Report on Technical Education Quality Improvement Program (TEQIP)-II

Directorate of Technical Education
SPFU Maharashtra State
(2011-2017)
It gives me immense pleasure to present this Report on Technical Education Quality Improvement Program - II in Maharashtra. This report is a culmination of significant efforts and hard work from SPFU team of Directorate of Technical Education, Maharashtra, who are passionate about creating better opportunities in TEQIP - II Institutes in Maharashtra.

It is highly appreciated the leadership, encouragement and extensive support provided by Hon. Shri. Vinod Tawde, Minister Higher and Technical Education, Hon. Shri. Ravindra Waikar, State Minister, Higher and Technical Education, Government of Maharashtra. Hon. Tawade saheb instructed to prepare the booklet on impact of the TEQIP Project and with his inspiration and support this report is published.

I am especially thankful to Shri. Sitaram Kunte, Add. Chief Secretary, Dr. Kiran Patil and Shri. Satish Tidke, Deputy Secretary, Higher & Technical Education Department, who always encourage various initiatives to improve Technical Education in Maharashtra.


The Report has covered both Academic and Administrative Reforms implemented by project Institutes which focused on quality and relevance, excellence, resource mobilization, greater institutional autonomy with accountability, research and equity. It also covers issues such as building institutional capability by adopting good practices and processes, Internal Revenue Generation by Institutes, creation of Four Funds for sustainability of project and design and scope of TEQIP - III.

I express deep gratitude towards the Principals and TEQIP - II Co-ordinators of all project Institutes in Maharashtra for their valuable contribution for successful preparation of this report.

I am thankful to one and all who have contributed their valuable time and inputs for preparation of this report.

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Director,
Technical Education, M.S., Mumbai
The development of this “Report on Technical Education Quality Improvement Program - II in Maharashtra” has been a result of close cooperation among several individuals and organisations. The State Project Facilitation Unit (SPFU), Maharashtra State, acknowledges and appreciates the support and encouragement provided by such individuals and organisations. The SPFU is highly appreciative of the extensive guidance & support provided by NPIU team of Government of India throughout the project tenure.

The SPFU is highly appreciative of the leadership, encouragement and extensive support provided by Hon. Shri. Vinod Tawde, Minister Higher and Technical Education, Hon. Shri. Ravindra Waikar, State Minister, Higher and Technical Education, Government of Maharashtra. I am especially thankful to Shri. Sitaram Kunte, Add. Chief Secretary and Dr. Kiran Patil and Shri Satish Tidke, Deputy Secretary, Higher & Technical Education Department, who always encourage various initiatives to improve Technical Education in Maharashtra.

I would also like to convey our heartfelt thanks to Shri. Chandrashekhar Oak (IAS), Shri. A. E. Rayate (IAS) and Smt. Meeta Rajiv Lochan(IAS), the then Director, Technical Education, Mumbai, and also thankful to Hon. Dr. Abhay Wagh, Director Technical Education, Dr. Subhash Mahajan, Joint Director, Technical Education and Shri. Pramod Naik, Joint Director, Technical Education, for lending their support and cooperation in successfully executing TEQIP-II in the state and preparation of this Report. I am also thankful to Dr. Surendra Bhosale, Head, Monitoring & Evaluation Unit, Shri. Avinash Amte, Head, Academic Unit, TEQIP, Dr. A. B. Nandgaokar, Head of Procurement Unit and Shri. M. W. Khan, Financial Consultant, for their contribution towards preparation of this Report.

In addition, I take this opportunity to thank all Principals and co-ordinators of Project Institutes in Maharashtra who shared their information and progress and enriched this Report. Finally, I thank one & all who have made this report possible. I thank them for their commitment and contribution to the development and realization of this Report.

Dr. Suresh Yavalkar,
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CHAPTER 1

Background & Introduction
Chapter 1: Introduction about Technical Education Quality Improvement Programme (TEQIP)

1.1 Background: Present System of Engineering Education in India

Broadly speaking, “Technical Education” can be seen as an instruction in or teaching of those scientific and artistic principles, which underlie the industrial occupations as well as the instruction in, or teaching of the manual practice involved in the application of these principles. Viewed thus, it can be seen as an education that prepares people for specific trades, crafts and careers at various levels – as a craftsman or technician (vocational education), or a professional position in engineering and allied fields.

It’s a known fact that technical graduates have a strategic and long-term impact on productivity growth in industry and service sectors. To produce sophisticated industrial products and services that are competitive in the global market and to realize the ‘Make in India’ initiative, India will need a really high number of well trained and extremely qualified engineering graduates. Unfortunately, the facts look a bit dismal.

Of the existing 3700 public and private engineering institutions that have over 4 million engineering students, only a select few are producing high quality graduates. Institutions like the IITs, NITs and a few other public and private technical universities are admittedly performing well. The problem is that these institutions produce less than 5-10 per cent of the engineers in India. Most other institutions are in serious need of improvement in their quality. A majority of these are affiliated to universities and teach the curriculum developed by the affiliating university. As a result, they lack the incentive to continuously improve the quality of teaching and learning and are not geared to adapt to the changing qualification needs of the job market.

These colleges mostly focus on undergraduate teaching and their postgraduate programs are often weak. Furthermore, they lack a systematic capacity building effort in education and research. The quality assurance and accreditation efforts of these institutions can be characterized by “compliance” rather than “improvement” tool. Most of them do not have a deep engagement with the employers and are rarely involved in regional development and partnerships with local economic players. Without strong links in the industry, the colleges have a deficit of entrepreneurial and innovation spirit. And hence, the students and the faculty get little exposure and have little to no experience when it comes to solving practical problems.

Some of the concerns in Engineering Education System are:

- Largely affiliated colleges following the curriculum of universities
- Only a small number of autonomous colleges are emerging
- Focus of most of the institutions is undergraduate teaching and the post-graduate programs are weak
- Employers are not happy with engineering talent pool
- Very little focus on research
- Absence of academic framework to constantly respond to the changing needs
- No serious engagement between education providers and employers
- Lack of enterprising character / innovation mindset
- Lack of systemic capacity building effort in education and research
- Accreditation is more of compliance rather than an improvement tool
- 95 to 100 percent revenue from government disbursement and/or student fees
- No participation in regional development
- Low key entrepreneurship promotion activities

Concerted efforts are required to bridge the gap in the quality of education between IITs and other institutions.

1.2 Introduction about the Project:

Technical Education Quality Improvement Project (TEQIP) in India aims to improve the quality of Technical Education and Engineering Education to produce high quality technical professionals in order to raise productivity and competitiveness of the Indian economy. It seeks to scale up and support ongoing efforts of the Government of India to enhance existing capacities of the institutions to become dynamic, demand-driven, quality conscious, efficient and forward looking, responsive to rapid economic and technological developments occurring at the local, State, National and International levels. TEQIP assists to improve the quality of Technical Education in competitively selected engineering institution from the participating States by providing inputs like modernization of laboratories/workshops, library, faculty and staff development, networking between institutions, curricula development, research and improve interaction with Industries, service to community and economy and tribal development plan etc. Technical Education Quality Improvement Program (TEQIP) was envisaged as a long-term program of about 10-15 years duration to be implemented in 3 phases for transformation of the Technical Education System with the World Bank Assistance.

As per TEQIP design, each phase is to be designed on the basis of lessons learnt from the implementation of an earlier phase. TEQIP-I started a reform process in 127 Institutions. The reform process needs to be sustained and scaled-up for embedding gains in the system and taking the transformation to a higher level. To continue the development activities
initiated through TEQIP-I, a sequel Project was planned as TEQIP-II. Now to further continue the activities, a third sequel Project is planned as TEQIP-III.

The Project Agreement with World Bank was signed on February 04, 2003 for First cycle of First phase and on April 12, 2004 for second cycle of First phase. The project agreement between the State government and World Bank under TEQIP was signed by the Secretary to Government, Higher Education Department at New Delhi on 12.4.2004. The Project ended on 31st March 2009. In this centrally coordinated state-sector project, In all 127 institutions from 13 States participated along with 18 centrally-sponsored (NIT) and 109 state – sponsored institutions (State government and self financing). In the First cycle of First phase, the six states (1) Haryana (2) Himachal Pradesh (3) Kerala (4) Madhya Pradesh (5) Maharashtra and (6) Uttar Pradesh were included. In the Second cycle of First phase among the seven states (1) Andhra Pradesh (2) Gujarat (3) Jharkhand (4) Karnataka (5) Tamil Nadu (6) Uttaranchal (7) West Bengal were included in the program. Maharashtra was selected in the First cycle of First phase.

### 1.3 TEQIP-Phase I in Maharashtra

- 17 institutes from the State participated in phase I of TEQIP. Of these, 9 were Government / Government aided Engineering Colleges, 5 were Private Engineering Colleges and 3 Government Polytechnics.
- Total fund disbursed Rs. 162.50 crore
- Funds were used for up-gradation of infrastructure, modernization of laboratories, subscription of e-journals, creation of campus wide networking, training of teachers and staff.

### 1.4 Impact of TEQIP-I:

- NPIU (MHRD) had conducted State-wise impact evaluation based on input parameters viz: Institutional reforms, Institutional governance, academic excellence, networking and services to community & economy, which were further assessed through 76 sub-parameters. In this study: All India Average is 6.68 on a scale of 10. Maharashtra score is 6.63
- Autonomy to institutes. – COE Pune, GCOEAmravati,Aurangabad, SGGSIET Nanded, VJTI Mumbai, WCE Sangli became autonomous. Autonomous institutes have established four Funds viz. Corpus fund, faculty development fund, equipment replacement fund and maintenance fund.
- Institutional reforms observed: - Implementation of Semester System, Flexible Pace of Learning, Credit Exemption, Multi Background Admission, Offering Electives, Continuous Evaluation, Grading System, Faculty Development and Performance Appraisal, remedial coaching.
Chapter 2: TEQIP-II - Project Scope, Objectives and Strategy

2.1 Technical Education Quality Improvement Program (TEQIP)–II

The goal of the Program is to scale-up and support ongoing efforts of the Government of India to improve quality of Technical Education and enhance existing capacities of the institutions to become dynamic, demand-driven, quality conscious, efficient and forward looking, responsive to rapid economic and technological developments occurring at the National and International levels. The reform process needs to be sustained and scaled-up for embedding gains in the system and taking the transformation to a higher level. To continue the development activities initiated through TEQIP-I, a sequel project is planned as TEQIP-II.

A. Project Scope:

Project was open for competition and participation by: (a) the All India Council for Technical Education (AICTE) approved Engineering institutions from all States and Union Territories across the country and (b) Engineering faculty, Engineering Teaching Department, Constituent Institutions of Universities and Deemed to be Universities (c) Centrally Funded Institutions (CFIs). An around 200 Engineering institutions will be competitively selected in one or two cycles. Eligible private unaided institutions willing to contribute to the vision of India to produce high quality technical manpower would also be selected in the Project. However, total number of private unaided institutions to be selected for participation in the Project will be limited to about 20% of total project institutions.

B. Project Objectives:

Following are the Project objectives:

- Strengthening institutions to improve learning outcomes and employability of graduates
- Scaling-up Postgraduate Education and demand-driven Research & Development and Innovation,
- Establishing Centers of Excellence for focused applicable research,
- Training of faculty for effective teaching, and
- Enhancing Institutional and System Management effectiveness.

C. Project Strategy:

The Project was implemented in pursuance of the National Policy on Education (NPE-1986 revised in 1992) through the Ministry of Human Resource Development (MHRD) of the Government of India. The Project was implemented as a Centrally Sponsored Scheme (CSS) with matching contribution from State Governments and Union Territories.

In TEQIP-II, at the national level, there is a Project Approval Board (PAB),
under the Chairmanship of Secretary, Department of Higher Education to select State / Institution, and to sanction project proposals and also review implementation of the program. The Institution submitted IEP (Institutional Eligibility Proposal), which was evaluated by the State Steering Committee, and National Evaluation Committee carried out final evaluation and ranking of eligible proposals. Finally, in TEQIP-II, 190 Engineering Institutes that included centrally funded, state funded and private unaided types were selected.

Project cost in the Government funded and Government aided institutions for all sub-components will be shared between the MHRD and State and UT Governments in the ratio of 75:25 in all States except the Special Category States wherein the ratio will be 90:10. For Centrally Funded Institutions, 100% of institutional project costs will be borne by the MHRD. Funding for private unaided institutions in all States and UTs will be in the ratio of 60:20:20 i.e. 60% funding as Grant from MHRD, 20% funding as Grant from the State and 20% funding from institutions.

A set of Eligibility Criteria for States and UTs is enforced to achieve a high and sustained impact of the Project. The criteria seek to give the project institutions adequate decision-making powers that will enable and encourage them to deliver quality education and undertake research in an efficient manner. A primary focus is to increase empowerment of institutions for self-governance and incentivizing improvements in Engineering Education.

Professional development programs for engineering education policy planners; administrators and implementers at the Central, State and Institutional levels will be organized. The Project will also support development of an effective governance model.

The project institutions will be required to implement academic and non-academic reforms within their self-conceived development programs that focus on quality and relevance, excellence, resource mobilization, greater institutional autonomy with accountability, research and equity.

The Project will lay major emphasis on monitoring and evaluation. The prime responsibility of monitoring will lie with the institutions themselves. The management structure at the Institutional level i.e. the Board of Governors (BoG) will monitor the progress of Institutional projects on a regular basis and provide guidance for improving the performance of institutions in project implementation. The information from project institutions will be collected through a scalable web-based Management Information System (MIS). State Governments will also regularly monitor and evaluate the progress of institutions.

The Government of India and the World Bank will conduct bi-annual Joint Reviews of the Project with assistance from the National Project Implementation Unit.
(NPIU). The monitoring will be based on action plans prepared by each project institution and achievements made on a set of Key Performance Indicators (KPIs). The monitoring will focus on implementation of reforms by institutions, achievements in project activities under different Sub-components, procurement of resources and services, utilization of financial allocations and achievements in faculty and staff development and management development activities.

Establishing Centers of Excellence with potential for world-class research in emerging areas is one of the important aspects of the Project.

2.2 Uniqueness of TEQIP

TEQIP has all the main ingredients, required to make a success of a large government initiative/program viz:

- Detailed Planning: Undertaken through a detailed Project Implementation Plan (PIP), which is in place well before Project commencement.
- Appropriate Staffing: Adequately taken care at all levels by NPIU.
- Approach: Freedom to institutions to develop own institutional development plan and to determine own path for excellence.
- Thorough Monitoring: Ensured through a system of periodic auditing and mentoring of Project institutions during Project cycle followed by independent external impact assessment of the Project.

TEQIP has been a successfully implemented Project with unique achievements such as:

1. Institutional reforms for faculty development were undertaken and teacher’s performance appraisal by students has been a best practice spread wide through TEQIP.
2. Reforms in institutional governance process through grant of autonomy.
3. Creation of better learning Infrastructure such as world-class 24X7 operational computer facilities, modernization of labs with state of the art equipment leading to high quality/demand driven research & development, publications and introduction of new post graduate & doctoral programs for first time in the institutions

2.3 Notable gains from the Project –TEQIP-II:

- Establishment of 30 Centers of Excellence all over India.
- Each participating institution implemented a set of reforms, which promoted academic autonomy. Out of the 191 participating Institutions,
124 Institutions are autonomous and the remaining institutions are in the process of applying/ applied to the UGC for autonomous institution status.

- The Project empowered the institutions to improve and develop curriculum based on the demand for skills and the latest research in the market.
- Accountability reforms took place through creation of a Board of Governors at each of the institutions.
- Collaboration with 8 IITs to stimulate Quality Circles for catalyzing the growth of Engineering Education in Technical Institutions.
- Collaboration with IIT Madras under Quality Enhancement in Engineering Education (QEEE) program of MHRD, Government of India.
- Establish a Center at Institute of Chemical Technology, Mumbai for Innovation Networking of TEQIP institutions for promoting innovation in Research.
- Collaboration with 7 IIMs for imparting training for senior faculty.

