EXISTENCE OF TECHNICAL CUM ENGINEERING EDUCATION UNDER NEW EDUCATION POLICY -2020-A VIABLE VIEW

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1-Abstract-

New education policy-2020 has been implemented in all sectors of education besides of Law and Medical. Main emphasis has been made on literature, where graduation certificate, graduation diploma, graduation degree and graduation research degree will be conferred on completion of one, two, three and four year respectively duration of any graduation course. After this only after one year, master degree will be served after passing exam.

In engineering ITI (Industrial Training Institutes) imparts two year certificate course, three year diploma from Polytechnics and four year engineering degrees from IITs, NITs, IIITs, Universities of national importance and state importance, which are existing hitherto. To make engineering parallel to new education policy-2020, course contents will be subsidized and syllabus will be revised according as policy. Also ITIs, Polytechnics, IITs, NITs and Universities will be formed according as new format. Difficulties will come before the AICTE to form the syllabus in such a way that could cover the overall knowledge of mathematics-science-engineering, because of merger of existing subjects of two year to one year as certification, three year to two year as diploma, four year to three year as degree and five year to four year as research degree. Also if after three year degree completion, if pursuance to P.G. is done and after completion of its one year be given post graduate diploma.

2-Key Words-

AICTE- All India Council for Technical Education, ITI -Industrial Training Institute, IIT-Indian Institute of Technology, NEP-National Education Policy.

3-Introduction-

Education policy was initially came in existence in 1986 and it was revised in 1992 and now this policy has its new origin with NEP-2020 (National Education Policy-2020), which has come in force in 2022, with base of 5+3+3+4, that has means to know as foundational, preparatory, middle and secondary level status comes under following way.

5= 3+2=3 year as Pre-school with Aganwadi (Age between 3 to 6 years) and 2 year as class 1^{st} and 2^{nd}. Here the age may be between 6 to 8 years and no exam will be there.

3=Preparatory level=class 3^{rd}, 4^{th} and 5^{th}--Age 8 to 11 years and assessment will be on examination basis. Mother tongue or local language will be followed. No compulsion of English language however it will be optional.

3=Middle level=class 6^{th}, 7^{th} and 8^{th}-- Age11 to 14 years. Some vocational type training course have been made on choice basis like computer language, coding, pottery, electrician, textile designing, beautician, horticulture, saddlery, floriculture, leather, origami /paper folding, manure making, pickle making and bee keeping etc.

4=Secondary level=9^{th} to 12^{th}--Age 14 to 18 years and 360 degree assessment will be through semester exam as well as other activities too. Any stream subjects can be chosen according as main choice as major subject and remaining as minor subject.

In 10^{th} and 12^{th} boards exam in different form will be conducted. Minor is the secondary subject that will compliment the major and will be any one in 10^{th} like painting, language like Urdu, Punjabi ,Bengali, Telugu, Tamil, Marathi, Gujarati, Sanskrit & Manipuri etc, retailing security, automotive, beauty n wellness, banking n insurance, food production, health care, apparel, multimedia, artificial intelligence, physical activity trainer, information technology, NCC, Tangkhul, Bodo, Japanese , Bhutia, Spanish ,Sindhi, Malyalam, Odiya, Assamese, Kannada, elements of business, Arabic etc.

Major is the subject that main focuses on the field by which the degree will be disciplined and in 10^{th} like Hindi course-A, home science, mathematics standard, science, social science, computer application, English language & literature, mathematics basic and Hindi course –B.For class 12^{th} major subjects are as Hindi elective, history, political science,geography,economice,psychology,socialogy,physics,mathematics,chemistry,biology,physical education, Hindi core, English core, business studies, home science, accountancy, computer science and informatics etc.For class 12^{th} minor subjects include like web application, information technology, Sanskrit elective, car music vocal, English elective, Urdu elective, Hindi music vocal, Hindi music melins, Hindi per ins, Spanish, Kashmiri, Mizo, Sanskrit core, Urdu core, retail, biotechnology, health care, marketing, banking, food production, Engg. graphics, Kathak dance, Kuchipuri, web application, kuchipudi dance, Odyssey dance, short hand, air conditioning & refrigeration, medical diagnostics, textile designing, Kannad, Tibetan, French, yoga and early childhood care & education etc.

Major subjects say in civil engineering may be the main subjects like surveying-1 & 2, concrete technology, water resources engineering, geotechnical engineering, strength of material, building material, design of RCC structures, design of steel structures, quantity surveying & valuation, earthquake engineering, engineering mechanics, waste water engineering, fluid mechanics, building planning, concrete engineering, building & urban planning, bridge engineering, structural analysis and engineering

mathematics etc.
Minors may include engineering management, computer science, environmental engineering, economics and energy environmental engineering etc.

