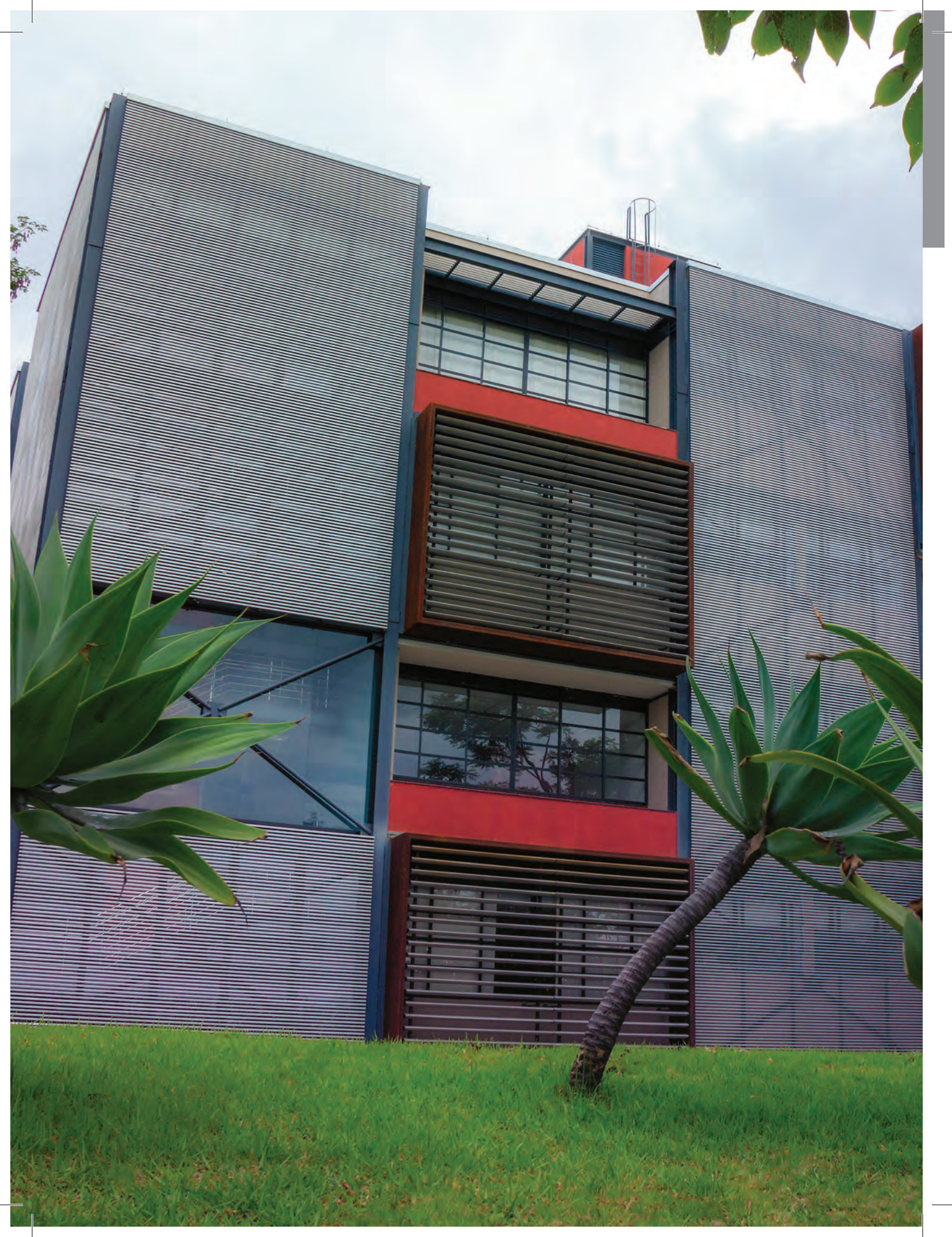


A collage of 24 historical photographs showing the development of the University of the Philippines from 1908 to 1968. The images include the original building, early campus views, the construction of the new building, and various campus activities and buildings over time.