2.4 Lessons learnt from TEQIP-II:

- Objective and transparent selection of institutions, with clear pre-requisites, takes more time, but is essential.
- Institutions and government structures from States lagging in technical education need more support.
- Fund flow through State treasury affects timely disbursement of funds to the project institutions.
- High turnover of officials at state and institutional level slows down implementation.
- Project duration of 4 years is too short a period, unless the selection of institutions is done before the project commences.
- The inclusion of State Universities, State Govt., etc., in addressing issues of governance, accountability and quality assurance is essential for technical education system reform.
- Academic autonomy needs to be augmented by financial and administrative autonomy – with appropriate accountability – to maximize quality improvement.
- States with a higher number of institutions in the project are more successful in project implementation.
- Implementation support units need strong technical skills and adequate delegated authority to be effective.

2.5 Continuation of Project activities:

- Among engineering / technical institutions, the Program, TEQIP-I & TEQIP-II combined, covered only a 233 engineering/technical Institutions (154 State Govt. funded / State Govt. aided, 28 Centrally Funded Institutions and 51 Private unaided Institutions) i.e. less than 10% of the institutions. However, institutional and systemic reforms
initiated under TEQIP have begun to take root and similar interventions need to be made in more institutions to improve the competencies of their undergraduates, thereby raising the level of academic excellence in the Indian technical education system.

- The pedagogical and capacity development activities undertaken during TEQIP-II need to cover a greater number of institutions in order to produce more M.Tech and Ph.D. pass outs.
- Supporting Centers of Excellence (CoEs) established during TEQIP-II.
- Increasing the scope of Industry-Academia Collaboration.
- Promote stronger student support systems so that transition, graduate and placement rates increase.
- More focused support to institutions in Educationally Backward Districts (EBDs)
- Networking Model of Academic Resource Support (Mentoring, Quality Circles, KIT etc.)
- Maintain consistency of the Standard Faculty Student ratio
- Stronger Technical Skills and delegated authority to implementation units
- Strengthening the entire Technical Education eco-system to support the envisaged reforms in institutions.

2.6 Extension of TEQIP-II Period

Originally the project period was till December 2014. However, since the Project Grant was received late, the Govt. of India had extended the project till March 2017.

2.7 Achievements of TEQIP-II

1. Improving quality by helping institutes become autonomous and obtain accreditation;
2. Boards of Governors in Colleges that help institutes balance autonomy and accountability;
3. Building a performance culture where institutes receive additional funds based upon performance against a series of benchmarks that are updates every six months;
4. Improvement in transition rates across all categories of students;
5. Doubling of student placement activities
6. Improved research outputs — between 2009-10 and 2014-15, the number of publications in refereed journals in engineering fields almost doubled from 7032 to 13929 in TEQIP-II institutions.
Chapter 3: Project Design, Monitoring and Evaluation

3.1 Project Design:

The Second Phase Project of the Technical Education Quality Improvement Program (TEQIP) seeks to strengthen selected institutions to produce more employable and higher quality Engineers and prepare more Post-graduate Students to reduce faculty shortage. “Strengthening of Institutions” is the long-term objective of the Project emphasizing on production of more employable and high quality graduate engineers. Improving quality of education (learning outcomes) and employability of graduates are medium-term outcomes. The Project is composed of the following Components and Sub-components:

3.1.1 Component 1: Improving Quality of Education in Selected Institutions

This Component aims to strengthen around 200 competitively selected Engineering Education Institutions to improve learning outcomes and employability of graduates and scale-up Postgraduate education, research & development and innovation and establishing centers of excellence. The faculty of these institutions will also be offered pedagogical training for effective teaching.

The objectives of this Component will be achieved through the following Sub-components:

<table>
<thead>
<tr>
<th>Sub-component 1.1</th>
<th>Strengthening institutions to improve learning outcomes and employability of graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-component 1.2</td>
<td>Scaling-up Postgraduate Education and Demand-Driven Research &amp; Development and Innovation</td>
</tr>
<tr>
<td>Sub-component 1.2.1</td>
<td>Establishing Centers of Excellence</td>
</tr>
<tr>
<td>Sub-component 1.3</td>
<td>Faculty Development for Effective Teaching (Pedagogical Training)</td>
</tr>
</tbody>
</table>

3.1.2 Component 2: Improving System Management

This Component aims to build capacity of Technical Education policy planners, administrators and implementers at the Central, State, and Institutional levels to effectively implement the institutional reforms and to introduce and sustain innovative systemic quality improvement practices. It also aims to provide timely, sufficient, precise, and reliable information to improve and assess the performance of the selected institutions for effective Project Management through the following sub-components:

<table>
<thead>
<tr>
<th>Sub-component 2.1</th>
<th>Capacity Building to Strengthen Management</th>
</tr>
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<tbody>
<tr>
<td>Sub-component 2.2</td>
<td>Project Management, Monitoring and Evaluation</td>
</tr>
</tbody>
</table>
In this scheme, in the component 1.1 (Targeted towards undergraduate Institutes) the ratio of Central to State funding is 75:25 for Government and Government aided Institutes. However, for unaided institutes, Central: State: Institute funding ratio is 60:20:20. In another component 1.2, (Targeted towards Post Graduate Institutes) the ratio of Central to State is 75:25 for all types of Institutes. Accordingly, in Maharashtra, 18 Institutes have been selected by National Project Implementation Unit, MHRD vide G.R. dt. 30-11-2011 and State Project Facilitation Unit has been established for monitoring and implementation.

3.2 Project Implementation:

Project Implementation Structure/Arrangement

A. National level
   · National Steering Committee
   · National Project Directorate in MHRD assisted by National Project Implementation Unit (NPIU)

B. State Level
   · State Screening Committee
   · State Project Facilitation Unit

C. Institute level
   · Board of Governors
   · Institutional TEQIP Unit

3.3 National Project Implementation Unit (NPIU):

The existing NPIU will be restructured to carry out its functions through 6 functional Units and was headed by the Central Project Advisor (CPA). State Level Project Implementation Arrangements: The project States and the UTs through the respective State Steering Committee (SSC) and the State Project Facilitation Unit (SPFU) were directly responsible for management, coordination, implementation and monitoring of the Project at the State/UT levels.
3.4 State Project Facilitation Unit (SPFU):

The Department of the State Government responsible for managing Technical Education established a State Project Facilitation Unit (SPFU) with adequate staff. The SPFU was located within the Department of the State Government responsible for Technical Education. The head of the SPFU, designated as the State Project Advisor (SPA), was the Director of Technical Education and assisted by a State Project Coordinator (SPC).

3.5 Institutional Level Implementation Arrangements:

The Project at the Institutional level was managed by two bodies (i) the Board of Governors (BoG) and (ii) an Institutional TEQIP Unit.

Institutional TEQIP Unit:

Each Institution formed an Institutional TEQIP Unit with appropriate representation from academic officials of the Institution, faculty, senior administrative officers, technical and non-technical support staff and students. The Unit, headed by the Head of the Institution called as Institutional Project Director (IPD), was responsible for implementation of the Institutional project. He/she was to be assisted by a Senior Professor called as Institutional Project Coordinator (IPC) for coordinating the activities of the institutional project.

3.6 Funding Pattern

TEQIP-II was implemented as a Centrally Sponsored Scheme (CSS). The share of Central Government, State Government and Institute, as planned initially, is as indicated below - component wise:
Each institute has been given a **Life Time Allocation** depending on the sub component of the Project in which it is selected. The Life time allocation is as shown below:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Component &amp; Type of Institute</th>
<th>Central Share (%)</th>
<th>State Share (%)</th>
<th>Institute own Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Government Institute</td>
<td>75</td>
<td>25</td>
<td>Nil</td>
</tr>
<tr>
<td>2.</td>
<td>Government Aided institute</td>
<td>75</td>
<td>25</td>
<td>Nil</td>
</tr>
<tr>
<td>3.</td>
<td>Private Unaided institute</td>
<td>60</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Sub Component</th>
<th>Life Time Allocation (Rs in crore)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sub Component 1.1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>Sub Component 1.2</td>
<td>12.5</td>
</tr>
<tr>
<td>3</td>
<td>Sub Component 1.2.1</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Sub Component 1.1 (Innovation Networking)</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Unaided Private institute (any of the above sub components)</td>
<td>4</td>
</tr>
</tbody>
</table>

During TEQIP-II initial project Life Time Allocation of All 17 institutes and SPFU together was Rs 205 cr approx. However well performing institutes were given some additional allocations. Out of this, year wise fund release position was as follows: (all figures in Rs lakh).

**Table:- Year wise fund release position**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Financial Year</th>
<th>Central Share</th>
<th>State Share</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2012-13</td>
<td>2487.00</td>
<td>829.00</td>
<td>3316.00</td>
</tr>
<tr>
<td>2</td>
<td>2013-14</td>
<td>4448.875</td>
<td>1482.95</td>
<td>5931.83</td>
</tr>
<tr>
<td>3</td>
<td>2014-15</td>
<td>5623.50</td>
<td>1874.50</td>
<td>7498.00</td>
</tr>
<tr>
<td>4</td>
<td>2015-16</td>
<td>1074.00</td>
<td>358.00</td>
<td>1432.00</td>
</tr>
<tr>
<td>5</td>
<td>2015-16 (but released in 2016-17)</td>
<td>975.00</td>
<td>1031.34</td>
<td>2006.34</td>
</tr>
<tr>
<td>6</td>
<td>2016-17</td>
<td>1012.75</td>
<td>892.75</td>
<td>1905.50</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>16079.465</td>
<td>6810.545</td>
<td>22890.005</td>
</tr>
</tbody>
</table>

The above table clearly illustrates the Life Time Allocation and total fund released to project institutes till 31st January, 2016. The fund released to an institute consists of central share, state share. In case of unaided private institutes, it consists of own contribution of the institute *i.e.*, own share.
3.7 Project Monitoring and Evaluation

Project Monitoring and Evaluation Strategy was designed to provide reasonably complete, correct and reliable data through a web-based Management Information System (MIS) to stakeholders that will lead to improvements in Project implementation, decision making and learning from shortcomings. The project was monitored through:

1. Performance Indicators including Key Performance Indicators with Target values.

2. Web Based Management Information System (MIS): This is a web-based Management Information System (MIS) to track implementation of Key Project Inputs, Outputs, Outcomes and Impact corresponding to Project activities through Performance Indicators developed for the Project.


4. Web Based Procurement Management Support System (PMSS):

3.7.1 Project Evaluation:

The Project evaluation activities are mandatory for the NPIU, the SPFUs and all the project institutions. The Project evaluation activities cover all entities and was done through:

- Assessment of Institutional performance towards improving education quality and service delivery through Institutional **Performance Audits**.
  - Assessment of Institutional data through **Data Audits** for ensuring good data quality.
  - Assessment of the implementation strategy through **Implementation Surveys** adopted during Project design and corrective measures to be taken for improvement.
  - Assessment of performance achieved against set targets through **bi-annual and Mid-Term Reviews** conducted jointly by the MHRD/NPIU and the World Bank.
  - Overall assessment of the objectives achieved under the Project through a rigorous **Impact Assessment Study**.

The Assessment Surveys and Performance and Data Audits are being conducted until the Project closure. Consulting firms will be employed to conduct the surveys as and when required. Assessment Surveys mainly consist of:

- Student Satisfaction Surveys
- Faculty Satisfaction Surveys
- Implementation Surveys

3.7.2 Performance and Data Audits:

One of the key objectives of TEQIP was to strengthen the effectiveness of management systems and enhance the institutional capacity to manage change in sync with changes in external
environment. In pursuit of this, the concept of Performance Audit was introduced as a binding necessity for the state governments and State Project Facilitation Units (SPFUs) to plan and facilitate audit of Performance and Data maintained in TEQIP institutions. Performance and data audits were carried out bi-annually to evaluate the progress made by all project institutions in terms of their goal setting, achievements in regard to key performance indicators and over all implementation of various initiatives and reforms planned and proposed under the TEQIP-II programme for promoting academic excellence. The Performance Auditors were senior academicians, appointed out of a pool of mentors created from persons suggested by the SPFUs and those identified by the NPIU. The evaluation carried out by performance auditors was used as the basis by the SPFUs and NPIU to grade performance and rank the institutions in the implementation of the TEQIP.

3.7.3 Fiduciary Reviews:

The Fiduciary Reviews, conducted by the World Bank, cover Post-Procurement Reviews and Financial Management Reviews.

3.7.4 Resources Utilization Study:

The objective of the Resources Utilization Study, to be conducted by the NPIU, was to assess the extent of availability and utilization with respect to equipment, books and learning resources and suggest strategies for their optimum utilization and sustenance. It was conducted twice; (i) during the implementation of the Project and (ii) at the end of the Project.

3.7.5 Impact Assessment Study:

The objective of the Impact Assessment Study was to assess the impact that can be attributed to the Project in up-grading the quality of Engineering Education offered by project institutions and in producing better skilled and more employable graduates. The study, conducted by the NPIU measured the extent to which Project objectives have been achieved. The Study was undertaken towards the end of the Project.
3.7.6 Joint Review Mission (JRM)
National level Review of the whole Project was carried out by the World Bank and MHRD, GoI jointly twice in a year.

3.7.7 Mentoring:-
Mentoring under TEQIP-II was a means of providing professional support and mature advice to the management of TEQIP institutions, on a regular basis. Over 80 academics with rich and proven experience as academic administrators had been identified to serve as mentors for the TEQIP institutions. While supporting institutional development processes for promoting academic excellence, the mentors were also expected to play the role of ‘critical friends’ who served as sounding boards for governing bodies, Heads of Institution (HoI), faculty, students and other stakeholders of TEQIP institutions. Like Performance and Data auditors, mentors were also nominated by the SPFUs while the NPIU nominated them for centrally funded institutions.

Since mentors were usually chosen from within states, the benefits of the mentors’ familiarity with the policy environment and their techno economic knowledge of the geography was often useful in guiding the institutions’ progress. While the professional advice provided by the mentors was not binding on the management of the institution, TEQIP Institutions expressed satisfaction with the system with the private institutions felt more benefitted.
CHAPTER 4
Evaluation of TEQIP-II in Maharashtra
Key Performance Indicators (KPIs)
Chapter 4: Evaluation of TEQIP-II in Maharashtra

Key Performance Indicators

4.1 Evaluation of TEQIP-II in Maharashtra in terms of Key Performance Indicators

That the learning environment with necessary infrastructure is a prerequisite to maintaining high academic standards, is now a well-accepted proposition, independent of the level and domain of education. Traditionally, physical parameters have been used to describe different aspects of the learning environment, such as classroom space, open recreational spaces and laboratory space per student, library space and book volumes, faculty to student ratio etc. Besides these, Information and Communication Technology (ICT) related facilities such as computers, internet connectivity and access to digital learning resources are now integral to modern education. Above all, good quality education requires an environment that is motivating to both teachers and students in the form of freedom to research and innovate new teaching tools while encouraging students to work on small non-credit projects or assignments, providing opportunities for peer group discussions and support for self-earning.

Quality of the students’ learning is at the heart of all academic processes including development of faculty resources for enhancing their quality of instruction as well as research output. Since most components of the TEQIP project drive these processes, the evaluation of TEQIP-II on the basis of Key Performance Indicators (KPIs) is very important. Key Performance Indicators are important intermediate / long-term outcome indicators that will help in monitoring the progress of project institutions. The data for the various KPIs was collected on continuous basis through MIS and compiled for each state.

The major Key Performance Indicators include:
- Share of supported programmes that are accredited/applied for
- Percentage of institutions with academic autonomy
- Capacity Development of Faculty
  - Increase in percentage of regular faculty with Masters degree in engineering disciplines above baseline
  - Increase in percentage of regular faculty with Doctoral degree in engineering disciplines above baseline
- Vacancy position for faculty and staff
- Increase in the number of publications in the field of Engineering in refereed journals
- Transition rate for students from the First year to the second year of undergraduate programmes
The present chapter is focusing on evaluation of TEQIP-II in Maharashtra based on analysis of various KPIs (identified by NPIU) with respect to project institutes in Maharashtra and data related to it which is updated by the NPIU on its website.