4-Engineering Domain-

Engineering has various trades like civil, electrical, mechanical, electronics, computer science, architecture, electronics and telecommunication etc and also has diploma and engineering degree course where entry qualification is different and number of subjects are much more. As engineering subjects have different concept and to know one subject, it is required to get the knowledge of other subjects too. Like engineering mechanics subject needs prior to know the physics, mathematics, English and dynamics etc, industrial engineering required to know applied chemistry, industrial chemistry, mathematics, English and figure drawing etc., structural design needs to know higher level mathematics, English, mechanics, drawing, interior designing, hydraulics required to know the water flow in river, canal, orifice, weir, barrage, turbine, etc for which pressure, density, weights and mathematics are minimum required to know beside of English. In engineering detailed knowledge is required. So to place engineering and technical education in single or limited subjects is difficult to include in NEP-2020. It is not like a separation of subjects, it has intermingled connection with subjects.
As an illustration if a construction of structure is required to be done, then knowledge of location survey with dimension, status of ground water table, depletion of water level, rain fall intensity during pre and post monsoon, type and nature of soil available, construction materials, testing of material, type of foundation suitable for existing soil, design of foundation according as incoming load after the detailed analysis under seismic and storm cum snow/rain fall condition, surveying for drainage, detailed drawing for structure with plan/elevation/section/reinforcement details, specifications for materials/items, collection and space for storage of material, laborer dealing, payment making , quality controlling, equipments and setting up of heavy machinery with operation, casting and placing of items, finishing, safety measures and accidental analysis, plumbing for water supply, external –internal electrification cum , sanitary cum sewerage, disposal, site development, timbering items, interior designing, upholstery, mural designing, glass work, hoisting cum erection technique, fittings & RCC work etc. Every work is measured in detail and their detailed analysis is required to get done the work. Every work required skill and knowledge for having good performance over construction. Engagement of labor, material and supervision, control of progress, time management, accidental management cum liasoning with higher officers, and proper gesture with persons indulged with construction activities are the main key of governing activities.
Similar activities are required with engineers of other field and everything required with wide perspective, mathematical boundaries, scientific approach, technical skill, sound language, communication and drawing skill etc. Beside this presence of mind, in hand problem solution, typical analysis, in-depth thinking, knowledge and skills are required to execute the work. For the geo quakes and tsunami, global positioning system, remote sensing, geographic information system and data science skills are mandatory to know, that seems much more typical.

5-TECHNICAL DOMAIN

Diploma comes under technical education, which is running in more than 33 branches like agriculture, architectural assistantship, civil ,electrical, mechanical, information technology, computer science & engineering, chemical ,dairy, textile, glass & ceramics, printing technology, leather technology, interior design & decoration, plastic mould technology, tool & mould making , hotel management & catering technology and air craft & maintenance engineering etc ,of three year duration.
Some P.G. Diplomas / Post Diplomas are of two/one year duration like home science, modern office management & secretarial practice, library & information science, pharmacy, biotechnology, computer application, marketing & sales management, customer service management, beauty & health care, tourism & travel management, textile design, fashion technology, mass communication, hardware & networking, advertising & public relation, web designing, accountancy, pulp & paper technology, retail management and information technology etc.
As a Civil diploma holder should know the survey, drawing, layout, supervision, testing, data entry, construction management and accounts too. Hence major subjects may the same as specialization.
Though there is no need to highlight the certificate courses like as vocational trades known as ITI which has some different trades of two year like construction & wood working, civil, surveyor (merge through lateral entry of two year diploma course in civil engineering), electrician, electroplater, wireman, electric sector(Electrical engineering), instrument mechanic, mechanic of radio & T.V., electronics mechanic, mechanic cum operator of electronics communication system, information technology & electronics system maintenance, mechanic consumers electronics(electronics engineering) tool & die maker, mechanical draughtsman mechanical, machinist, fitter, turner, automobile, production & manufacturing, refrigeration & air conditioning, fabrication, motor mechanic, agriculture machine mechanic (mechanical engineering), litho offset machine winder, plate maker cum imposter(printing technology) , I.T. Sector(information technology) etc.

6-Covered Subjects in Existing period:-

In existing scenario just prior of information of NEP-2020 and before its implementation, following subjects with respective practical were included in the syllabi under NSQF (National Skill Qualification Framework) scheme.
ITI has for semester syllabus of civil draughtsman trade. Even in existing time the ITI course is running annually. Though the subjects are available semester-wise.