CEFET-MG
CENTRO FEDERAL DE EDUCAÇÃO TECNOLÓGICA DE MINAS GERAIS

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Presentation

CEFET-MG: technological, public (free of charge), multicampi and with a unique academic structure.

For more than a century, CEFET-MG has been a Brazilian centre of discovery and knowledge, of development and response to the technological demands of the society. Figuring among the best higher education institutions in Brazil, we believe on the international cooperation as a way to academic relevance and excellence.

CEFET-MG is a public institution directly linked to and financed by the Brazilian Ministry of Education, offering courses from technical level (vocational training) to undergraduate and graduate courses. Our academic community of students, professors and staff is composed by more than 20.000 people, spread in our 11 campi located in Belo Horizonte and in eight other cities along Minas Gerais State; each with the flavors and colors of a specific region of our huge State.

By delivering the change given by the power of ideas and understanding, of good practices for sustainable development, of formation of a citizen committed to ethical principles, we cherish our past and face the future sure of our role of transmitting technological excellence to the coming generations.

History and

1909 -



1909

1910

1920

1930

1940

1941-1943

1950

1960

1909 - 1943
Escola de Aprendizes Artífices

1943 - 1965
Escola Técnica de Belo Horizonte

1941 - 1943
Liceu Industrial de Minas Gerais

and Heritage

- 2022



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Multicampi structure

As an institution of technological excellence, CEFET-MG has been invited along the years, to be hosted in several other towns in Minas Gerais state, besides its capital city – Belo Horizonte. These invitations were usually rooted in the necessity of qualified manpower to attend the demands posed by the local productive arrangements. That is the main reason why CEFET's campi are located in areas of intense industrial development and why each campus offers a range of different courses, whether they are technical, under graduation or graduation

levels. This has lead to the constitution of an intricate technological network, making CEFET-MG the largest technological teaching institution of Minas Gerais.

1909 - Belo Horizonte
1987 - Leopoldina
1992 - Araxá
1994 - Divinópolis
2006 - Timóteo
2006 - Varginha
2007 - Nepomuceno
2010 - Curvelo
2012 - Contagem