4.2 Improvement in Students Knowledge and Skills

One of the major objectives of TEQIP-II is to bring about improvement in Students Knowledge and Skills. For achieving this objective, various TEQIP institutes in Maharashtra promoted following activities:

- Diagnostic Test
- Remedial teaching
- E-enabled learning
- Research projects at UG levels
- Assistantships

In order to measure the extent to which there is an improvement in Students Knowledge and Skills, the following indicators are used to determine the trend during various years.

**Fig. 4.1(a) Share of Female Students against Total Engineering Students (UG)**
It has been observed that the share of female students against total engineering students in various under graduate courses in Maharashtra has gone up quite substantially in the initial years of the project due to low level of share in the beginning. It was at its peak at 33.13 % during 2013-14. In the remaining period it remained more or less same around 32.7 %.

Fig. 4.1(b) Share of Female Students against Total Engineering Students (PG)

It has been observed that the share of female students against total engineering students in various under Post - Graduate courses has been going down in the first three years but after that it started improving. It has achieved its peak at 33.8 % during 2016-17.

Fig 4.3 (a) Average Scores (%) at passing out at Under Graduate level

It has been observed that the Student transition rate (%) from first year to second year of Under Graduate Programs (clearing all subjects/courses of 1st year in first attempt) has been fluctuating over the years. It has achieved its peak at 72.02 % during 2014-15 but next year i.e. 2015-16 it was lowest at 64.66%.

Fig 4.2 Student transition rate (%) from first year to second year of Under Graduate Programs (clearing all subjects/courses of 1st year in first attempt)

It has been observed that the Average Scores (%) at passing out at Under
Graduate level has been going down till 2014-15 but next year only it showed tremendous improvement. It has achieved its peak at 65.76% during 2011-12 and was lowest at 45.57% during 2014-15.

Fig 4.3 (b) average scores (%) at passing out at Post Graduate level

It has been observed that the Average Scores (%) at passing out at Post Graduate level has gone down during initial years of TEQIP-II. It was lowest at 21.83% during 2013-14 but it improved considerably in the next year i.e., 2014-15 when it was highest at 52.47%.

Fig 4.4 Number of Students enrolled in M. Tech. Programs

It has been observed that number of students enrolled in M.Tech. Programs have increased during TEQIP-II period. It has achieved its peak at 4971 during 2015-16 after which it immediately declined in last year of the project. The reason could be that projects Institutes might have introduced some new Post Graduate programs as per the mandate given by the project in this phase.

Fig. 4.5 Number of Students enrolled in Ph.D. Programs

It has been observed that the total number of Students enrolled in Ph.D. Programs during the project period was 1373.

Fig. 4.6 Number of Masters Students enrolled with TEQIP Teaching Assistantship
It has been observed that number of Masters Students enrolled with TEQIP Teaching Assistantship have increased during TEQIP-II period. Total 2852 Masters Students were benefited with Teaching Assistantship during the Project Period.

Fig. 4.7 Number of Ph.D. students enrolled with TEQIP Research Assistantship

It has been observed that number of Ph.D. students enrolled with TEQIP Research Assistantship have increased during TEQIP-II period. Total 106 Ph.D. scholars were benefited with Research Assistantship during the Project Period.

Fig. 4.8 Number of Research Projects taken by UG students

It has been observed that number of Research Projects taken by UG students have fluctuated during TEQIP-II period. It has achieved its peak at 1514 during 2013-14 and lowest during 2016-17. Total 5271 Research Projects were taken by the Under-Graduate Students during the Project period.

4.3 Capacity Development of Faculty

Faculty needs to be prepared enough by to deal with the rapid changes and shifting paradigms in technical education. Without Capacity Development of Faculty, they are reduced to instructors presenting their understanding of the subject by one-way lecturing. Interestingly, faculty in private and government aided institutions have taken the best advantage of TEQIP in upgrading their qualifications. This parameter covers:

- Recruitment of faculty
- Subject domain training
- Qualification up gradation
- Pedagogical Training
- E-enabled training
- Management Development training
- Continuing Education Program
It has been observed that the percentage of faculty positions filled-in as per AICTE / MHRD required Teacher-Student ratio (Regular) have remained similar till 2014-15. It has shown improvement since 2015-16 and achieved its peak at 78.24% during 2016-17.

It has been observed that the percentage of faculty positions filled-in as per AICTE/MHRD required Teacher-Student ratio (Regular + Contract) has shown marginal increase over the years and it has peaked at 92.9% during 2016-17.

It has been observed that percentage of Faculty with B.Tech enrolled for M.Tech against total B.Tech Faculty have increased during TEQIP-II period. It has achieved its peak at 22.06% during 2015-16.
It has been observed that percentage of Faculty with M. Tech enrolled for Ph.D against total M. Tech Faculty have marginally increased during TEQIP-II period. It has achieved its peak at 29.86% during 2016-17.

**Fig. 4.12 Percentage of regular Faculty with Masters degree in Engineering against Total Engineering Faculty**

It has been observed that percentage of regular Faculty with Masters degree in Engineering against Total Engineering Faculty have increased during TEQIP-II period till 2015-16 but declined during 2016-17.

**Fig. 4.13 Percentage of regular Faculty with Ph.D. degree in Engineering against Total Engineering Faculty**

It has been observed that percentage of regular Faculty with Ph.D. degree in Engineering against Total Engineering Faculty have increased during TEQIP-II period till 2016-17. This is a welcome sign as such faculty would promote research oriented mind-set among students also.

**Fig. 4.14 Number of faculty members attended training in subject domain**

State Project Facilitation Unit, Directorate of Technical Education, MB Faculty
Number of Faculty Members attended Training in subject domain
It is evident from above diagram that there is no set pattern with regards to number of faculty members who attended training in subject domain. Total 1337 faculty members from the 17 Project institutions were trained in subject domain area.

**Fig. 4.15 Number of faculty members attended training in Management Development training**

![Number of Faculty Members attended Training in Management Development](chart1.png)

It is observed that there is no set pattern with regard to number of faculty members who attended training in Management Development. Total 754 faculty members from the 17 Project institutions were trained in management development area. It was observed that, the Management Courses were beneficial for overall development of the Institute as well as for students.

**Fig.4.16 Number of faculty members attended pedagogical training**

![Number of Faculty Members attended Pedagogical Training](chart2.png)

It is observed that the number of faculty members who attended pedagogical training has shown improvement over the years during TEQIP-II. Total 1049 faculty members from the 17 Project institutions were trained in Pedagogical training.

Imparting pedagogical training to faculty is all the more needed as there is no such training for them before they join this profession. Institutes should encourage their faculties to attend programs organised by various NITTTR.
4.4 Institutional Reforms

Various Institutional Reforms aimed at improving the quality of technical education can be categorized into two sets of Reforms i.e.

4.4.1 Academic reforms
- Curricular Reforms
- NBA Accreditation
- Improved Student Performance Evaluation
- Performance appraisal of faculty by students
- Faculty incentive for Continuing Education (CE), Consultancy and R&D

4.4.2 Non-Academic reforms
- Exercise of autonomies-- Academic, Administrative, Managerial and Financial
- Establishment of Sustainability Fund (Corpus Fund, Faculty Development Fund, Equipment Replacement Fund and Maintenance Fund)
- Generation, retention and utilization of revenue generated through variety of activities
- Filling-up existing teaching and staff vacancies
- Delegation of decision-making powers to senior institutional functionaries with accountability

It was observed that the Percentage of NBA accredited UG & PG programs against total eligible programs was on the rise since 2013-14 during TEQIP-II period. It was highest at 37.4 % during 2016-17 and lowest at 15.09% during 2012-13.

Fig. 4.17 Percentage of NBA accredited UG & PG programs against total eligible Programs

Fig. 4.18 Percentage of Applied UG & PG programs against total eligible programs
It appears that the Percentage of Applied UG & PG programs against total eligible programs was fluctuating between 40 to 50% over the TEQIP period. During 2011-12, it was comparatively low at 23.62% but the trend changed after that.

**Fig. 4.19 Autonomous Institution status concurred by UGC**

It is evident that the percentage of Autonomous status as granted by UGC increased marginally over the years. It was also observed that autonomous colleges performed better than affiliated colleges as they have academic freedom due to which they are more creative and innovative while revising their curriculum.

**Fig. 4.20 Number of academic programs i.e. M.Tech/Ph.D. etc. with Industry**

It has been observed that Number of academic programs i.e., M.Tech/Ph.D. etc., with Industry was continuously increased. Total 64 industry collaborated M.Tech/Ph.D. programs were started during the project period.

**Fig. 4.21 Total Internal Revenue Generation (Rs. in Lakhs)**

It was observed that Total Internal Revenue Generation (IRG) was increased over the years with exception of 2016-17 when the project was coming to an end.
4.5 Enhance Access to Knowledge Resources

Improvement in Teaching, Training and Learning facilities

- New PG programs
- Updating of learning resources
- Equipment details
- Modernization of Labs and classrooms

Fig. 4.23 IRG as percentage of Annual Recurring Expenditure

It was observed that IRG as percentage of Annual Recurring Expenditure was declining till 2013-14 but it again showed an upward trend till 2015-16. It was highest during 2011-12 at 273.96% of Annual Recurring Expenditure.

Fig. 4.24 Existing Laboratory (Nos.) modernized

It was observed that number of existing Laboratories modernised consistently increased till 2014-15. It was maximum in 2014-15 and afterwards it declined in 2016-17.
It was observed that number of Course specific Softwares acquired were quite low till 2013-14 and during 2014-15 and 2015-16 it saw a massive jump.

It was observed that number of e-books acquired was slightly increased till 2014-15 and it saw a massive decline in 2015-16.

It was observed that number of e-journals acquired was increased till 2013-14 and it saw a fluctuating graphs in subsequent years.

It was also observed that number of printed journals acquired was increasing till 2013-14 and it saw a declining trend afterwards. It became lowest in 2016-17.
4.6 Enhancement of Research & Development Activities

The increased emphasis on excellence in engineering education through TEQIP-II is most visible in the form of a better research culture at the participant institutions. Research and Development activities in technical education form an important aspect of the TEQIP programs. Since refereed publications in high impact international journals is a preferred measure of excellence in research, TEQIP has triggered a positive change in research orientation. At the aggregate level, TEQIP has provided an impetus to knowledge exchange and dissemination as all categories of institutions have shown considerable initiative in promoting one type of activity or the other. Promoting R&D culture in the institution involves following activities: Modern R&D equipment, Conferences/Workshops organized and Conferences/Workshops attended.

Fig. 4.29 Number of Research publications in Engineering in refereed Indian Journals

The number of Research publications in Engineering in refereed Indian Journals has also shown an upward trend till 2014-15. It has declined slightly in 2015-16 but considerably in 2016-17.

Fig. 4.30 Number of Research publications in Engineering in refereed Foreign Journals

The number of Research publications in Engineering in refereed Foreign Journals has also shown an upward trend till 2015-16. It has declined considerably in 2016-17, last year of project.

Fig. 4.31 Number of Books Published
The number of Books published has been an indicator which did not perform well except in 2013-14 when it was suddenly risen to a figure of 520 otherwise it was mostly below 50 only.

**Fig. 4.32 Number of Patents Obtained/Filed**

It has been observed that number of Patents Filed was consistently increasing till 2014-15 but started declining after that. But the number of Patent obtained was fluctuating at low levels with the exception of 2016-17 when it was maximum at 50.

### 4.7 Improved Employability of Graduates

The jobs market is deeply competitive and the candidates who can show key skills are the choice of most employers. Nearly 64% percent employers express their dissatisfaction with the current engineering graduate skills in India. The Key skills have been categorized as Core Employability Skills, Communication Skills and Professional Skills. Institutes can improve the employability of their graduates by improving their competencies through:

- Industrial collaboration
- Finishing School
- Industrial Training

**Fig. 4.33 Campus Placement Percentage: UG**

It appears that Percentage of UG Campus Placement has been fluctuating between 35 to 40% over the TEQIP-II period. During 2011-12, it was comparatively slightly high at 44.95 % but the trend changed after that.

**Fig. 4.34 Campus Placement Percentage: PG**
It is observed that appears that Percentage of PG Campus Placement has been showing a declining trend till 2013-14 but after that it has started showing an upward trend. During 2015-16, it was highest at 38.28 %.

**Fig. 4.35 Average Annual Salary (Rs. Lakh) of UG**

It is observed that Average Annual Salary (Rs. Lakh) of UG has been showing an increasing trend till 2014-15 but after that it has started showing an upward trend. During 2015-16, it was at 3.21 lakhs. This is because the industry is facing recessionary phase particularly IT & IT related sectors.

**Fig. 4.36 Average Annual Salary (Rs. Lakh) of PG**

It is observed that Average Annual Salary (Rs. Lakh) of PG has been showing an increasing trend till 2013-14 but after that it has slightly declined. During 2015-16, it was at Rs 3.46 lakhs, better than previous years but still the industry is facing recessionary phase particularly IT & IT related sectors keeping it lower than 2013-14.

**Fig. 4.37 Share of UG students attended industrial internship (percentage)**

It has been observed that Share of UG students attended industrial internship (percentage) have increased during TEQIP-II period till 2014-15. It has achieved its peak at 46.95 % during 2014-15. However, it declined in 2015-16 due to recession faced by industry.
Chapter 5: Comparative Institutional Performance

5.1 TEQIP Phase-II Participating Institutes from Maharashtra

At national level, there are 190 institutes from 23 states, which are participating in the project. These 190 institutes include 23 Centrally Funded Institutes (CFIs) also. During the course of project implementation, 8 have been weeded out resulting into total 182 institutes as on date. There are 17 institutes from the State of Maharashtra, which have been selected. Out of 17 institutes, 6 are Government Institutes, 8 are Government aided & 3 are private unaided. The details are as follows:

5.1.1 Sub Component 1.1:
Strengthening institutions to improve learning outcomes and employability of graduates

1. Government College of Engineering, Karad
2. BVB’s Sardar Patel College of Engineering, Mumbai
3. Government College of Engineering, Chandrapur
4. Government College of Engineering, Jalgaon
5. Bharati Vidyapeeth University, College of Engineering, Pune
6. ICT, North Maharashtra University, Jalgaon
7. DOT, Shivaji University, Kolhapur

5.1.2 Sub Component 1.2:
Scaling-up Postgraduate Education and Demand-Driven Research & Development and Innovation

1. Institute of Chemical Technology, Matunga, Mumbai
2. College of Engineering, Shivajinagar, Pune
3. Veermata Jijabai Technological Institute, Matunga, Mumbai
4. Shri Guru Gobind Singhji Institute of Engineering and Technology, Nanded
5. Walchand College of Engineering, Sangli
6. Govt. College of Engineering, Amravati
7. Govt. College of Engineering, Aurangabad
8. Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad
9. GH Raisoni College of Engineering, Nagpur
10. Rajarambapu Institute of Technology, Islampur, Sangli

Maharashtra has received 5 Centres of Excellence (CoE) out of 30 CoEs all over country. College of Engineering, Pune has two Centers of Excellence. Institute of Chemical Technology, Mumbai is the only institute in the nation to be selected under Innovation Fund i.e., sub component 2.1
Fig. 5.1 Progress of Number of Ph.D. Offered

It is evident that the number of Ph.D. offered levels were better compared to pre-TEQIP levels in most of the Institutes especially in case of ICT, Mumbai which performed best followed by COE, Pune.