First semester has Paper 1st includes Part-A as Trade theory, Part-B as Employability Skills plus Sessional , Paper 2nd includes Part-A as Workshop Calculation & Science, Part-B as Engineering Drawing plus Sessional and Practical includes Trade practical plus sessional. Second semester has Paper 1st includes Trade theory plus sessional, Paper 2nd includes Part-A as Workshop Calculation & Science, sessional and Part-B as Employability Skills, Paper 3rd includes Engineering drawing plus sessional, and Practical includes Trade practical plus sessional. Third semester has Paper 1st includes Trade theory plus sessional, Paper 2nd includes Part-A as Workshop Calculation & Science, sessional and Part-B as Employability Skills, Paper 3rd includes Engineering drawing plus sessional, and Practical includes Trade practical plus sessional. Fourth semester has Paper 1st includes Trade theory plus sessional, Paper 2nd includes Part-A as Workshop Calculation & Science, sessional and Part-B as Employability Skills, Paper 3rd includes Engineering drawing plus sessional, and Practical includes Trade practical plus sessional.

Diploma in civil engineering has six semester , means three year, includes subjects with practical like communication skills-1, applied mathematics-1,applied physics-1, applied chemistry, engineering drawing, construction materials, general workshop practice-1 in first semester, applied mathematics-2nd, computer aided drawing, applied mechanics, basics of mechanical & electrical engineering, basics of information technology and general workshop practice-2nd for second semester, hydraulics & hydraulic machine, concrete technology, environmental studies, structural mechanics, building construction and building drawing for third semester, communication skills -2nd, highway engineering, irrigation engineering, surveying -1st, reinforced cement concrete structures, energy conservation and RCC drawing for 4th semester, water & waste water engineering, railways bridge & tunnels, earthquake engineering, soil mechanics & foundation engineering, surveying -2nd, waste water & irrigation engineering drawing and universal human values for 5th semester, Quantity surveying & valuation, construction management accounts & entrepreneurship development, design of steel structure, steel structure drawing, software application in civil engineering, repair & maintenance of buildings and project work with students centered activities in all semester comprise of co-curricular activities like extension lectures, games, hobby clubs includes photography etc, seminars, declamation contests, educational field visits, NSS, NCC, Cultural activities and self study with survey camp etc. This has been illustrated for the year 2021. The gist includes 34 as theory subjects and 25 as practical subject besides students centered activities.

Engineering degree prior or after NSQF has syllabus cum subjects for eight semester as meant for four year, like engineering physics-1st, engineering mechanics, mathematics-1st, computer concept & programming, electronics engineering, environmental engineering and practical like engineering mechanics, computer programming, computer aided engineering graphics, physics lab & general proficiency for 1st semester, engineering physics 2nd, engineering chemistry, mathmatics-2nd, electrical engineering, professional communication & manufacturing process with practical of engineering chemistry lab, electrical engineering lab, workshop practice, professional communication lab and general proficiency for 2nd semester, industrial sociology, material science, fluid mechanics, building material & construction, surveying-1st, strength of material consisting of practical like fluid mechanics lab, building material lab, surveying lab, building planning& drawing plus general proficiency for 3rd semester and industrial physiology,mathematics-2nd, structural analysis-1st, geo informatics, engineering geology, hydraulic & hydraulic machine with practical like structural analysis lab, geo-informatics lab, hydraulic & hydraulic machine lab, CBSNT lab and general proficiency for 4th semester. Engineering & management economics, transportation engineering-1st, geo technical engineering, structural analysis-2nd, design of concrete structure -1, environmental engineering-1st and CAD lab, quantity surveying & valuation, transportation engineering lab geotechnical engineering lab for 5th semester and industrial management, advance concrete design, design of concrete structures-2nd,advance foundation design, environmental engineering-2,transportation engineering-2 and structural detailing lab, CAD Lab, survey camp, environmental engineering lab, general proficiency and structural detailing lab for 6th semester. Quality management, bridge engineering, open channel flow, design of steel structures, water resources engineering with practical like seminar, industrial training, project,& general proficiency for 7th semester and Non conventional energy resources, analysis a & design of hydraulic structures, earthquake resistant design of structures, construction technology & management with project and general proficiency as in practical for 8th semester. Grand total is taken 25% for 1st year, 50% for second year, 75% for 3rd year and 100% for final year. This has been taken as an illustration for the year 2013.