Belo Horizonte • Campus Nova Suíça



Population	2.523.794
Surface	330,230 Km ²
HDI	0,810
GIP	R\$ 87,364 bi

Belo Horizonte • Campus Nova Gameleira



Leopoldina

Population	53.354
Surface	943,076 Km ²
HDI	0,726
GIP	R\$ 974,967 mi



Araxá

Population	104.283
Surface	1.164,358 Km ²
HDI	0,772
GIP	R\$ 2,94 bi



Divinópolis

Population	234.937
Surface	708,115 Km ²
HDI	0,764
GIP	R\$ 5,478 bi



Timóteo

Population	88.931
Surface	144,381 Km ²
HDI	0,770
GIP	R\$ 2,773 bi



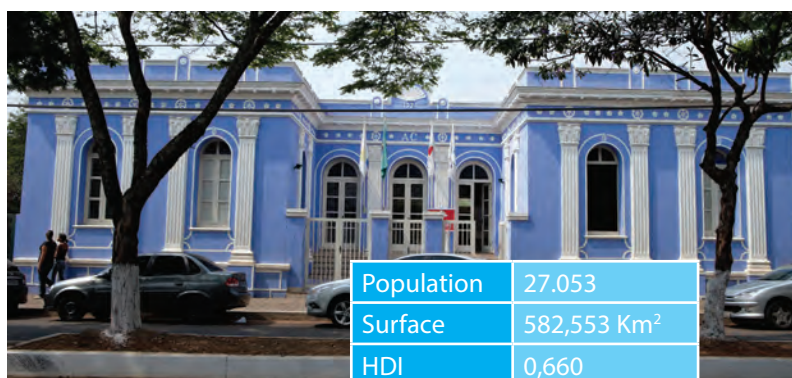
Varginha

Population	134.364
Surface	395,396 Km ²
HDI	0,770
GIP	R\$ 4,609 bi



Nepomuceno

Population	27.053
Surface	582,553 Km ²
HDI	0,660
GIP	R\$ 395,01 mi



Curvelo

Population	79.878
Surface	3.296,200 Km ²
HDI	0,726
GIP	R\$ 1,369 bi



Contagem

Population	658.580
Surface	195,045 Km ²
HDI	0,756
GIP	R\$ 26,016 bi





Some info about Minas Gerais

Minas Gerais is the third largest Brazilian State (after Amazonas and Pará) with an area of 586,520 km² (a little bigger than France). It is the second most populated State, with nearly 21 million people. The capital city is Belo Horizonte, whose metropolitan area concentrates much of the industries from Minas. The State has 853 towns and concentrates 60% of the national historic patrimony. It is localized in the Southwest Region of Brazil and has the third biggest Gross Intern Product among the 27 other States. And due to its localization, it is linked to the biggest urban centers of Brazil and to the main ports by federal roads.

The name Minas Gerais is a reference to the fact that, during the 18th and 19th centuries, large mines of gold and precious

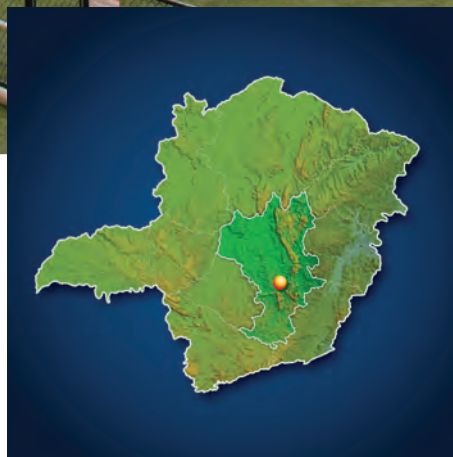
stones were found here. Due to that, some of the historical towns prospered much because of gold, and, therefore, present, since then, a rich architecture: Ouro Preto, Mariana, Barbacena, São João del Rei.

The biggest national mines of iron ore are in Minas Gerais, which is also the biggest national producer of cement, coffee and milk and the second on the production of automobiles and textiles. It also plays an important role in areas like mining, iron works, electroelectronics, food, shoes, and garments. Minas houses the biggest cluster of industries related to biotechnology in the country; the second one of automotive construction, the second one related to metal foundry, and the second biggest livestock.





Belo Horizonte



Belo Horizonte rises from the determination of the Federal Government to replace the capital city of the state of Minas Gerais from Ouro Preto to a region of broader economical expression. It was inaugurated on December, 12th, 1897.

Since then, it has been the stage of rapid industrial development, which has brought, by its turn, the increment of commercial and service activities. Nowadays, Belo Horizonte is a metropolis with 2.5 million

inhabitants, and yet, it can be a welcoming and friendly city. It's Gross Intern Product is around R\$ 87,364 bi.

It is in Belo Horizonte that three of the 12 campuses of CEFET-MG are located. The central administration of CEFET-MG is housed in this city, in Campus Nova Suíça, which was built in the 1950's. It is in CEFET-MG's three campuses that the great majority of courses take place.





Leopoldina

Leopoldina is the largest town located in this geographical area (Zona da Mata). Leopoldina's area of influence presents a highly developed textile industry, which demands a qualified workforce. Due to that, CEFET-MG was invited to construct a campus over there. It started its teaching activities in 1987.

Nowadays, it offers three teaching levels – technical, undergraduation and graduate. Its teaching staff is qualified, and thus, several research groups are found there. It is also very welcoming to foreign students and has had a successful experience, mostly with French and African students.





Araxá

Araxá is located in a plain, and was founded on a volcanic crater. That is why its soil is highly mineralized. Therefore, there are many mining industries installed in the region, especially dedicated to rare earths. Tourism is also a strong economical activity there, due to the mineral water fountains and correlated health treatments. It is no surprise the value of its GIP – R\$ 4,878 bi.

CEFET-MG's unit started working in 1992. Since its beginning, the technical courses offered answered the demands posed by the mining industries. Nowadays, this unit houses two bachelor engineering programs.