Fig. 5.2 Progress of Publication in Refereed Journal

It is evident that the number of Publication in Refereed Journal is quite impressively better compared to pre-TEQIP levels in most of the Institutes especially in case of ICT, Mumbai which performed best followed by G H Raisoni, Nagpur. Bharati Vidyapeeth University, College of Engineering, Pune, also performed well in this regard.
It is evident that the number of Patents filed compared to pre-TEQIP levels is better in most of the Institutes. In case of ICT, Mumbai it has gone up from 17 to 153 during TEQIP-II. This is followed by G H Raisoni, Nagpur, which has also filed more than 100 patents. College of Engineering, Pune, which is third, has filed only 47. Remaining institutes showed slow progress in this regard.

**Fig. 5.4 Progress of % of Undergraduate Placements**
It is observed that there was 100% of Undergraduate Placements both pre and post TEQIP-II in VJTI, Mumbai. The second position in this regard is showed by Walchand College of Engineering, Sangli. However, in Government College of Engineering, Amravati, Government College of Engineering, Aurangabad and Rajarambapu Institute of Technology, Islampur, Sangli, post TEQIP-II placement has declined.

So far as Post Graduate Students Placements is concerned, Government College of Engineering, Amravati, has shown tremendous improvement post TEQIP where it has crossed 92% compared to 32% during pre TEQIP-II. The second position in this regard is showed by G H Raisoni College of Engineering, Nagpur. However, in Walchand College of Engineering, Sangli and Government College of Engineering, Aurangabad and Shri Guru Gobind Singhji Institute of Engineering and Technology, Nanded, post TEQIP-II placement has declined.
Pre TEQIP, only two Institutes i.e., ICT, Mumbai and Walchand College of Engineering, Sangli, had Innovation/Incubation Centre in their premises. However, post TEQIP, 12 Institutes have one or more Innovation/Incubation Centre in their premises. Government College of Engineering, Amravati is at the top having 5 Innovation/Incubation Centre within their campus.

**Fig. 5.6 Progress of Research/ Innovation or Incubation Centers**

**Fig. 5.7 Progress of Conferences Attended for Publication/Study Tour Foreign**
With regard to progress of Conferences attended for Publication/Study Tour in Foreign countries, situation has improved compared to pre TEQIP level in all the Institutes except Bharati Vidyapeeth University, College of Engineering, Pune. In case of Dr. Babasaheb Ambedkar Technological University, Lonere, 390 faculties have attended Conference for publication / Study tours abroad. Government College of Engineering, Chandrapur has performed second best with 66 such cases.

**Fig. 5.8 Progress of Joint Programs / Research or Degree**

It is evident that very few Institutes have little progress with regard to Joint Programs / Research or Degree in both pre or post TEQIP situation. However, BVB’s Sardar Patel College of Engineering, Mumbai has performed well in this regard with 116 cases of Joint Programs / Research or Degree. It is followed by Shri Guru Gobind Singhji Institute of Engineering and Technology, Nanded & ICT Mumbai at second and third position respectively.
In terms of number of MoUs with Industry or Foreign University, all 17 Institutes have improved their performance post TEQIP. College of Engineering, Pune has topped with 161 MoU’s followed by ICT Mumbai with 139 MoU’s. Rajarambapu Institute of Technology, Sakhrale, stood at third position with 59 MoU’s post TEQIP. Dr. Babasaheb Ambedkar Technological University, Lonere has performed least with only 3 MoU’s post TEQIP (Pre TEQIP it was zero).

It is evident that most of the Institutes have shown considerable improvement in number of National & International Conferences organised by them. G.H.Raisoni COE Nagpur has conducted highest number of National & International Conferences i.e., 35, ICT has organised 25 and COE Pune has 20.
It is evident from above that Walchand College of Engineering, Sangli, has provided 2577 Consultancy services to Industry or Society post TEQIP which was only 190 during pre TEQIP period. In this regard, College of Engineering, Pune has performed second best with 1155 Consultancy services to Industry or Society. Apart from these two, all other institutes have started taking efforts to improve their situation in this regard. Such services will generate funds for improvement of Institutes.

Fig. 5.12 Progress of No. of New Laboratories established and modernisation of existing laboratories
It is observed that Walchand College of Engineering, Sangli had conducted the highest number of workshops for Faculty. Government College of Engineering Chandrapur had organised maximum number of workshops for the Society and G.H.Raisoni COE had organised maximum number of workshops for students.
CHAPTER 6

Project Achievements in Maharashtra

Achievements
Chapter 6: Project Achievement in Maharashtra

6.1 Overview of Achievements of Project Institutes in the State

- **Accreditation:** NBA accreditation is an important Key Performance Indicator for the project institutes and 16 institutes have either got accredited or applied/re-applied for accreditation of more than 55% programs run by them.

- **UGC Autonomy:** Out of 17 project institutes, 10 institutes selected under sub component 1.2 were already autonomous at the time of entry in project. In case of 7 institutes selected under sub component 1.1, 4 were autonomous at the time of entry. Remaining 3, which are Government Colleges at Jalgaon, Chandrapur and Karad, were required to achieve autonomous status within 2 years of selection. Accordingly, all the 3 Government Engineering Colleges applied for autonomy and 2 (GCOE Jalgaon and GCOE Karad) have been awarded autonomy.

- **COE Pune, VJTI Mumbai, RIT Sakhrales and GHRCE Nagpur, SPCE Mumbai and GCOE Jalgaon** have been distributed full 100% life allocation. **SGGS Nanded, ICT Mumbai, COE Aurangabad, COE Karad, BVUCOE Pune, NMU Jalgaon and DBATU Lonere** have been released more than or equal to 90% Life Time Allocation. In terms of expenditure on procurement COEP, VJTI and SGGS are top ranking.

- In view of the performance shown by institutes in project implementation, 15 institutes out of 17 were considered for additional funding (life time allocation) of Rs 5.00 Cr each. Only GCOE Amravati and GCOE Chandrapur were left out.

6.2 State Initiatives

Every year State conducted two review meetings before the respective Joint Review Mission (JRM) by the MHRD.

- Three meetings have been conducted at State level for verifying data auditors reports against institute data.

- State has strong liaison with IIT, Bombay for conducting KIT (Knowledge Incubation under TEQIP) activities. Two three - day residential programs were conducted for UG/PG/Ph.D. students of Chemical and Mechanical branch respectively at IIT Bombay during 2014-15. One program on ‘Applied Mathematics for Engineering Departments’ was designed especially for TEQIP institutes of Maharashtra and conducted at IIT Bombay.

- In order to assess the progress of Centers of Excellence, State had conducted a special Review meeting
at IIT Bombay on 1st December 2015. The reviewers were from IIT Bombay. The entire proceedings were recorded and made available on website of CDEEP of IIT Bombay.

- State has selected all TEQIP institutes from the State to carry out various activities under its Unnat Maharashtra Abhiyaan scheme for solving socio, economic and development related problems of the region with the help of technology.

6.3 Broad Achievements of the TEQIP-II Project in Maharashtra

Lot of development has been observed in the 17 Engineering/Technology Institutes in Maharashtra, which received funding under the TEQIP-II. The ambience of the colleges has improved to a great extent. Quality equipment for students and researchers were purchased. Research output and development activities were substantially improved. The TEQIP-aided institutions have become role models for other institutions. The broad achievements of the TEQIP project in Maharashtra are:

- Better academic standards, through accreditation, filling up faculty positions, training faculty in better teaching methods & in subject domain, improved research outputs in institution.
- Focus on student development through diagnostic tests
- Increase in Number of publications in reputed journals having H-Index, Impact factor.
- Increase in Number of patents Filed.
- Awareness in UG students for higher studies & competitive examinations.
- Strengthening institutions to produce high quality engineers for better employability.
- Better administration of the institutions with improved financial/academic autonomy.
- Better systems for assessment of Student Learning, higher transition rates.
- Transparent and expeditious release of funds to institutes by way of Direct Funds Transfer (DFT) System
- Established five Centers of Excellence (CoE) focused on applicable research.
- Scaling up Postgraduate Education, due to which awareness about research and innovation has improved to a large extent.
- Demand Driven Research & Development and Innovation.
### 6.4 Achievement by Project Components

#### 6.4.1 Utilization of Funds

The allocation of funds among the 17 Project Institutions and SPFU is indicated below.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Institutions</th>
<th>Allocation (Rs. in Lakhs)</th>
<th>Amount Utilised (Rs in Lakhs) as on 31st March 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Government College of Engineering, Karad</td>
<td>1500</td>
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<td>Amount Utilised (Rs in Lakhs) as on 31st March 2017</td>
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6.4.2 Academic achievements

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<td>Consultancy services provided to Industry or Society</td>
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Following are the academic achievements of the Project Institutions under TEQIP-II Project

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<th>Name of Laboratories</th>
<th>New Labs estt.</th>
<th>Existing Labs</th>
<th>Modernised Labs</th>
<th>No. of Conferences organised</th>
<th>No. of Workshops organised</th>
<th>MoU signed</th>
<th>Patents Filed</th>
<th>Publications</th>
<th>National Journals</th>
<th>International Journals</th>
<th>National Conferences</th>
<th>International Conferences</th>
<th>Workshops organised</th>
<th>No. of Publications</th>
<th>No. of Journals</th>
<th>No. of Conferences</th>
<th>No. of E-Journals</th>
<th>Subscribed E-Journals</th>
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6.4.3 Networking of Institutions:
Institutions have formed networks with other institutions to enhance capacity, improve quality and promote excellence. Academic Sharing, Credit Transfer and Carry Over of Credits, Staff Development, Learning Resources and Library, Expertise and Joint Ventures are a few examples of sharing of resources. Institutions expanded the concept to include many more activities. One option that can be used is creation of Networking Cell in each institution and a network facilitator at Lead Institution, which would ensure flow of networking benefits in the network. Two types of networking were happening, (1) Formal and (2) Non-formal. The formal networking was bi-directional sharing of expertise and resources among the institutions. Lead institutions provided help and guidance to the Network institutions in improving their academic and research capabilities, and institutional management practices. Resource sharing between the networked institutions resulted not only in improved academic, research and consultancy outputs but also in reduction in investment and operating costs. In academic matters, institutions have shared curricular improvement and new curricula, innovations in curriculum implementation, teaching aids and modern learning resources, faculty, training facilities, etc. Students got the benefit of attending special courses in another institution. Lead institutions have carried out, organised and co-ordinated faculty and staff development programmes for all the networked institutions. Joint research projects, consultancies, seminars and conferences were undertaken to build capacity in all the institutions. Project institutions have also established non-formal networks with R & D organisations, specialised laboratories, eminent educational institutions, industry, community, institutions from other formal networks etc., for deriving a variety of benefits for the institution.

Networks Lab and Optical Fiber Measurement, Earth quake disaster management, Modern construction methods, Modern methods in project management, Introduction of PLCs in Automation, Micro Controller and its Applications, Principles of Instrumentation, Training Program on Communication Skills, Nano Technology, Training on CNC machines were some of the programs that were conducted.

6.4.4 Case Study of Innovation Networking Project with Institute of Chemical Technology, Mumbai
Innovation & Research is a regular activity at major Universities and academic Institutes in the country. However, converting the research output in Technology is hindered by lack of cohesive infrastructure. It is unlikely that such infrastructure shall be built in near future anywhere in the country. In the absence of necessary infrastructure for the indigenous technology development, Institute of Chemical Technology (ICT) has taken
the initiative to form a virtual network of Institutes in the State and outside the State of Maharashtra, which shall bring together different engineering disciplines to build products and prototypes based on their research. The Innovation Networking will involve use of current infrastructure at and core strength(s) of each partner Institute to develop innovation products/processes for commercialization. Most innovations require partners from other disciplines and thus creation and operation of Innovation Networking of Indian Institutes (INN) may become imperative.

Innovation is key parameter in order to survive in the global competition and in the research; majority of funding is spent today in purchasing equipments of worth of crores from companies. A Innovation Networking Centre established at ICT with three support staff members of appropriate qualifications and expertise for administration and finance as all expenses shall be through the Centre’ office. The office will coordinate all the activities of the Innovation Networking. A Committee consisting of three members - one faculty member from IIT/IIM, One MHRD/NPIU nominee and one SPFU member - on quarterly basis monitors the project.

The INN of the technical institutes is expected to address needs of regional industries and society, in general, converting innovative and out of box ideas into prototypes for demonstration and possible commercialization. The following products/processes are expected to the deliverable in the first phase of the project.

1. Microchannel reactors for highly exothermic and high pressure and high temperature systems
2. Sensors for pesticides and biological species in water management and therapeutic materials
3. Continuous and tunable Microwave assisted Micro reactor system for chemical reactions
4. Microwave assisted micro reactor for chemical manufacturing and natural product extraction
5. Continuous and tunable Cavitation system for chemical reactions
6. Ultrasound assisted sub-liter size continuous water purifier
7. Lab-scale self-sustaining pyrolysis system for waste polymer-to-chemicals reactor
9. Laboratory scale inexpensive gas chromatograph
10. Continuous Enzyme Reactor in micro-capillary bundles with reduced pressure drop.
11. Solar energy based biomass conversion system
12. Robust Iris Recognition System
13. Polymer-Metal composite stent(s) for drug delivery in angioplasty
14. Design and fabrication of Improved Mobile blancher for turmeric processing

Benefit of the Project to Partner Institutes

Each project is expected to lead to fabrication of a new unit/product/process for further research and technology development for implementation.

a) The IPRs for the new products/processes, if any, shall be equally shared amongst the Partner Institutes involved in the development of the unit. All the Institutes shall also share the cost of filing patents and maintenance of it equally.

b) Each Institute is free to adopt policies of its own for its share of IPRs so jointly generated.

c) The equipments developed in the project shall remain with the Lead institute of the project but shall be allowed for use to other partner institutes, as and when necessary in consultation with the lead institute.

d) The cost of operation and maintenance of such units shall be jointly shared by the partner institutes.

Responsibilities of Experts and Monitoring Committee

(I) The Expert Committee evaluated new Innovation Projects for selection and monitors the selected projects for timely completion and project deliverables.

(II) Additional expert members were invited for their advice and opinion as per the need of the project proposals.

(III) The expert committee helped the institutes to fine-tune the project(s) as per the need of the industry and/or society.

(IV) Innovation, and creation of new IP was underlying theme and experts on the committee are expected to have relevant experience.

Institute of Chemical Technology, Matunga, Mumbai, was the lead institute of the Project. ICT’s close relationship to the chemical and allied industries has resulted in relevant research programs with a high level of innovations, large consultancy programs, a dynamic curriculum development process and a high level of involvement from the industry. ICT was responsible for - Selection of Innovation project(s) on advice of the expert and monitoring committee, Funds disbursal to partner institutes within the state for their projects in four phases and Timely completion of the projects with project deliverables.

a) The starting date of the Project was 1st January 2014

b) The date of completion of the Project was 31st December 2014.

c) ICT established the Innovation Networking Centre’s office at its premises and appointed necessary support staff for the duration of project for timely and efficient execution of the project.
d) The executive team of ICT promoted the Innovation Spirit by regular workshops, lectures and visits to engineering/ Science Institutes in the state.

e) The Centre has developed its website and keep information of the Center’s activity on the site for general public, and invite industry to post their challenges and innovators to solve them in reasonable time period.

f) The proposals from partner Institutes were continuously received by the INN Centre and evaluated by the expert committee every month in the first week, ie. first Friday, for inclusion in the networking projects.

g) Out-of-box ideas were also considered for funding, for developing proof of concept that can bring disruptive innovation.

h) Non-TEQIP institutes were also allowed to participate to work in collaboration with TEQIP institutes for innovation but no direct funding was given to these institutes. They can, however, work in collaboration with the TEQIP institutes.

i) Innovation networking projects led to new product(s) and/or new processes or new system(s) for implementation in Technical and Educational Institutes.

j) No procurement of ready-made equipment was permitted unless it is a unit required by regulatory bodies, such as in medicinal products.

k) Development of equipment from separate components was encouraged to build the final prototype as a substitute for imported equipment.
• A workshop on identification of projects for third year students out of the two networking projects of SGGSIE&T, Nanded, was conducted by Dr. Nemade and Dr. Dalvi of ICT Mumbai.

