embedding soft skills** like leadership, creativity, analytical abilities, values, attitudes, Life skills such as communication, cooperation, teamwork, and resilience; for

preparing students to develop social skills to contribute effectively and efficiently at home, society and also towards his/her profession

35. **Embedding entrepreneurship** development for orienting and enhancing self employment and start ups awareness, by inclusion of courses (entrepreneurship, project management, etc.)
36. **Promote multilingualism** and the power of language in teaching, learning and learning material development.
37. Creating the **culture of respect for diversity** and respect for the local context in all curriculum, pedagogy, and policy.
38. Use of various **innovative instructional and implementation strategies**
39. Inclusion of **professional elective courses**, **higher order labs** and enhanced engagement of industry at UG and PG level to widen skills so as to cope up the requirement of world of work in line with IR 4.0.
40. Development of **advanced knowledge & hightech skills required for IR 4.0** through proposed **Centre of Excellence (COE), industry supported labs** and professional core and elective courses.
41. Inclusion of **Mandatory Audit courses** on environment, ethics, Indian culture and civilisation for overall development of scholars as per AICTE and NEP guidelines
42. **Establishment of a National Research Foundation** to fund outstanding peer-reviewed research and to actively seed research in universities and colleges.
43. Provide **academic and administrative autonomy** to institutions for effective planning, implementation of innovations.
44. Introducing **practical experiences with local industry, businesses, artists, crafts** persons by planning and implementing the exposure/hands on experience through industrial visits, expert lectures and workshops.
45. **Collaboration with overseas universities** for offering few courses/semester and joint certification.
46. **Promoting usage of modern tools/software's** to make globally competent graduate.
47. **Introducing relevant capstone projects** in the areas related to community engagement and service, environmental education, and value-based education. Environment education will include areas such as climate change, pollution, waste management, sanitation, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living.
48. Establishing **support system for online distance learning (ODL) for access to all**. Framework for quality of ODL, Norms, standards, and guidelines for systemic development, regulation, and accreditation of ODL will be prepared in line with NEP.
49. Focussing on **Vocationalization of Higher Education and skills develop**ment.

50. Specifying the **curriculum framework** for preparing our own curricula, set the standards or expectations in particular fields of learning and practice aligned with **Professional Standard Setting Bodies (PSSBs)**.

51. Developing **effective and efficient leaders** for managing and innovating educational reforms related to curriculum and assessment.

52. Tailor made **curriculum design models** for the stakeholders.

53. Curriculum implementation and **monitoring systems through academic audit**.

VII. Futuristic Assessment Reforms:

1. Support MOE in **Policy formation** related to assessment.
2. Challenges in **outcome based assessment and its certification.**
3. **Design, implementation, and use of national and international large-scale assessments** for the improvement of national education systems.
4. Undertake **researches on International large scale assessments (ILSA)** as resource for studying global trends and evolving systems in education and among the educational practitioners, researchers, policymakers, and the public at large for formulation of policy.
5. Promote and **develop mechanism for self assessment and portfolio based assessment.**
6. Evolve approaches/mechanism to cater to **paradigm Shift from high-stakes examinations towards more continuous and comprehensive evaluation**.
7. Establishing **academic bank of credit** for certification.
8. Policy on **credit transfer, vertical and horizontal mobility amongst across general and vocational education** by National Committee for the Integration of Vocational Education **(NCIVE).**
9. Focus on **formative assessment** for learning rather than the summative assessment
10. **Development of question bank** to assess outcomes at different levels.
11. Develop **Criterion Based Grading System** that assesses student achievement based on the learning outcomes for each course/programme. **Development of rubric bank for assessment** of outcomes in various dimensions of teaching and learning
12. Design curriculum with **Credible Evaluation System.**
13. **Flexibility/Mobility** Options from **certificate to diploma to degree to PG.**

VIII. Future Research Areas in Curriculum & Assessment:

- Curriculum Design & Development-Evolving models and approaches
- Curriculum implementation –effectiveness/improvisation
- Students' assessment and evaluation system development
- Curriculum Review, Monitoring & evaluation for impact assessment
- Institutional assessment & evaluation for qualitative improvisation
- Examination Reforms- Design of computerized assessment
- Resources Utilization for effective curriculum implementation
- Studies on Interventions and reforms in CD & A
- Training and Development in pedagogy and educational technology areas
- Students' assessment issues
- Institutional system design and development related curriculum and assessment – through academic monitoring and Audit
- Standardization of Assessment among institute of Higher Engineering education