Divinópolis

Divinópolis has its roots on the importance the railroads had from late 19th century to middle 20th century in that area of the state of Minas Gerais. It is a rich town, presenting a final GIP of R\$5,478 bi. There, one can find a strong garment and shoe industry along with the mechanical parts industrial park.

CEFET-MG's unit was founded in 1994 due to the demand for well trained workforce presented by this growing industrial park.





Timóteo

Timóteo is located in the same area the most important metallurgical industries are planted. Its GIP is R\$ 2,773 bi. No wonder the requirement for a well prepared workforce that must be up to the challenges presented.

CEFET-MG's unit was created in 2006, not only because of the industrial demand, but also due to the expansion plan projected by the federal government to amplify the number of federal institutions devoted to the technical level teaching. So, Timóteo's unit started only with the technical level, but currently a bachelor engineering program is also offered.





Varginha

Varginha is one of the main Brazilian centers for commerce and production of coffee, since it produces high quality, gourmet brands. The city has an outstanding and strategic localization, since it is at the same distance of the three main cities in Brazil: São Paulo, Rio de Janeiro, and Belo Horizonte.

CEFET-MG's unit in Varginha has been created in 2006 as a result of the technical education expansion plan developed by the federal government, offering a wide range of technical courses and engineering bachelor programs.





Nepomuceno

Nepomuceno is located in the south of Minas Gerais. Therefore, its weather is humid, with very mild summertime. It is near São Paulo state. Coffee plantation is responsible for 70% of the economical life of the town. Along with it, aviculture is the second most important economic activity.

CEFET-MG's unit in Nepomuceno started functioning in 2007. It offers, since then, technical courses and engineering bachelor programs.

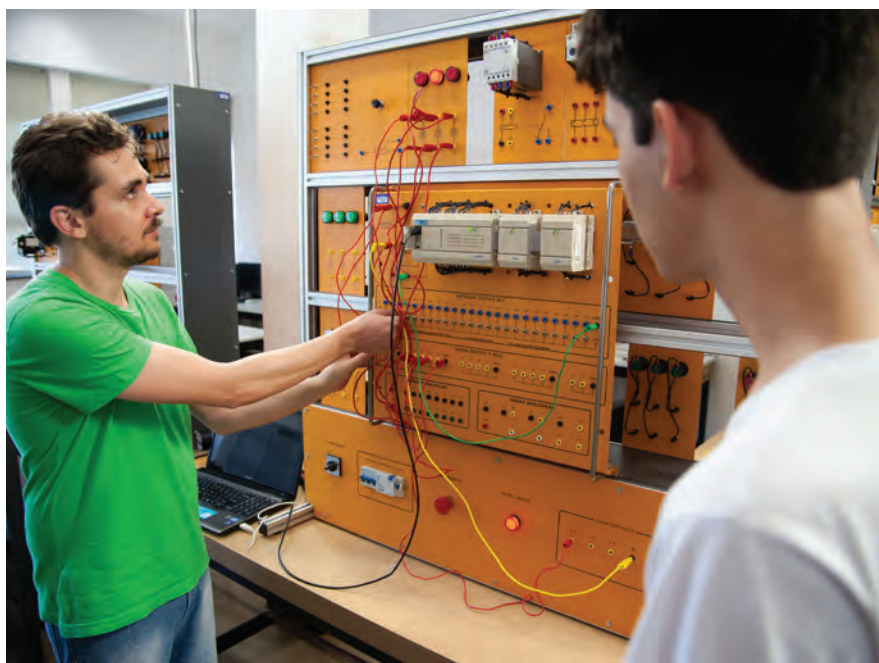




Curvelo

Curvelo is located in the central geographic zone of Minas Gerais in a high mineralized soil: there are large mineral reserves around the town. That is why there are many mining related industries around it.

CEFET-MG's unit in Curvelo was founded in 2006 and currently offers technical and engineering bachelor programs.