An expert lecture on “Innovation, the need of the hour” was delivered by Prof Gaikar. It was attended by faculty of SGGSIE&T, faculty members of MPGI College of Engineering and MGM’s College of Engineering along with research scholars.

• Work shop on, “Molecular modeling” was conducted by Dr (Ms) Madyal, expert from ICT Mumbai. The workshop was attended by UG, PG students of Production Engineering, Mechanical engineering and UG students of Chemical Engineering.
Institutes participated in the Innovation Networking Project

<table>
<thead>
<tr>
<th>S. No</th>
<th>Institute</th>
<th>Areas of expertise at each Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Institute of Chemical Technology, Matunga, Mumbai</td>
<td>Chemical Engg., Textile Processing, Biotechnology, Pharmaceuticals, Water Management</td>
</tr>
<tr>
<td>2.</td>
<td>Veermata Jijabai Technological Institute, Matunga, Mumbai</td>
<td>Mechanical Engineering, Textile Technology</td>
</tr>
<tr>
<td>3.</td>
<td>Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad</td>
<td>Mechanical Engineering, Chemical Engineering</td>
</tr>
<tr>
<td>4.</td>
<td>Sardar Patel College of Engineering, Mumbai</td>
<td>Mechanical, Electronics, Instrumentation</td>
</tr>
<tr>
<td>5.</td>
<td>SGGS Institute of Engineering and Technology, Nanded</td>
<td>Electrical, Electronics, Civil, Mechanical</td>
</tr>
<tr>
<td>6.</td>
<td>Rajarambapu Institute of Technology, Sangli</td>
<td>Civil Engineering</td>
</tr>
<tr>
<td>7.</td>
<td>Raisoni College of Engineering, Nagpur</td>
<td>Mechanical Engineering, Civil Engineering</td>
</tr>
</tbody>
</table>

Projects under Innovation Networking: The Number of total projects will be limited to 25 in the Entire Project Period

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Project Title</th>
<th>Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>P01</td>
<td>Micro-channel reactors for highly exothermic and high pressure and high temperature systems</td>
<td>Dr. Babasaheb Ambedkar Technological University (L) Institute of Chemical Technology Sardar Patel College of Engineering</td>
</tr>
<tr>
<td>P02</td>
<td>Sensors for pesticides and biological species in water management and therapeutic materials</td>
<td>Institute of Chemical Technology (L) Dr. Babasaheb Ambedkar Technological University Sardar Patel College of Engineering</td>
</tr>
<tr>
<td>P03</td>
<td>Continuous and tunable Microwave assisted Micro-reactor system for chemical reactions</td>
<td>Institute of Chemical Technology (L) Dr. Babasaheb Ambedkar Technological University</td>
</tr>
<tr>
<td>P04</td>
<td>Continuous and tunable Microwave reactor system for chemical manufacturing and extraction of natural products</td>
<td>Institute of Chemical Technology, (L) COEP, Pune</td>
</tr>
<tr>
<td>P05</td>
<td>Continuous and tunable Cavitation system for chemical reactions</td>
<td>Institute of Chemical Technology, (L) Dr. Babasaheb Ambedkar Technological University</td>
</tr>
<tr>
<td>Sr. No</td>
<td>Project Title</td>
<td>Institute</td>
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</tr>
<tr>
<td>P06</td>
<td>Ultrasound assisted sub-liter size continuous water purifier</td>
<td>Institute of Chemical Technology (L) Dr. Babasaheb Ambedkar Technological University</td>
</tr>
<tr>
<td>P07</td>
<td>Lab-scale self-sustaining pyrolysis system for Polymerto Chemicals</td>
<td>Institute of Chemical Technology (L) Sardar Patel College of Engineering</td>
</tr>
<tr>
<td>P08</td>
<td>Mosquito-repellent textiles using sustainable and eco-friendly materials</td>
<td>Institute of Chemical Technology,(L) Veermata Jijabai Technological Institute</td>
</tr>
<tr>
<td>P09</td>
<td>Laboratory scale inexpensive gas chromatograph</td>
<td>Institute of Chemical Technology Dr. Babasaheb Ambedkar Technological University (L) Dr. Neetu Jha Mr. Siddharth Kasthurirangan Dr. Parag R Nemade Dr.</td>
</tr>
<tr>
<td>P10</td>
<td>Continuous Enzyme Reactor in microcapillaries with reduced pressure drop</td>
<td>Dr. Babasaheb Ambedkar Technological University (L) Institute of Chemical Technology</td>
</tr>
<tr>
<td>P11</td>
<td>Solar energy based biomassto-chemical conversion system</td>
<td>Dr. Babasaheb Ambedkar Technological University (L) Institute of Chemical Technology</td>
</tr>
<tr>
<td>P12</td>
<td>Robust Iris Recognition System</td>
<td>SGGS Institute of Engineering and Technology, Nanded(L) ICT, Mumbai COEP,</td>
</tr>
<tr>
<td>P13</td>
<td>Polymer-Metal composite stent(s) for drug delivery in angioplasty</td>
<td>ICT, Mumbai (L) Dr. BATU, Lonere</td>
</tr>
<tr>
<td>P14</td>
<td>Design and fabrication of Improved Mobile blancher for turmeric processing</td>
<td>SGGS Institute of Engineering and Technology, Nanded (L) ICT, Mumbai</td>
</tr>
<tr>
<td></td>
<td>Projects that were under further consideration</td>
<td></td>
</tr>
<tr>
<td>P15</td>
<td>Development of Cotton Plucking machine</td>
<td>GH Raisoni College of Engineering</td>
</tr>
<tr>
<td>P16</td>
<td>Black-cotton soil based materials for Road construction</td>
<td>Rajarambapu Institute of Technology, Sangli Institute of Chemical Technology,</td>
</tr>
<tr>
<td>P17</td>
<td>Image analysis techniques for resolving biological problems</td>
<td>College of Engineering Pune</td>
</tr>
</tbody>
</table>
6.4.5 Service to Community & Economy:

Training Programs are conducted by various TEQIP-II project Institutes to benefit the community and rural areas around the TEQIP Institutions. Because of these training programs to the community, the beneficiaries of the respective places & the community can start their own enterprise and generate money. In Maharashtra, an innovative scheme ‘Unnat Maharashtra Abhiyan’ launched by Government of Maharashtra and implemented by the TEQIP institutes is resulting in Service to Community & Economy.

The ‘Unnat Bharat Abhiyan’ is being implemented through select, advanced educational institutes in the country, to revolutionize developmental activities in rural area of the country by increasing participation of advanced educational institutes like IIT. The Maharashtra Government launched an innovative scheme ‘Unnat Maharashtra Abhiyan’ on the lines of ‘Unnat Bharat Abhiyan’ with mutual understanding between educational institutes and various Government agencies.

The Unnat Maharashtra Abhiyan is being approved to increase mutual coordination & cooperation among quality educational institutes and various Government Systems (Zilla Parishad, Municipal Corporations, Municipal Councils, Panchayat Samiti, District Development and Planning Development System, etc.) in order to analyze and find solutions to various social and developmental day-to-day problems in the state with help of higher and technical education institutes in the state and to transform the implementation process of various schemes through research and to find out solutions to developmental problems at local level by using technology.

For example to prepare village-level action plan regarding rural sanitation, toilets, drainage management based on various statistical information, to prepare budget, to define criteria for quality and valuation, to design technical work procedure for planning.
Apart from 17 institutes participating under Technical Education Quality Improvement Program (TEQIP) who are eligible to participate in this campaign, other willing higher education institutes can also participate in this campaign.

Some of the TEQIP Institutes very actively participating in this activity are:

1. G.H. Raisoni, Nagpur
2. SGGS IET Nanded
3. RIT Sakhrale
4. Govt. CoE Aurangabad
5. Bharti Vidyapeeth Pune

6.4.6 Learning Resources:
Continuous updating of Learning Resources (Books & Softwares) and procuring the same is the improvement to be brought about in the Teaching Learning Process. Many course specific Soft wares are purchased in the various Departments of TEQIP Institutions with multi-user facility under Network systems. These softwares are helpful for the research work of the faculty and also for the PG students and UG students to do their project work in the college premises. Also the faculties were encouraged and trained to use modern equipment and course specific Soft wares.
6.4.7 Best Practices by Maharashtra TEQIP Institutes

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Institute Name</th>
<th>Best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Government College of Engineering, Karad</td>
<td>✓ Industry Advisory boards are constituted for all departments which suggest about industrial visit, industrial expert lectures, industry related curriculum and CSR help to improve placement. &lt;br&gt; ✓ Evaluation by faculty by students and 360° feedback during Exit Interview, online student’s feedback.</td>
</tr>
<tr>
<td>2</td>
<td>Government College of Engineering, Jalgaon</td>
<td>✓ Reforms as per institute autonomy proposal sanctioned by UGC and NMU undertaken in compliance with state autonomy GR. &lt;br&gt; ✓ All expected committees, Board of studies, APEC, Academic Council, BoG in place. Board of Society proposal submitted with State Government through DTE</td>
</tr>
<tr>
<td>3</td>
<td>Government College of Engg., Chandrapur</td>
<td>✓ Employability Enhancement Training Programs for students are arranged regularly. &lt;br&gt; ✓ RFID cards are given to The students for cashless transaction</td>
</tr>
<tr>
<td>4</td>
<td>BVB’s Sardar Patel College of Engineering, Mumbai</td>
<td>✓ Efficient Administration System: Well defined organization structure with Chairman BOG, Principal, Vice-Principal, Deans and Heads of Department etc., Minimum resources utilized for maximum output (Faculty and Support Staff). &lt;br&gt; ✓ Effective Academic System: Academic Calendar is displayed on website in the beginning and is strictly followed. &lt;br&gt; ✓ System: Assessed answer Books with synoptic are shown to the students. Specific dates allotted for showing of answer books and followed scrupulously by all faculties. A Redressal Committee is formed by the Chairman of the committee to look into Malpractices / Unfair Means during examinations.</td>
</tr>
<tr>
<td>5</td>
<td>Bharati Vidyapeeth University, College of Engineering, Pune</td>
<td>✓ Saturday @ BV &lt;br&gt; ✓ Institutionally Funded Research Program &lt;br&gt; ✓ Employment Enhancement Program (EEP) &lt;br&gt; ✓ Value added courses &lt;br&gt; ✓ Technology implementation: a) Website, b) Corporate Mailing System, c) Corporate SMS alert, d) ERP Software, e) Online Feedback System f) Attendance Monitoring System</td>
</tr>
<tr>
<td>Sr. No.</td>
<td>Institute Name</td>
<td>Best Practices</td>
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</table>
| 6       | College of Engineering, Pune                            | ✓ All the BoG members contributing at least 100 hours a year towards Institute's development without Conflict of Interest, in various sub-committees of the Board.  
                      |                                                                                   | ✓ Co-teaching with Industry personnel/IIT faculty for at least single in a Semester, in every department.  
                      |                                                                                   | ✓ Students Exchange Program effectively implemented for Autonomous Colleges in the State with Credit Transfer Scheme deployed for a Semester. |
| 7       | Institute of Chemical Technology, Mumbai                | ✓ Implementation of MIS with the objective of e-governance  
                      |                                                                                   | ✓ Choice Based Electives at UG and PG level  
                      |                                                                                   | ✓ Compulsory certificate course on Chemical safety and security for all masters students |
| 8       | Veermata Jijabai Technological Institute, Mumbai        | ✓ Multiple Electives with Open Electives Credit transfer from the elite Institute in India & abroad.  
                      |                                                                                   | ✓ Industry advisory Boards for each department  
                      |                                                                                   | ✓ Wednesday afternoon for students co curricular activities,III Programmes,Expert lectures. |
| 9       | Shri Guru Gobind Singhji Institute of Engineering & Technology, Nanded | ✓ Industry Advisory Panel is formed in every department.  
                      |                                                                                   | ✓ Monthly News letter  
                      |                                                                                   | ✓ Library facility ;Liberal learning, drop box, display of new arrival books  
                      |                                                                                   | ✓ Remote Sensing Application for Land Surface, Atmosphere and Ocean Studies by Department of Civil Engineering, SGGSIE&T, Nanded in Collaboration with NOAA-CREST, Centre, City College of City University of New York, New York(January 18-29, 2016)  
                      |                                                                                   | ✓ Foreign language (French ,Spanish and German) courses are available for students  
                      |                                                                                   | ✓ Institute offered open elective |
| 10      | Walchand College of Engineering, Sangli                 | ✓ Project based learning  
                      |                                                                                   | ✓ Internship program at UG & PG level  
                      |                                                                                   | ✓ Worldwide alumni network for current students mentoring  
                      |                                                                                   | ✓ ICT enabled teaching learning |
| 11      | Government College of Engineering, Amravati              | ✓ Academic Audit of Each Department by External Experts,  
                      |                                                                                   | ✓ Standard Report writing for PG and Research dissertation or thesis,  
<pre><code>                  |                                                                                   | ✓ Awarding best project /dissertation work |
</code></pre>
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Institute Name</th>
<th>Best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Government College of Engineering, Aurangabad</td>
<td>✓ PG colloquium&lt;br&gt;✓ Improved teaching learning process and implementing blended methods&lt;br&gt;✓ Deputing PG students to IITs and NITs for training on their dissertation work, conferences</td>
</tr>
<tr>
<td>13</td>
<td>Dr. Babasaheb Ambedkar Technological University, Lonere</td>
<td>✓ Research-oriented projects at BTech level. Final year students are attached to MTech/Ph.D. students for their projects.&lt;br&gt;✓ Induction program on “pedagogy” even for contract basis faculty&lt;br&gt;✓ e-governance: Online Attendance System/Online Ph.D. admissions and monitoring</td>
</tr>
<tr>
<td>14</td>
<td>GH Raisoni College of Engineering, Nagpur</td>
<td>✓ Mandatory Internship: Six-week internship including two weeks social Internship and Six Months industry internship &amp; Field Project&lt;br&gt;✓ Choice based Credit System (CBCS), Credit Transfer Scheme (CTS) with VJTI Mumbai &amp; COE Pune, PEER teaching&lt;br&gt;✓ iThenticate plagiarism check for all research publications of faculty/students, Ph.D. Pre submission seminar before experts from IITs/IISc/Universities, Pre-registration seminar, progress seminar and pre-submission seminar for Ph.D. scholars, Ph.D colloquia</td>
</tr>
<tr>
<td>15</td>
<td>Rajarambapu Institute of Technology, Sakhrale, Sangli</td>
<td>✓ Quality Circle&lt;br&gt;✓ One Page Strategic Plan&lt;br&gt;✓ Mini Project for First year students</td>
</tr>
<tr>
<td>16</td>
<td>Department of Tech. Shivaji University, Kolhapur</td>
<td>✓ Branch wise test series&lt;br&gt;✓ Expert Lectures to guide students for career&lt;br&gt;✓ Software training programs and spoken tutorial projects&lt;br&gt;✓ Industry and society activities</td>
</tr>
<tr>
<td>17</td>
<td>University Institute of Chemical Technology, NMU, Jalgaon</td>
<td>✓ Capacity building among women students by organizing Gender sensitization programmes in collaboration with Women’s Studies Center&lt;br&gt;✓ Digital English Language Lab established to improve communication skills, group discussion and phonetics etc.&lt;br&gt;✓ Faculty Development programs with Industry Support.</td>
</tr>
</tbody>
</table>
6.4.8 Innovative Administrative Practices

- All data pertaining to human resources and physical resources are stored in digital form for easy retrieval and access to all stakeholders.

- Digital library for accessing e-journals and e-books have been established.

- Throughout the week, various activities such as Team Building, Synergy, Carrier guidance and counselling of students are conducted in all the departments for preparing the students to the industry's expectations.

- Online feedback facility for all UG and PG students have been introduced based on which high scoring faculty is appreciated.

- All classrooms are provided Internet access with wired and wireless network through campus wide networks, which enable to utilize it as resources for online teaching.