By latest(2017-21) subjects in Civil engineering degree course under grading system are Engineering Physics-1st, Basic Electronics, Engineering Maths-1st, Basic Electrical Engineering, Professional Communication, Engineering Physics Lab, Basic Electrical Engineering Lab, Professional Communication Lab and Workshop Practice in 1st Semester, Engineering Maths-2nd ,Engineering Physics-2nd Elements of Mechanical Engineering, Computer System & Programming in C, Engineering Chemistry, Engineering Chemistry Lab, Elements of Mechanical Engineering Lab, Computer Program Lab, Computer Aided Engineering Graphics in 2nd Semester. Mathematics-3rd,UHV & Professional Ethics, Mechanics of Solids, Building Materials & Construction, Surveying, Fluid Mechanics, Building Material Lab, Surveying Lab, Fluid Mechanics Lab, CBS & Numerical Techniques Lab in 3rd Semester and Material Science, Environment & Ecology, Data Structures, Hydraulics & Hydraulics Machines, Geoinformatics, Structural Analysis Lab, Building Planning Lab & Drawing Lab, Hydraulics & Machine Lab in 4th Semester. 5th Semester includes Managerial Economics, Sociology, Geotechnical Engineering, Design of Structure-1, Quantity Estimation & Management, Concrete Technology, Geotechnical Engineering Lab, CAD Lab-1, Construction Management Lab, Concrete Lab and 6th Semester includes subjects like Industrial Management, Cyber Security, Design of Structures-2nd,Environmental Engineering, Transportation Engineering, Foundation Design, CAD Lab-2nd, Environmental Engineering Lab, Transportation Engineering Lab and Structural Detailing Lab. 7th Semester includes Understanding the Human Being Comprehensively-Human Aspirations & its Fulfillment, Rural Development Engineering, Railways, Airport & Waterways, Design of Structures-3rd,Water Resources, Non Destructive Testing Laboratory, Mini Project, Industrial Training Viva- Voce & Project-1, and 8th Semester has Renewal Energy Resources, Solid Waste Management, Engineering Hydrology & Ground Water Management, Seminar and Project-2. So in a nut shell 42 theory subjects and 30 practical subjects are there, hence total subjects 72.

7-Vocational, technical and engineering education under NEP-2020-

Vocational courses are of ITI, which are of two year after high school and courses to convert it into one year seems quite difficult, however some syllabus can be reduced like in theory and practical.
In technical course, which is of six semester and to reduce it up-to four semester, physics, chemistry, and mathematics subjects should be removed from syllabus and emphasis on drawing, surveying, estimation, general testing of materials, skill based branch wise subjects and computer related work only be included. Drawing in civil should include building, RCC cum steel structures, sanitary & irrigation engineering. Surveying should include chain, compass, dumpy level, theodolite and total station. Estimation should include the existing syllabus, general testing should include equipment operation and testing of all building materials. Skill based branch-wise subjects like structural mechanics, hydraulics, building construction and concrete technology. CAD and software in civil engineering on computer practice be done.
In engineering four year course to be done for three year may contain specific site subjects like detailed projects on framed structures, fly over, retaining wall, dam, over head tank, sewerage and water supply projects, over head water tanks, bridges, tunnels, canal head works, river training works, railway network, etc.
Though the engineering must not come under NEP-2020 as the issuance of certificate in concern field does not seem feasible, however certificate course may be launched in Building Construction, building estimation, land surveying, plumbing, building repair & maintenance, environmental education, civil engineering drawing, estimation of building, valuation of immovable properties under Civil engineering etc.
Two year diploma may be given in Structural design & Construction, Valuation of Structures and Extent Surveying under civil engineering etc.
Three year degree may be given in civil construction & management, Extent Surveying & Management, Valuation of Structure & Management, Structural Design & Management, Civil Testing & Management, Transportation Engineering & Management and Hydraulic Structure Construction & Management under civil engineering etc.
Four year degree with research may be given in Software in civil engineering, Project Planning & Management, Sky Scrapers Construction & Management, Typical Construction Planning & Management, Water Management & Drainage Planning etc.
The syllabus may be made accordingly, so that after the particular certification, learners might have according knowledge with certification.

8-Conclusion:-

Though the NEP 2020 has been launched and beside medical and law, all courses have been included in this policy. It has been a typical task to include it in technical and engineering courses even already existing two year certificate course as ITI, three year as Diploma and four year as Engineering Degree.
However it will be very much difficult to form the syllabus of existing 2 year ITI to one year, 3 year diploma to two year and 4 year engineering degree to three year. Also it will typical for further years for higher education to research level. This can be achieved by merging syllabus of existing syllabus, not as it is, but avoiding Chemistry, Physics, Mathematics, Construction Material, Human Values, English, Engineering Drawing and Elements of Electrical & Mechanical Engineering under civil discipline since beginning. Also include in syllabus to visit on heavy construction sites, visit of manufacturing of cement companies & its allied units, visit of water & drainage sites, Visit of historical buildings, visits on Dams/ barrage/ aqueduct/ super passage/irrigation channels/head works & railway sites and industrial visits too etc.
For such professional courses like engineering falling under NEP should be given extra privilege in the form of value & pay scales, than other courses, as engineers can do any type of work because of having read so many subjects and are much better in mathematics, science, concern engineering and in communication too. Also they have better technological update and have better use of technology. Science and engineering have better option in job seeking. However it will be better if like medical and law courses, technical and engineering courses may also be kept away and all other courses be included under NEP.
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