Contagem

Contagem is primarily a city of heavy industry with a diversified industrial complex; even though minerals processing and chemicals still have a large importance. The municipality is responsible for 5.28% of the state GDP, occupying third place after Belo Horizonte and Betim. It was the first industrial district built in Minas Gerais. Inaugurated in 1946, by 1950 it was the largest in the state.

CEFET-MG's unit in Contagem was created in 2012, also as a result of the technological education expansion plan designed by the federal government. It offers technical courses as well as an engineering bachelor program.





CEFET-MG in numbers

Campi **11**

Staff

Academic (93% are PhD) **950**

Administrative **662**

Students

Technical level students **6500**

Undergraduation students **6700**

Post-Graduation students **1600**

Technical **38**

Bachelor **28**

Master **14**

Doctorate **7**

Formative route

The formative route adopted by CEFET-MG starts with the technical level and ends up with post-doctoral studies. Therefore, the Institution presents a complete formation possibility for students, so that it is a quite differentiated teaching institution in Brazil. And an important consequence of this pedagogical format can be verified inside the

research groups: students from all levels work together, sharing the same laboratories and being lectured by the same researchers. Moreover, the academic staff gives lectures to all teaching levels. Because of this, CEFET-MG receives research grants for its students from all levels from the federal and state government.









Technical courses

The offered technical courses at CEFET-MG last four years included the period for apprenticeship. As a public, fee free institution, the number of applications is always greater than the available places. Thus, an entrance exam must be taken. They are offered in all campuses, and are organized according to each town's productive arrangements. Besides that, the technical subject matters are delivered along with the general knowledge courses, such as mathematics, geography, history etc. So, the student is able to proceed the studies into undergraduate level.

Technicians certified by CEFET-MG present a solid scientific and technological knowledge, which grants them as able professionals to grasp the productive process as a whole. They are also able to grasp the relationship among the processes and the demands posed by society, as well as to develop a critical view of their own place on the world.

The great majority of these technicians are very well accepted by the job market and many of them pursue higher education level.

Axes	Courses
Environment, Health and Security	Biomedical Equipments, Environment, Environment Control.
Control and Industrial Processes	Electromechanics, Electronics, Electrotechnics, Electroelectronics, Mechanics, Mechatronics, Metallurgy, Chemistry.
Hospitality and Leisure	Hospitality Management.
Information and Communication	Informatics, Informatics for Web, Computer Network.
Infrastructure	Building, Transport and Traffic, Roads.
Cultural Production and Design	Fashion Production.
Natural Resources	Mining.





Bachelor programs

Since 1978, CEFET-MG has been also working on the under graduation level, which has been granted by the Law n# 6.545, from the 30th of June, 1978. The Bachelor Programs offered by CEFET-MG are related to the areas of engineering, administration and management, letters and technological chemistry. It has also been preparing teachers for the technical subject matters given in technical courses.

The under graduate professionals of CEFET-MG are able to face the challenges posed by evolving fields of knowledge, due to the fact that they are prepared to solve problems, to propose technological solutions and to behave as continuous learner. They are also able to supervise projects on their areas of knowledge.

Currently, CEFET-MG offers 23 bachelor programs, which congregate around 6.762 students. These programs are deeply rooted on the historically installed technical level. Besides that, they are the result of the institutional policy that consolidated several areas of knowledge, of the intense academic staff capacitating program, and of the constitution of new and supported research groups. Moreover, several bachelor programs are offered in inner state towns by CEFET-MG's units. This represents an important effort to have a federal, public, and fee free institution of higher education around the State of Minas Gerais.