6.4.9 Improving Interaction with Industry

The Industry Institute Partnership helps the institute to increase the placement rate of the students, to handle consultancy assignments and to establish specialized training centres for the industry. Industry-Institute interaction would provide an impetus for the economic growth of the state. The Central Advisory Board of Education (CABE) has suggested a strong need for developing effective synergies between research in the Institutes and their application in and utilization by the industry to the mutual advantage of both the systems. Likewise, industry should be persuaded to establish organic linkages with the Institutes to seek solutions of problems faced by the industry.

Services offered by institutions to industry include:

- Using the expertise of the project institutions for technology assessment, upgradation and absorption.
- Deputation of faculties to industries.
- Conducting continuing education programs;
- Undertaking problem solving projects and consultancies on industrial products
- Testing and calibration, serving as training centers for industry, etc.

Contributions from industries to institutions include:

- Participation in governing and other bodies of the institutions, participation in curriculum improvement and development;
- Training of students by industries in traditional and new technologies, soft skills, etc.
- Providing expert lectures and industry senior persons acting as adjunct faculty.
- Assisting institutions to establish new laboratories and providing literature on new technologies.
- Helping students undertaking problem-solving projects;
● Training teachers and staff in new technologies and process,
● Collaborating sandwich program offerings.
● Assistance for improving employability etc.

6.4.10 Quality Enhancement in Engineering Education

TEQIP sought to reinforce the linkages between the project institutions and the IITs through an initiative of the IIT-Madras, which was aimed at addressing the concerns over the quality of teaching, content and delivery in TEQIP institutions. Labelled as Quality Enhancement in Engineering Education (QEEE), this ‘direct to student program’ has been designed to leverage real time and synchronous technology to integrate high quality scholastic inputs in the form of instructors and multi-media resources into the current curriculum and pedagogical practices of the TEQIP institutions. Launched as a pilot project in January 2014 to cover TEQIP and non-TEQIP institutions in the first phase, the QEEE comprises of Live Classes, Tutorials, Massive Open Online Courses (MOOCs), Virtual Labs and Vocational Augmentation Courses. The participating institutions have been assisted under TEQIP to procure the hardware required to receive the live feed from classes delivered by the faculty of IIT- Madras, IIT-Kanpur, IIT-Hyderabad and IIT-Bombay who are also funded by the MHRD. The live feed would be transmitted through broadband as well as through satellite. From each institution, two QEEE facilitators- academic and systems, were identified and adequately trained at IIT-Madras, to ensure smooth transmission of the live classes and tutorials.

The program envisages delivery via a software platform with cloud server at IIT-Madras in sync with a local server at each participating institute. Virtual Labs have also been initiated. The TEQIP institutions have been advised to make necessary changes in their teaching schedules to align to the extent possible with live lectures under QEEE. Each Institution also identifies two slots for tutorials between 3 and 5 PM on scheduled days. the GHRCE, Nagpur prominently displayed the fact of their participation in QEEE as a major achievement on their website.
CHAPTER 7
Centre of Excellence established in Maharashtra
Chapter 7: Centre of Excellence Established under TEQIP-II

7.1 Centres of Excellence (CoE) under TEQIP-II

Centres of Excellence (CoE) are established under TEQIP, subcomponent 1.2.1 with an objective of establishing Competency Centres to develop collaborative and multi-disciplinary research within specific thematic areas of regional and national importance. The major focus is to create knowledge in thematic multi-disciplinary areas in collaboration with industry and other knowledge users; producing human capital, increase societal use of engineering R&D through technology transfer, commercialization and increase in research output. The thrust also is on collaboration with Industry for applied research and product development. A total of 30 Centres of Excellence (CoEs) with thematic areas have been identified and established in 27 project institutions. The thematic areas are Nano technology, Biotechnology, Biomedical Engineering, Chemical Engineering, Environmental Engineering, Water Resource Engineering, Disaster management, Mechanical & Material Science, Process Control, Data Mining and computer science, Electronics Systems and Energy Systems etc.

7.1.1 Salient Features of a CoE

- The COE should be relevant to Indian technological needs and have a long-term vision of evolving technological requirements and changing natural/societal constraints.

- A Centre of Excellence (CoE) is expected to be a collaborative activity between a team of high quality researchers in the institution and researchers or research users in several companies or organizations. In cases where the nature of research is partially related to production or improvement of public goods, collaboration may include appropriate public agencies. In all cases, however, CoEs will need to demonstrate that the majority of their collaborators are from private firms (if such exist within the thematic research areas).

- The CoE is expected to contribute significantly both to economic advancement and to building a robust research culture in institutions that is more applied and collaborative in nature. In particular, the CoE is expected to address emerging industry and societal needs in close collaboration with industries and users, within India and possibly abroad. The scientific merit of the research undertaken is as important as the relevance to economic growth and development.

- The CoE is expected to further scale-up Postgraduate Education through
increased enrolments for Masters and Doctoral programmes in topics closely linked to the thematic areas of the CoE and therefore closely linked to economic and societal needs. Some of these students could also undertake their research within collaborating firms.

- The Centre should join faculty members from several departments around a common research programme, in which all the collaborating departments are expected to share their physical and intellectual resources with each other. Evaluation will give greater weight to CoEs that are multi-disciplinary in nature.

- The Centre is expected to trigger an R&D culture in the institutions as evidenced by significant increase in commercial applications and research outputs, collaborative and sponsored research, publications, in reputed national/international journals and conferences, patents, innovations, commercialized products and Ph.D. enrolments.

- The Centre is expected to increase collaboration with National and International academic and research institutions/organizations. This will facilitate transfer of technology and knowledge to improve the quality of research and development, and aim to create a critical mass of researchers with potential for global research and development.

### 7.1.2 Deliverables:

The CoEs are expected to ensure the following deliverables:

- Increased collaborative and applied research as documented by:
  - Increase in external R&D funding, notably Industry sponsored R&D projects and Industry Chairs
  - Increase in patents filed and obtained or other manners of knowledge commercialization and transfer

- Increased production of advanced human capital as measured by:
  - Increase in enrolment of Masters and Doctoral students
  - Increase in number of MTech/Ph.D. Graduates
  - Increase in placement of graduate students and research staff in short- and long-term positions within collaborating firms as well as with local industry
  - Updated and more relevant undergraduate and postgraduate engineering curricula

- Developing long term R&D capability as evidenced by:
  - Increase in publications in refereed Journals
  - Increase in joint publications in refereed Journals with international authors
7. Increase in joint programmes/projects/exchanges with international research organisations and institutions

7. External awards for research at the National and International levels.

7. Publications of books, and technical reports

7.2 Centre of Excellences (COE) established in Maharashtra are:

1. Process Intensification Institute of Chemical Technology, Mumbai
2. Complex & Nonlinear Dynamical Systems (CNDS), VJTI, Mumbai
3. Signal and Image Processing, College of Engineering, Pune
4. Smart Renewable Energy Systems, College of Engineering, Pune
5. Signal and Image Processing, SGGSIET, Nanded.

7.2.1 Centre of Excellence in Process Intensification (CoE-PI) at Institute of Chemical Technology, Mumbai

The Centre for Process Intensification for Process Industries in the Institute of Chemical Technology (ICT), Mumbai, aims to be a world leader in the field of conceptual process design, Process Integration and Process Engineering. The methodologies allow environmentally friendly process design with the most efficient use of raw materials and energy with affordable cost. The Centre is dedicated to the development of design methodologies in the field of process intensification and process integration.

The Centre of Excellence in Process Intensification (COE-PI) had been established under TEQIP-II, sponsored by MHRD, GoI. The centre received a grant of Rs. 5 Crores. The Centre has taken up research activities to help industries to modify their processes with an objective of achieving reduction in the energy consumption and environmental impact. The centre works on real life problems, train research students as well as improve the undergraduate education by incorporating principles of process intensification. In addition, the Centre has taken up few projects related to social relevance related to water purification, indigenous generation of electricity in rural area, improvement of energy efficiency in cooperative dairy industry. The centre is carrying out interdisciplinary research, which includes Chemical Engineering, Polymer Science and Engineering, Textiles, Food Engineering and Technology, Basic chemistry, Oils, Oleochemicals and Surfactants Technology, Dyestuff Technology branches. The centre is committed to improve the existing chemical processes in terms of reduction in number of steps, equipment, time, and space and energy.

The Centre had taken up 16 R&D projects, which had direct relevance to current
industrial practice, and few had social relevance. All the projects had industrial partners who were involved process, prototype development and were willing to absorb the technology. Based on the research outcome, eight patents have been filed and three are in process. Sixteen research articles have been published in International peer reviewed journals and nine have been forwarded for publication. The centre had conducted seven workshops for Ph.D. students, faculty members from other organization and industry people in the area of process intensification, process modeling, simulation and optimization, process intensification in dyeing, safety, value addition to handloom products. Three faculty members availed the international travel grant to deliver keynote address in International conferences. The centre has procured about 50 advanced analytical instruments, high end equipments, software for R&D activity. All the departments within the Institute for process intensification activity share the facility. The Centre has trained more than 75 research scholars on various projects and many of those have continued for their Ph.D. program within the Institute, IITs and NITs.

Novel refrigeration technology named as ‘Combo VAR-VCR Technology’, already successfully implemented at Gokul Dairy, Kolhapur. Dr. R. D. Kale, Mr Vikrant Gorade and Ms Prerana Kane won best presentation award at “CoE, TEQIP-II - Conclave for Research Excellence through Collaboration” organized by The Centre of Excellence (CoE), College of Technology, GB Pant University of Agriculture & Technology, Uttarakhand held from October 06-08, 2016. New hand pumps prototype has been developed under Centre’s activity and tested across various villages in Maharashtra. The results indicate 95% removal of disease spreading bacteria. This research won the university challenge of India Innovation Growth Program 2.0 (IIGP 2.0). They were awarded with a cash prize of INR 10 lakh at the award ceremony organized by FICCI at Hotel Taj Mahal, New Delhi on 26th July 2017.

7.2.1.1 Activities under CoE:

- **Energy and Energy**: Experimental investigation is planned for a single stage VAM (Vapor absorption machine) at various operating conditions.

- **Interfacial Science**: Micro-emulsions based on triglycerides were formulated, characterized and their phase behaviour studied. The effect of different components and parameters on the microstructure of micro-mulsions and their structural inter relationship was studied. Such micro-emulsions can be employed in products like hair care conditioners.

- **Heat Based Refrigeration Technology**: ICT has developed a novel refrigeration technology named as ‘Combo VAR-VCR Technology and it is a combination of Vapour Absorption Refrigeration (VAR) and Vapour Compression Refrigeration system (VCR).
7.2.2 Centre of Excellence in “Complex & Nonlinear Dynamical Systems” at VJTI, Matunga, Mumbai

Centre of Excellence (CoE) in Complex & Nonlinear Dynamical Systems (CNDS) is established at VJTI under TEQIP-II (subcomponent 1.2.1) funding with a funding of Rs 5 Crores by World Bank through National Project Implementation Unit (NPIU), MHRD. It was by Padma Vibhushan Dr. Anil Kakodkar (Ex Chairman-Atomic Energy Commission of India) on 15th September 2015 in the presence of Mr. R.K. Malhotra, Vice President, L&T Ltd., Dr N C Shivprakash (Mentor & Professor- IISc Bangalore), Prof S J Bhosale (SPFU), Dr A B Nandgaonkar (SPFU), Industry Advisory Board members, faculty and research scholars of VJTI. The main objective of CoE CNDS is to act as a focal point for the interdisciplinary research into the theory of complex and nonlinear dynamical systems and its applications across science and engineering branches. Main areas and application domains include complex power grid/smart grid modelled as a critical cyber-physical system (CPS), nonlinear dynamics exhibited by integration of distributed generation sources like solar and wind due to their intermittency. The centre is also focussed on leveraging emerging technologies like Block chain, Artificial Intelligence (AI), Machine Learning, Cloud & Fog Computing, Internet of Things (IoT) and cyber security for improving efficiency and reliability of complex networks and critical infrastructures like energy/water networks.
Over a period of time, CoE CNDS has established collaborative and working relationships with reputed academic institutes within and outside India. Memorandum of Understanding (MoU) is signed with IIT Bombay and IIT Madras for faculty/student exchange, joint publications and research projects and conducting faculty development program (FDP). MoU with IIT Kanpur and IIT Delhi is in the final stage. CoE CNDS is also mentoring many engineering colleges under MARGDARSHAK Scheme of AICTE by providing internship opportunities to their students and faculty participation in various FDPs conducted by CoE CNDS in its thematic areas.

Industry participation has been a main ingredient in the success of CoE CNDS. Larsen & Toubro (Electrical Automation) has established L&T-VJTI Innovation Centre with state-of-the-art power electronics set-up. Emerson Process Management Ltd has provided their Delta V Distributed Control System (DCS) under Emerson Centre for Advanced Studies (ECAS) and L & T Infotech has established Industrial IoT test-bed under Corporate Social Responsibility (CSR) funding. CoE CNDS has also signed MoUs with industries like ABB, Mahindra Susten, Stelmec, Customized Energy Solutions and Ernst & Young. Collaboration framework with General Electric (GE), Eaton and Siemens are being worked out. Joint activities with industry partners includes “Ph.D. in Industry Programme”, internship to students, industry driven research problems and industry mentor, joint publications and product development, conducting joint workshops and conferences. CoE CNDS has formed Industry Advisory Board which provides timely inputs on emerging industry trends.

CoE CNDS is an academic partner for India Smart Grid Forum (ISGF), PPP of Ministry of Power, GoI and has contributed in forming various policies on reliability and security of power grid. It has also signed MoU with India Energy Storage Alliance (IESA) and CDAC as a knowledge partner. It is working closely with industry bodies like IEEMA for conducting awareness programmes for its stakeholders.

CoE CNDS has published around 100 research papers in reputed international journals & conferences. It has received project funding from agencies like BARC, ISRO and DST. It has worked on import-
substitution of 2 products with its industry partners. Few more are in the stage of proof-of-concept (PoC).

Future plan of CoE CNDS is to extend its research activities to creation of intellectual property (IP) and product development. It has received Rs 8 Crores approval from Department of Science & Technology (DST), GoI, for establishment of Technology Business Incubator (TBI) under NIDHI initiative. Proposed TBI shall incubate startups in the thematic area of CoE CNDS.

- **Research Areas**
  - Complex Power Grid
  - Smart Grid modeled as cyber-physical system (CPS)
  - Cyber-Security in Smart Grid Systems
  - Nonlinear dynamics & transient stability of electrical pulse power & plasma systems
  - Hybrid energy management systems for clean renewable energy
  - Nonlinear vibration analysis etc.