IX. Major Client and Stakeholders:

- Gujarat Technology University (GTU)
- Chhattisgarh Swami Vivekanand Technical University (CSVTU), Bhilai, Chhattisgarh
- Rajiv Gandhi Technology University (RGTU), M.P.
- Directorate of Technical Education (DTE), Goa
- Directorate of Technical Education (DTE), M. P.
- Directorate of Technical Education (DTE), Chhattisgarh
- Directorate of Technical Education (DTE), Gujarat
- Maharashtra State Board Technical Education (MSBTE)
- North-Eastern States (Arunachal Pradesh and Nagaland State)
- Autonomous Institute/Polytechnics
- Engineering Institute and Universities,
- ITEC Partner countries
- Private Universities and Institutions
- Virtual Universities
- Bihar State
- Uttar Pradesh
- Other States
-

X. Infrastructures and Resources:

- State of the Art workshop/Class rooms
- Well-equipped computer Class room
- Modern discussion /committee rooms
- Computerized Data Bank
- Seminar /search conference Hall

XI. Achievements in Curriculum and Assessments:

The achievements of Curriculum Development and Assessment have been very significant over last few decades. Year wise number of course curriculum developed since 1975 are depicted below:

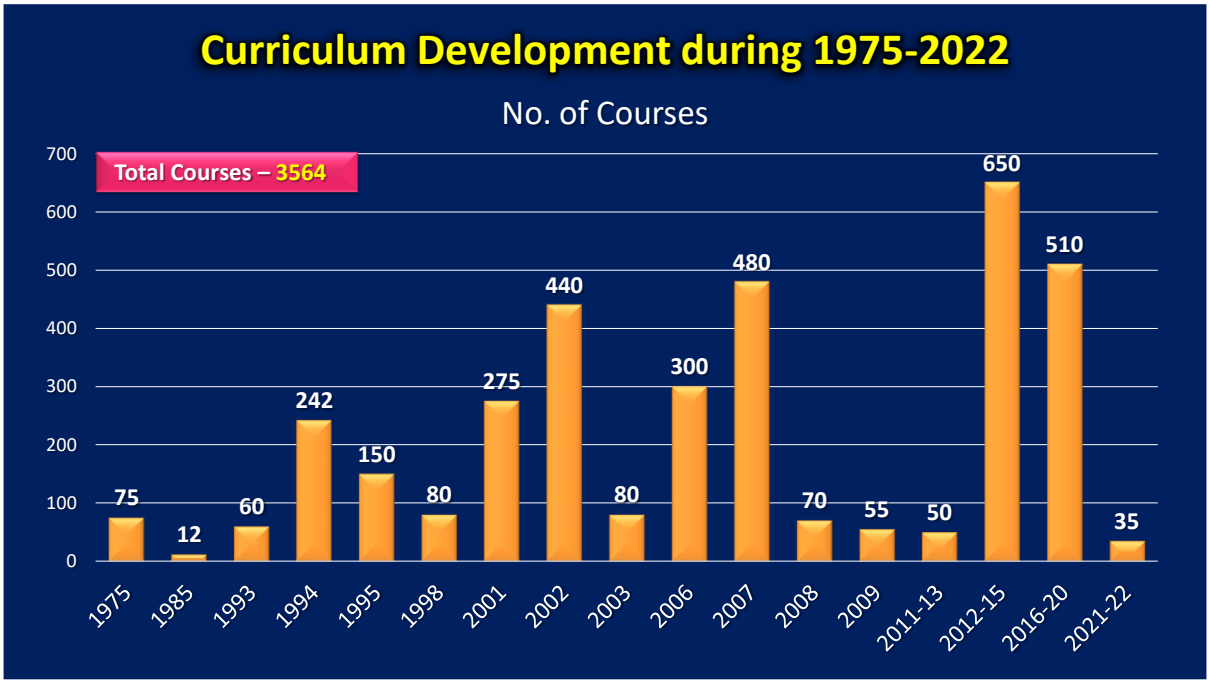

Figure-8 Curriculum Development during 1975-2022

Statewise achievements of Curriculum and Assessment is given in annexure-1 and 2 respectively.

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