ENGINEERING BACHELOR PROGRAMS	CAMPUS								
	Belo Horizonte	Leopoldina	Divinópolis	Curvelo	Araxá	Timóteo	Nepomuceno	Varginha	Contagem
Electrical									
Mechanical									
Civil Production									
Control and Automation									
Industrial Automation									
Chemistry									
Computation									
Materials									
Mechatronics									
Environmental									
Mining									
Transport									
Metallurgical									
Civil									
Architecture									
Energy									
Other Programs									
Letters									
Administration									
Teaching Pedagogical Preparation									
Fashion Design									





Post-Graduation programs

This level of teaching started at CEFET-MG in the 1980's, after a Technical Agreement was signed by both CEFET-MG and Loughborough University of Technology, with the support by CAPES and the British Council. The main purpose of the agreement was to develop a master program to enhance the academic staff capacity, so that the Institution could offer bachelor programs other

than Electric and Mechanical Engineering. And at that time, the Master Program on Technology was launched, and in 1991 it had its own group of professors and laboratorial infrastructure. From 2005 on, there was a significant expansion of the number of post-graduation programs: in 2022 CEFET-MG offers 14 master programs and three doctorates.

Master Courses	Starting date	Research Topics
Technological Education	2005	<ul style="list-style-type: none"> • Science, Technology, and Work: Philosophical, Historical, and Sociological Approaches • Formative Processes in Technological Education • Information Technologies, and Education • Educational Practices in Science and Technology
Mathematical and Computational Modeling	2005	<ul style="list-style-type: none"> • Mathematical Applied Methods • Intelligent Systems
Civil Engineering	2007	<ul style="list-style-type: none"> • Analysis and Project of Structures • Construction Materials and Components and • Constructive Processes • Mechanics of Structures
Energy Engineering	2008	<ul style="list-style-type: none"> • Energetic Efficiency • Energetic Systems
Electric Engineering	2009	<ul style="list-style-type: none"> • Systems Analysis and Modeling • Applied Electromagnetism • Electric Power Systems Planning and Operation • Control Systems
Studies of Languages	2009	<ul style="list-style-type: none"> • Literature, Culture and Technology • Discourse, Media and Technology • Language, Teaching, Learning and Technology • Edition, Language and Technology

Materials Engineering	2010	<ul style="list-style-type: none"> • Biomaterials • Recycling • Selection, Processing, and Characterization
Administration	2014	<ul style="list-style-type: none"> • Decision Processes and Systems in Organizational Arrangements
Chemistry	2016	<ul style="list-style-type: none"> • Chemical materials • Theoretical chemistry • Catalysis • Analytical Methods
Mathematics	2017	<ul style="list-style-type: none"> • Functional analysis • Numerical analysis • Basic math education • University mathematics education • Partial differential equations • Algebraic geometry • Differential geometry • Optimization • Dynamic systems • Singularity theory • Number theory • Algebraic topology
Technology of Products and Process	2019	<ul style="list-style-type: none"> • Development of products and processes with biotechnological potential • Process sustainability and environmental control
Mechanical Engineering	2019	<ul style="list-style-type: none"> • Energy efficiency • Efficiency in mechanical systems and processes
Mining Engineering	2019	<ul style="list-style-type: none"> • Engineering geology in mining • Ore and tailings processing
Professional and Technological Education	2019	<ul style="list-style-type: none"> • Educational practices in Vocational and Technological Education • Organization and memories of pedagogical spaces in Vocational and Technological Education
Automation and System	2021	<ul style="list-style-type: none"> • Control, instrumentation and intelligent systems • Internet of things
Doctorate Courses	Starting Date	Research Topics
Mathematical and Computational Modeling	2013	<ul style="list-style-type: none"> • Mathematical Applied Methods • Intelligent Systems
Studies of Languages	2014	<ul style="list-style-type: none"> • Literature, Culture and Technology • Discourse, Media and Technology • Language, Teaching, Learning and Technology • Edition, Language and Technology
Civil Engineering	2016	<ul style="list-style-type: none"> • Construction Components and Construction Processes • Sustainable Construction Materials
Chemistry	2019	<ul style="list-style-type: none"> • Energy storage • Theoretical calculations of the structure and stability of metallic alloys on the nanometer scale • Heterogeneous catalysis for environmental and industrial application • Materials science • Development of supercapacitors and hybrid accumulator devices (redox-capacitive) • Development, characterization and application of polymers and composites • Dynamics of atmospheric reactions involving excited electronic states • Applied electrochemistry • Identification and quantification of organic compounds in complex mixtures • Chemical instrumentation • Magnetochemistry • Preparation of multifunctional hybrid materials • Medicinal inorganic chemistry • Synthesis and characterization of electrochemically active materials • Treatment and operation of industrial waste
Electrical Engineering	2024	<ul style="list-style-type: none"> • Systems Analysis and Modeling • Applied Electromagnetism • Electric Power Systems Planning and Operation • Control Systems
Technological Education	2024	<ul style="list-style-type: none"> • Science, Technology, and Work: Philosophical, Historical, and Sociological Approaches • Formative Processes in Technological Education • Information Technologies, and Education • Educational Practices in Science and Technology
Administration	2025	<ul style="list-style-type: none"> • Decision Processes and Systems in Organizational Arrangements