- **Projects**
  - Modeling & Analysis of Complex Power Grid as a Cyber-Physical System
  - Modeling & PIC Based Simulations of Relativistic Nonlinear Phenomenon in Magnetron
  - Bifurcation Analysis of Cascade Failures in Power Grid: Northern Grid Blackout Case Study
  - A System Theoretic Approach for Modeling and Sequencing the Execution of Component Models for Adapting Parallel Processing in Complex Process Simulation Tool
  - Probabilistic Analysis of Cascade Failures
  - Deposition of High k Dielectric Thin Films Using Non-linear Dynamic Gaseous Plasma
  - Passivity-based Control of Under-actuated Non-linear Dynamical Systems
  - Synchronization Control of Nonlinear Heterogeneous Systems & Hybrid Energy Management Systems
  - Development of Nonlinear Control Law using Multilevel SVM for Suppressing Inverter Non-linear Distortions with Low Harmonics
  - Development of Experimental UWB Systems
7.2.3 Centre of Excellence in Smart Renewable Energy System, College of Engineering, Pune

Objectives of the Center: To work in the following areas of energy studies:

A. Power generation and utilization using wind and solar energy
   ● Development of 10 kw micro grid using 2-3 kw wind mills and 2-3 kw solar plant
   ● Development of permanent magnet generators for small wind 2-5 kw wind turbines
   ● Development of efficient power converters

B. Real time system simulation of energy systems
   ● Real time simulation of power converters
   ● Real time simulation of electrical machines
   ● Real time simulation of interconnected systems
   ● Real time simulation of microgrid

C. Solar Thermal System
   ● Community solar water heating systems[SWHS]
   ● Constant temperature delivery from SWHS
   ● Solar Food Dryers
   ● Parabolic trough concentrator systems Parabolic trough concentrator systems
   ● Optimization of low and medium temperature solar thermal systems
   ● Mobile energy audit unit

D. Demand side management through energy Conservation
   ● Energy related consultancy to consumers
   ● Consultancy in preparing and implementing energy efficiency measures
   ● Creating energy awareness and demonstrations through case studies
   ● Pilot demonstration model development for educational institutes

E. Demand side management through development of energy efficient systems
   ● Research and consultancy in the area of energy efficient equipment.
   ● Design and Development of permanent magnet motors for fixed and variable speed applications
• Development of switched reluctance drive / PM motor drive for solar pump

F. Development of power conditioners, digital controllers for RES
• Development of high performance controllers
• Application of modern control algorithms for renewable energy systems
• Development of DAS for the low power renewable energy

Accomplishments and Practices:
• Development of a new infrastructure as School of Energy
• New PG program started in Power Electronics, Machines and Drives
• 07 Full Time & 11 Associated Ph.D. scholars at the Centre.
• 21 Ph.D. Research projects, 37 Masters’ Projects, 04 Funded Research Projects and 05 Industry defined projects are being done
• 47 research papers in reputed International Conferences, 13 research papers in National Conferences, 16 research papers in International Journals and 04 research papers in National Journals of repute have been published.

• 05 patents filed with Centre’s support.
• Extended working hours, almost 24 X 7 for the students.
• 05 Active MoUs with Industries and 06 with R&D Organizations.

Activities:
• 04 Conferences, 03 Workshops and 10 Faculty Development programs organized
• 01 Winter Academy in association with Ostfalia University, Germany, organized since inception of the Centre.
• Organized Research Conclave in collaboration with IITs and NITs as a platform for interaction for researchers
• 36- Books have been purchased and IEEE membership of journal and consortium taken.
• Networked with 5 autonomous colleges

• Started industry mentorship program in association with “Eklakshya Consultants”
• One international workshop on “Energy” with Princeton University”
Introduction:

The field of Digital Signal Processing (DSP) has seen explosive growth during past three decades, in terms of phenomenal advances and attainments, both on research and applications fronts. Parallel advances in digital hardware VLSI technology and concerned software/tools have fueled this growth. The spectrum of signals that can be processed and analyzed ranges from simple coded text/documents treated as images, presentations enriched with graphics and animation, through speeches and audio to color images and real life high definition videos. Analyzing biological, industrial, metallographic signals leads to decisive and diagnostic knowledge, convertible to intelligent systems capable of predictions and estimations in the relevant field. Processing involves novel algorithmic development for enhancing the quality of acquired signals and compactly coding the same for efficient storage and bandwidth optimized long-haul communication. Analysis involves intense mathematical modeling of signals and systems that leads to recognition, classification and conclusions. Examples of socially relevant real life applications that deploy signal processing and analysis are Biometric person authentication, Diseases diagnosis, Speech to text / Braille Conversion for dumb / deaf and visually impaired population, Content based high definition video communication, Vehicular sensor network and intra vehicle signal processing for passenger safety, automatic surface inspection for fault detection in automated manufacturing processes, to mention a few.

Investigations, research and experimentation spanning over such a diversified range of signals under the shelter of an academic and development centre, with focused laboratories is a need of time. This Multidisciplinary Centre of Excellence in “Signal and Image Processing”, at COEP, intends to harness the potential of our human resource and the participating industry, in terms of PG education and Ph.D. programs, to match global standards and competitiveness.
in this much diversified and potent arena of development. With Department of Electronics and Telecommunication at the nuclear position, other departments viz. Instrumentation & Control, Electrical and Computer Engineering, will cohesively contribute to the development of the Centre in terms of patents and referred publications, developing real life applications, useful to Industry and Society at large, with the ultimate objective of generating passionate and resourceful researchers in the domain.

Specific Areas of Excellence:
- Multimedia-Multidimensional Signal Processing spanning from text, document, graphics and animation through speech, audio, image and video signals
- Signal Analysis and Decision support systems for biological/biomedical/genomic, Automotive/industrial and metallographic signals
- Signal Processing Applications in RF/Microwave/Optical Communication
- DSP/Reconfigurable/Full custom VLSI Hardware Technologies for Signal/Image Processing Applications Development

Accomplishments and Practices:
- Development of Laboratory Complex as a Centre’s Distinct Infrastructure and Identity for domains such as Image, Speech/Audio, Video and Biomedical/Industrial Signal
- 06 Full Time & 21 Associated Ph.D. scholars and 17 PG students working at the Centre.
- 03 Industry Mentors weekly visit the Centre for monitoring the progress of Students’ projects.
- 37 research papers in reputed Conferences and 13 in refereed and reviewed journals, 05 patents filed with Centre’s support.
- Extended working hours, almost 24 X 7 for the students.
- Close Association with IIT-Bombay’s TEQIP-KITE and CoE-S&IP at SGGSCoET, Nanded.
- PG Project Internships offered to the Students of neighbouring Good TEQIP Institutes.
- 03 Active MoUs with domain Industries and 04 with TEQIP Institutes and IIT Bombay.

Activities:
- 07 FDPs, 03 SDPs in association with Industries/Corporate, 01 Winter Academy in association with Ostfalia University, Germany, organized since inception of the Centre.
- Initiated and Supported Project Symposium in S & IP domain for all Masters’ students.
- Organized Pedagogical Workshops on “Signals & Systems” and “Wavelets” in association with IIT Bombay.
● Supported the S & IP tracks of 02 International Conferences at COEP (InCon-2015 and CAST-2016)

● Co-Host and Co-organizer of the International Conference on Signal & Image Processing-“IConSIP”-in October 2016 at Nanded. The second edition of the IConSIP is scheduled in October 2018

7.2.5 Centre of Excellence (CoE) in Signal & Image Processing established at Shri Guru Gobind Singhji Institute of Engineering & Technology, Nanded

Centre of Excellence (CoE) in Signal & Image Processing established at Shri Guru Gobind Singhji Institute of Engineering & Technology, Nanded under TEQIP-II funding through National Project Implementation Unit (NPIU), MHRD was inaugurated by Mr. Ram Bhogale, Chairman, Marathwada Auto Cluster, Aurangabad on 19th of September 2015

The Center runs a multidisciplinary research program involving more than 20 faculty members and 14 research scholars from various departments of engineering and basic science of institute. The Center has started its functioning in its state-of-the-art Signal and Image Processing Laboratory equipped with all the ultra modern machinery set at par with any international research center. Apart from carrying out frontier research in the areas mentioned above, the center aims at creating technologies that can be commercially exploited by industries. The Center is also engaged in an ambitious plan for generating high caliber manpower and entrepreneurs in the field of Signal and Image Processing.

The key aim of center is to attract and tap the top class talent to carryout frontier research in Signal and Image Processing. The CoE is expected to contribute to the training of R&D manpower for industry. To achieve this there is need to recruit research scholars at least twice in a year i.e. in every semester through thorough competitive environment.

Aspiration: To Become Leading World Class Centre of Excellence (CoE) in Signal and Image Processing and Analysis.
Objectives

- Establishing the State-of-the art-facilities to carry out research work in SIP.
- Increase production of advanced human capital by increase in Enrolment of Master’s and Doctoral students, Increase in placement, and updated and more relevant UG and PG curricula.
- Develop long term R&D capability as evidenced by increase in Publications in referred journals, joint publication with international authors, joint programmes/projects/exchanges with international research organisations, publication of books, and technical reports.
- Increase in collaborative and applied research as documented by increase in External R & D funding, notably industry sponsored projects and industry Chairs, patents filed and obtained or other manners of knowledge commercialisation and transfer.

Goals Achieved

- Ten joint research projects between SGGSE&T Nanded and UTP Malaysia are identified. Presently research work is going on these projects.
- Seventeen Faculty development programs and Workshops are conducted for the benefits of faculty members and research scholars. This has benefitted 756 researchers and faculty members.
- Two Joint Faculty Development Program with UTP Malaysia:
- National Conference on IConSIP was organized on 10th and 11th July 2015.
- This CoE has organized summer
internship program for UG and PG students of other institute from 15th May to 9th July 2016. This has benefitted 15 students from other institute.

This CoE has successfully hosted an International Conference on Signal and Information Processing (IConSIP-2016) during 6th-8th October 2016. This conference was jointly organized by IIT Bombay, College of Engineering Pune, S V University College of Engineering Tirupati and Technically supported by IEEE Bombay section. This mega international event was proudly hosted at SGGSIE&T Nanded.

Following Seven International Key note Speakers addressed the gathering
- Prof B S Manjunath (University of California Sanata Barabara USA),
- Prof Peter Mac Farlane (University of Glasgow , UK)
- Prof Ganesan (University of Oakland, Rochester, USA),
- Prof Hani (UTP Malaysia),
- Prof Rangayyan (University of Calgary, Canada)
- Bruno Lay (ADCIS, France)
- Fawnizu (UTP , Malaysia)

Near about 300 participants attended this conference.

This is very good example of collaborative research work of same thematic area of CoE.
MoU Signed

- MoU with Center for Intelligent Signal and Imaging Research (CISIR) of UTP Malaysia is signed on 28th Aug. 2013 for faculty and student exchange, and collaborative research work.
- MoU with Tata Memorial Hospital Bombay is signed on 20th August 2014 for medical database sharing and expertise.
- MoU with Zankariya Imaging Center Bombay.
- MoU with ADCIS France.
- MoU with Ganapati Netralaya Jalna for sharing Diabetic Retinopathy database and medical expertise is under progress.

CoE Infrastructure

- State of the Laboratory with 24x7 Access facility
- Separate Library
- Conference Room with Video Conferencing Facility
- Separate Cubicle for each Research Scholar
- 24x7 Laboratory Video Surveillance System

Key Features of CoE

- State-of-the-art CoE has been established, which is open 24 x 7 for research scholars and PG students.
- High end Equipment’s are made available for Research.
● Separate Knowledge Resource Centre (Library) is Established with:
  - All reference and handbook of thematic area.
  - Full subscription of IEEE Journal and Conference papers.
  - Full subscription of Elsevier and Science Direct papers.
● Ultra-modern seminar hall with video conferencing unit. (4 parties can interact with each other simultaneously)
● Mechanism for continuous evaluation of research scholar is established.
● Twenty FDP / Workshops / Seminars were arranged for benefit of research scholars and faculty members.
● Took lead to bring together other CoEs having same thematic area for collaborative research work. Its classical example is – International Conference on Signal and Information Processing (IConSIP 2016) jointly organised by IIT Bombay, COEP Pune, and SGGIE&T Nanded.
● MoU with International Centre of Excellence in same thematic Area
  - MoU with CISIR of UTP Malaysia.
  - Student and Faculty Exchange Program
    - Mr. Akash Gandhamal (RS) is currently doing joint research at UTP Malaysia.
    - Three research scholars will join UTP in Nov 2016.
    - Fourteen PG students will join UTO for M Tech project.
    - Joint research and publications: Five publications.
    - Conducted four joint international workshops.
    - Submitted five joint research proposals for international funding.
● Future Roadmap up to 2025 is ready and progress is made according to plan. Institute has proactively supported to take CoE to greater height.
● Strong human resource : Nineteen Ph.D. Faculty members having their research in the thematic area.
CHAPTER 8

Impact of TEQIP on Technical Education in Maharashtra
8.1 Major Findings

TEQIP, a well-timed and effectively implemented Project was the answer to emerging challenges the country is likely to face in the sector of technical education. In Maharashtra, overall influence on 17 Project Institutions has resulted in all the institutions having a highly satisfactory impact.

Alongside promoting academic progress in terms of support for student learning and employability; faculty and staff development; promotion of research and innovation; industry institution interaction; institutional collaborations; and other opportunities for institutional growth discussed in the previous chapters, TEQIP has provided an impetus for institution level reforms in terms of academic processes and management systems that were generally lacking before inception of the program. This chapter evaluates the impact of TEQIP interventions on both academic processes as well as management systems in the institutions where TEQIP has been under implementation.

A) Institutional Reforms

With new management systems under TEQIP, Institutes find it easier to track expenditure, control costs, procure efficiently and generate information about all academic and administrative activities with greater ease and efficiency. All institute established four Funds, generate revenue, modernize their systems, undertook audits, reduced wastages and developed their faculty.

- All Project institutions have carried out academic and non-academic reforms of their internal & external auditing processes.
- Project institutions could achieve improved efficiency and cost effectiveness of education process through optimum utilization of resources and minimizing wastages.
- All Project institutions have implemented flexible pace of learning and multi-background admission system.
- Project institutions have successfully implemented credit exemption system. Institutions have also implemented
a system for teachers’ performance evaluation by students.

- In Project institutions, teachers are being counselled to rectify their teaching/training deficiencies and they have schemes for recognizing meritorious teachers.
- All Project institutions have successfully implemented Four Fund System.
- A large number of awards, recognitions & certifications were awarded to Project institutions during/post TEQIP period.

Implementation of academic and administrative reforms

a) **Full Academic autonomy with accountability**

Academic autonomy implies greater direct responsibility of the institution for developing and implementing policies and procedures in the area of admissions, the pursuit of educational excellence, the preservation of academic standards, and the proper management of examination. The full academic autonomy is required to develop the curriculum to meet the needs of industry and society.

b) **Full Managerial autonomy with accountability**

Managerial autonomy implies at least two major undertakings; evolving a clear system of institutional governance suitable for the institution: and fostering the development of strong responsive linkages of the institution to its main stakeholders. All the TEQIP institutes are governed by establishing the Board of Governors headed by BOG includes the educationists and industrialists along with other official members.

c) **Full Administrative autonomy with accountability**

Administrative autonomy implies the development of an efficient system for recruitment and support of high quality faculty and the adoption of clear and transparent administrative policies. The administrative bodies like AICTE govern the TEQIP institutes. The pay scales and recruitment process is fully controlled under rules framed by AICTE from time to time.

d) **Full Financial autonomy with accountability**

The TEQIP institutes are striving hard to achieve the full financial autonomy. Academic institutions are known to be weak in their focus on accounting and financial management. In matters of procurement too, there is generally a lack of systematic evaluation of bids and tenders even for high-value purchases. TEQIP has brought in considerable discipline in these areas.
B) Institutional Governance
- In all 17 Project institutions, majority of the stakeholders participate in BoG.
- All Project institutions have full autonomy in all its components.
- Large number faculty members could attend management capacity development programs of five or more day’s duration.

C) Academic Excellence
- All 17 Project institutions could achieve academic excellence with respect to revision /reorientation & restructuring of their programs as well achieve the same with respect to faculty training.
- A number of institutions have carried out training need analysis for planning faculty training while majority of faculty members teaching engineering courses in Project institutions were sent for a training of five or more days duration.

D) Networking
Project institutions established formal & non-formal networking with well-performing institutions, R&D organizations, specialized laboratories, industry and community. They could achieve following results:
- A large number of students undertook visits to other Project institutions either for using their equipment and instruments or attending lectures.
- Similarly, a large number of faculties undertook visits to other Project institutions
- Students with students from other institutions organized a large number of co-curricular activities.
- Faculty jointly with faculty from other Project institutions undertook various R&D projects.
- Faculty jointly with faculty from other Project Institutions authored publications.
- Specialized training programs were organized for faculty of other Project institutions

E) Services to Community & Economy
The Project institutions undertook services to community in two ways:
- The faculty and students of each institution were involved in rendering services to the community and economy, and
- The Project institutions as a whole extended their services to rural segment of the economy in following ways:
  - **Village adoption**
    - Identify nearby villages for adoption
    - Explore areas of support
● **Vocational training**
  - Identify the job oriented courses as per local needs
  - Provide vocational training at our institute

● **Health and hygiene support**
  - Conducting health awareness camps
  - Providing free health care to the needy
  - Psychological and psychiatric support

● **Rural projects**
  - Identify societal problems and projects
  - Project execution and support services

Some of the achievements were:
- A large number visits were undertaken by community persons (from vicinity of Project institutions) for technical advice/guidance/help.
- Faculty visits were undertaken for assessing community needs, for providing technical advice/guidance/help or for explaining/demonstrating one or more technologies.
- A considerable number of technologies were transferred to the community.
- During TEQIP implementation, a number of externally funded R&D projects valued millions of rupees were executed by Project institutions.
- Unnat Maharashtra Abhiyan is also undertaken by some of the Project Institutions.