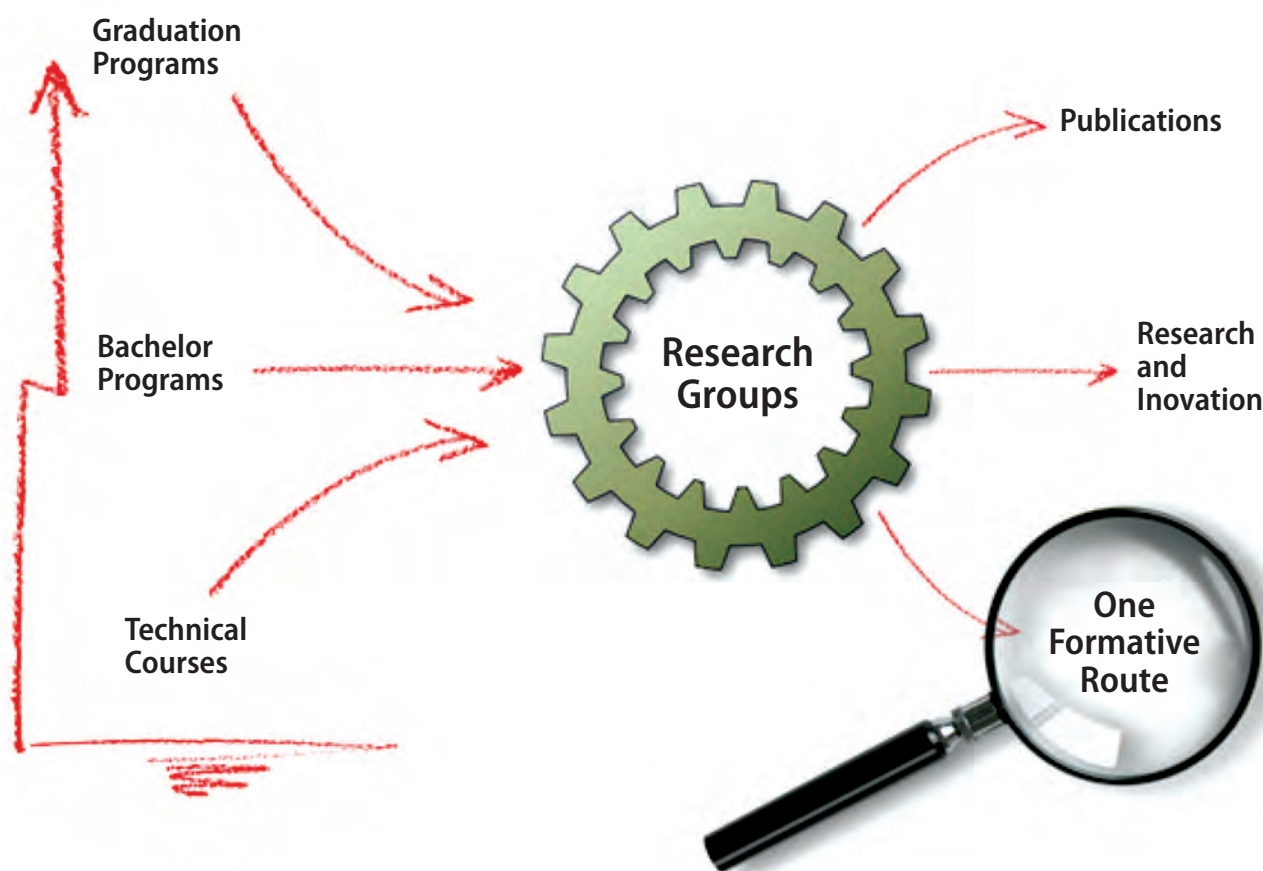
Research

The first research groups belonging to CEFET-MG started their activities in 1990s. Therefore, professors who had the same area of expertise and belonged to the same Department were gathered in research groups to investigate one theme. At that time, 9 groups were formalized and they were responsible to multiply the idea of subscription at CNPq and to give birth to the master programs.

In 2012, there were 106 active research groups at CEFET-MG. This increase has to do with the institutional policy that gave support and incentive to the newly formed groups; that put a lot of value to researchers' actions, and that

increased the number of masters and doctors in the Institution.

Another interesting aspect of the research groups is that they gather students from all levels, i.e., technical, under graduation, master and doctoral, to work in the same project, thus, sharing the same learning environment such as laboratories, classrooms, libraries and so on. As a result, CEFET-MG houses the biggest Junior Research Program, with 180 grants each year. The consequence is that all the students reach the highest level of expertise, they mature as researchers very early, and they are granted with national and international prizes.





Outreach

Concerning this area of actuation, CEFET-MG is tuned with the national policies, proposed by the federal universities, and with the Outreach National Plan, issued in 1999, which defined the direction for the area, i.e., outreach must be embedded with teaching and research; must be interdisciplinary and present a bidirectional relationship with society.

Outreach and community development activities are carried out by projects, programs, and events. All of them emphasize the support and interaction with public policies, which allows access to knowledge and technological development. These actions comprise professional qualification and continued education; technical partnership and knowledge transfer; innovation and development.

Applied engineering