F) **Stakeholders Satisfaction**
Students, teachers, HODs, Deans, Principals, BoG members, VCs, auditors and mentors, regular employers of students are some of the prominent stakeholders of institutions under TEQIP directly or indirectly benefited by TEQIP.
- Auditors and mentor’s continuous auditing and mentoring exercises led to improved performance and accountability.
• Major industrial employers of students from Project institutions like Reliance Industries Ltd., TCS, Infosys, etc have opined that students (recent recruits) are now more practical in approach, take less time to get inducted and give their best performance especially in key functional areas of Process Engineering, New Product Development, Production and Project Engineering.

Conclusion

It appears that TEQIP-II has led to substantive reforms at the level of institutions, in regard to both academic processes as well as management systems. Exposure of TEQIP-II institutions to the premier technology and the management institutions of the country - IITs and IIMs, has provided an opportunity for the institutions to find a benchmark towards which they can push the frontiers of academic excellence, besides an external prospective on how the standards of technical education are evolving within and outside the country. Various initiatives launched under TEQIP for knowledge incubation through the Knowledge Incubation Cells (KICs) / Knowledge Incubation for TEQIP (KITs) and live classes and tutorials under the QEEE, have contributed to a credible eco-system in which the TEQIP institutions can forge and sustain partnerships with the IITs and the IIMs. The participation of TEQIP institutions in various MDPs organized by the IIMs and other management development institutions has added a new learning experience to the faculty and heads of TEQIP institutions.
Chapter 9: Project Sustainability

9.1 Institutional Reforms
   Implemented after TEQIP:

Institutional reforms have taken place by implementing academic and non-academic reforms, exercise of autonomy status, and establishment of four funds, generation, retention and utilization of Revenue generated, delegation of decision making powers to Director/Principal/Dean/HOD with Account, Performance appraisal of faculty and students, Faculty incentive for continuing education (CE), Consultancy and R&D, Accreditation of eligible UG&PG programs.

9.1.1 Retention of Internal Revenue Generation:

Generation, retention and utilization of revenue generated through variety of activities: As per the eligibility condition for States and Union Territories, all Project Institutions are permitted to generate, retain and utilize the entire revenue, generated by them including income from tuition fee and other fees and charges from students. All Project Institutions are expected to increase revenue generation from such activities as self-financing teaching and training programs, testing services, consultancy and research, innovations, patents, commercialization of R&D outputs, sharing of high-tech equipment with industries, public usage of infrastructure for academic activities, etc.

1. In order that faculty and staff feel encouraged to develop and take up revenue raising activities and programs over and above their routine academic and other duties in the Institution, they have been given an appropriate share of the revenue earned as an incentive as per government guidelines

2. The department/college/institution should recognize performance faculty and staff in such activities through awards, rewards or promotions.

3. The institute has been given due freedom to utilize part of the earnings on development of laboratory facilities, purchase of equipment and faculty sponsoring to attend conferences and workshops.

4. Revenue generation activities includes:
   - Consultancy Projects sponsored by private or public sector industry
   - Sponsored research Projects
   - Offering specially tailored Continuing Education programs
   - Offering specially designed degree programs for candidates from public sector undertakings
   - Industry-Institute interactive programs ensuring mutual benefits including revenue generation for the institution
   - Commercial activities e.g. commercial use of facilities,
earning from Incubation Centers and Scientific and Technology Entrepreneurship Programs (STEP).

5. Improving facilities for personal academic research and travel for attending conferences could be permitted from the sponsored project funds as per rules of the sponsoring organization.

9.1.2 Four Funds: Sustainability of the project institutions beyond the project

To sustain development activities initiated in project institutions under TEQIP-II post project closure, all project-funded institutes are required to have established Four Funds. It was mandatory for all the project institutes:

a) Creation and establishment of Four Funds is a Project requirement that was complied with by all institutions.

b) The purpose of these Funds is to ensure sustainability of the reform process beyond the Project period.

c) Separate Bank Account has been opened for each of the Four Funds namely:
   - Corpus Fund
   - Faculty Development Fund
   - Equipment Replacement Fund
   - Maintenance Fund

d) These Funds shall be used after completion of the Project period as funds for various activities are available during the Project.

e) The authority for opening these Accounts is with the BoG of the institution. Each project institution is to build these Funds with annual contribution into each Fund equal to at least 0.5% (total 2%) of annual total recurring expenditure of the institution.

9.1.2.1 Sources for four funds:

Sources for the four funds could be
- a definite percentage of fee collection from students,
- savings from Block Grant,
- donations from alumni and charitable organizations,
- IRG including commercial use of facilities, consultancy earnings (institutional share), and matching Grants from Government/management on IRG etc.
- Each institution may additionally contribute from annual savings to the Corpus Fund.

9.1.2.2 Creation and establishment of Four Funds is a Legal Covenant to be complied with by the States and Institutions

Further, each project institution is encouraged to additionally contribute an amount from its savings into the Corpus Fund. Importantly, institutions are required to contribute this amount from their own funds and not from the project funds.
The Project Implementation Plan says that institutions are to utilize the revenue from the four funds only after the project is over, following approval from the BoG as per rules developed in consonance with state government guidelines (if any). In general, the amount deposited in the corpus fund is much higher than the amount in the other funds. Maharashtra leads in terms of amount of funds generated, high levels of local industry presence is likely to have contributed to revenue generation efforts. There is also considerable variation across institutes in the amount generated, with the bulk of funds having been generated by Government Institutes across all years and the least amount by private colleges.

Different colleges may wish to use their funds in different ways, in line with decisions made in the respective BoG (and subject to the overall requirement to use the funds to sustain activities initiated under TEQIP-II) Importantly, colleges which have not purchased equipment under TEQIP-II would like to redeploy funds from the Equipment Replacement Fund and Maintenance Fund to other developmental uses.

These funds should be reflected in the books of accounts and annual statements of the accounts maintained for TEQIP.

- All fees and other charges recovered from the students can not be used for creating the Four Funds except for Development Fee and savings from Tuition fees as per AICTE/State Government instructions
- Interest on Project Funds must be ploughed back to the Project Funds
- All interest other than above will go to the Corpus Fund
- No income is to be made from formal Networking activities, however income from non-formal Networking shall be considered as IRG
- No element of the government sanctioned Plan Fund shall go to the above Four Funds

Institute wise amounts, in each fund, is shown in the table shown below.

(Rs. in lakhs)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Institute</th>
<th>Corpus</th>
<th>Faculty Development</th>
<th>Equipment Replacement</th>
<th>Maintenance</th>
<th>Total</th>
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<tbody>
<tr>
<td>1</td>
<td>Government College of Engineering, Karad</td>
<td>69.50</td>
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<td>63.14</td>
<td>44.29</td>
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<td>1.02</td>
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<td>12.65</td>
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<td>Sr. No.</td>
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<td>Equipment Replacement</td>
<td>Maintenance</td>
<td>Total</td>
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<td>60.82</td>
<td>60.84</td>
<td>269.91</td>
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<td>15</td>
<td>Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad</td>
<td>225.64</td>
<td>62.07</td>
<td>10.12</td>
<td>10.12</td>
<td>307.95</td>
</tr>
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<td>16</td>
<td>GH Raisoni College of Engineering, Nagpur</td>
<td>15.89</td>
<td>16.77</td>
<td>15.89</td>
<td>15.89</td>
<td>64.44</td>
</tr>
<tr>
<td>17</td>
<td>Rajarambapu Institute of Technology, Islampur, Sangli</td>
<td>613.16</td>
<td>170.76</td>
<td>174.76</td>
<td>170.76</td>
<td>1129.44</td>
</tr>
</tbody>
</table>
9.1.3 Accreditation and Autonomy:

TEQIP has aggressively promoted the autonomy of technical educational institutions and accreditation of the courses offered by them, by making these qualifying criteria for institutions to participate in the project. Accreditation of both UG and PG courses is strongly emphasized under the TEQIP with a target that at least 50% of the UG and PG programs achieve accreditation by the end of the second year of the project and 80% of the courses by the conclusion of the project.

Institutional autonomy under the UGC scheme is also an important criterion to be met by TEQIP institutions. Benefits of autonomy to an institution cannot be over emphasized as the autonomous institution has the freedom to:

- Determine and prescribe its own curriculum and redesign courses to suit local needs;
- Prescribe rules for admission as per policy of the State Government;
- Evolve its own methods of assessment of students’ performance
- Conduct examinations and notify results on its own;
- Use modern tools of educational technology to achieve higher standards.

It was widely shared that autonomy has generally enabled them to manage their academic, administrative, managerial and financial matters more efficiently.

It was widely shared that autonomy has generally enabled them to manage their academic, administrative, managerial and financial matters more efficiently.
CHAPTER 10
TEQIP-III in Maharashtra

I need a job!
PHP/Java/.Net/C++
Pune/Bangalore/Delhi
Direct Marketing Jobs
Interview tips
High paying HR jobs
Noida Finance Jobs
Testing Jobs at Wipro
10.1 Introduction:

The World Bank has signed an agreement with the Government of India to provide $201.50 million loan for quality engineering education across several states in India. The loan agreement is part of the Technical Education Quality Improvement Project (TEQIP-III), which is the third phase of a 15-20 year programme that started in 2002.

TEQIP-II has supported 250 engineering institutes, including NIT Surathkal, College of Engineering Pune, Jawaharlal Nehru Technological University Hyderabad and BIT Mesra. It has made a considerable impact on the quality of education by implementing institutional and policy reforms by focusing on institutional autonomy and accountability.

TEQIP Phase-III as a Central Sector Scheme, which begun recently, will carry forward the quality-oriented reforms initiated under TEQIP-II. The focus of the project is to strengthen engineering education in India’s low-income, hill states and states of the North East. Around 100 government engineering colleges from these states will be paired with well-performing colleges from previous phases of TEQIP. The project has leveraged the expertise of the best in the country - the IITs and IIMs - to improve the academic rigor in TEQIP Colleges while also strengthening leadership practices.

TEQIP-III Project is fully integrated with Twelfth five-year plan for improving the quality of engineering education with a special consideration for Low Income States and special category states. The project is expected to be complete by March 31, 2020. The institutions have been selected under TEQIP phase-III, through challenge method of selection on the pre-defined eligibility criteria and academic performance. Well-performing institutions of TEQIP-I and TEQIP-II have been considered for participation under the sub-component including twinning arrangement to build capacity and improve performance of participating institutions in the focus states. Each of the selected mentor institutions would get a grant of Rs 7 crore each. The selected institutions would act as mentor institutions for providing support to focus state institutions through twining arrangement as well as working for their own development.

TEQIP-III will also support Affiliating Technical Universities (ATU) for the first time, multiplying benefits to all affiliated colleges and not just those being supported individually. The World Bank has estimated that nearly 30 lakh under-graduates and post-graduates will benefit from it. Some 30% of this will likely be females and 20% from scheduled castes and tribes. It will also scale up post-graduate education, research, development and innovation at these institutions.
In the latest phase, TEQIP will impart skill training to labour market entrants more equitably across the country by focusing on states with under-performing engineering education set-up. The focus on strengthening engineering education and research under TEQIP-III will help prospective labour market entrants acquire the skills needed to produce a world-class technical workforce. This project will help India meet its growing demand for highly qualified engineers. Significant efforts will be devoted to monitoring and evaluation to ensure the investments result in better performance of the selected institutions.

10.2 Project Objectives

- Improving quality and equity in engineering institutions in focus states viz. 7 Low Income States, 8 North East States, 3 Hills States & Andaman and Nicobar Islands.
- System-level initiatives by widening the scope of ATUs to improve their policy, academic and management process towards affiliated Institutions.
- Twinning arrangements to Build Capacity and Improve Performance of institutions and ATUs participating in focus states.

10.3 Academic Activities

10.3.1 Improve Student Learning

- Promotion of Start-up
- Internships
- Industry readiness
- Induction Training
- Peer Learning Groups
- Remedial Coaching
- Career Counselling

10.3.2 Improving Faculty Productivity

- Annual refresher courses on SWAYAM
- Student feedback & peer review
- Conferences
10.3.3 Establishing Twinning System to build capacity and improve performance

10.3.4 Steps for Project Implementation

- MoU between MHRD & State
- MoU between State & Individual Institution
- Twinning Agreement
- PFMS registration
- Submission of activity & expenditure plans
- Approval of activity plan by MHRD

10.3.5 Institutions selected in Maharashtra for TEQIP-III

In Maharashtra, following institutions are selected as a Mentor Institute to participate in TEQIP-III.

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### Table 1: List of Mentor Institutions from Maharashtra

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Mentor Institute</th>
<th>Name of Mentee Institute &amp; State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>College of Engineering Pune</td>
<td>Shri. G.S. Indor Institute of Technology &amp; Science, Indor (Madhya Pradesh)</td>
</tr>
<tr>
<td>2</td>
<td>V.J.T.I. Mumbai</td>
<td>Government Engineering College, Ajmer (Rajasthan)</td>
</tr>
<tr>
<td>3</td>
<td>Institute of Chemical Technology, Mumbai</td>
<td>Birla Institute of Technology, Mesra Ranchi (Jharkhand)</td>
</tr>
<tr>
<td>4</td>
<td>B.V.B.’s Sardar Patel College of Engineering, Mumbai</td>
<td>Rewa Engineering College, Rewa (Madhya Pradesh)</td>
</tr>
<tr>
<td>5</td>
<td>Walchand College of Engineering, Sangli</td>
<td>Jabalpur Engineering College, Jabalpur (Madhya Pradesh)</td>
</tr>
<tr>
<td>6</td>
<td>Government Engineering College, Aurangabad</td>
<td>Ujjain Engineering College, Ujjain (Madhya Pradesh)</td>
</tr>
<tr>
<td>7</td>
<td>SGGSIE&amp;T, Nanded</td>
<td>College of Technology, Pantnagar (Uttarakhand)</td>
</tr>
<tr>
<td>8</td>
<td>Government Engineering College, Karad</td>
<td>Rajakiya Engineering College, Azamgarh (Uttar Pradesh)</td>
</tr>
<tr>
<td>9</td>
<td>University Department of Chemical Technology, North Maharashtra University, Jalgaon</td>
<td>Uttar Pradesh Textile Technology Institute, Kanpur (Uttar Pradesh)</td>
</tr>
<tr>
<td>10</td>
<td>Department of Technology, Shivaji University, Kolhapur</td>
<td>Rajiv Gandhi Government Institute of Engineering &amp; Technology, Kangra (Himachal Pradesh)</td>
</tr>
</tbody>
</table>
**Table 2:- List of Mentor ATUs from Maharashtra**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Mentor ATU</th>
<th>Name of Mentee ATU &amp; State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. Babasaheb Ambedkar Technological University, Loner, Maharashtra</td>
<td>1. Himachal Technical University, Himachal Pradesh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Dr. APJ Abdul Kalam Technical University, Uttar Pradesh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Uttarakhand Technical University, Uttarakhand</td>
</tr>
</tbody>
</table>
Report on Technical Education Quality Improvement Program (TEQIP)-II

Directorate of Technical Education
3, Mahapalika Marg, Opp. Metro Cinema, Mumbai-400 001

Directorate of Technical Education
SPFU Maharashtra State
(2011-2017)