Students at CEFET-MG have always been very enthusiastic about competitions and keen on constructing their own prototypes. Thus, since 1996, they have engaged themselves into participating on national and international competitions concerning the construction of off road cars. So, they have participated on BAJA competitions and have won prizes since then. Having a professor as a tutor, to help them on the necessary research and development, they visit industries to get sponsorship for their needs concerning their cars, airplanes, robots, and funding for their trips. Many of these students are successful entrepreneurs nowadays.

The success achieved by the BAJA group was so motivating that other groups were formed such as the AERODESIGN, to constitute another area of research and development.

Until 2003, these two groups were working and striving to “survive”. There was no formal support or incentive. In 2004, this was changed by the creation of NEAC – a Nucleus of Engineering Applied to Competition, which gave these two original groups a formal existence and an administrative route to apply for support from CEFET-MG.

Since the creation of NEAC, four more groups were formed, with the same enthusiasm. Nowadays, the congregate students from different Bachelor Programs as well as from technical courses and they continue to represent CEFET-MG as the best applied research institution.

Some of the competitions won by NEAC's groups:



BAJA (OFF ROAD CAR)

- 1997 – Champion on the III Competition BAJA SAE Brazil
- 1999 – Champion on the V Competition BAJA SAE Brazil / 2nd place on the Worldwide Competition SAE Midwest EUA
- 2012 – 15th place on the XVIII Competition BAJA SAE Brazil
- 2015 – 8th place on the XXI Competition BAJA SAE Brazil
- 2017 - 6th place on the XXIII Competition BAJA SAE Brazil
- 2018 - 6th place on the XXIV Competition BAJA SAE Brazil



AERODESIGN

- 1999 – 2nd place on SAE Aerodesign Brazil
- 2007 – Champion on the SAE Aerodesign Brazil
- 2008 – 3rd place on SAE Aerodesign East (international)
- 2010 – Champion on SAE Aerodesign East (international)

ECOFET (ENERGY EFFICIENCY)

- 2012 – Champion on the University Marathon of Energy Efficiency
- 2013 - 2nd place on the University Marathon of Energy Efficiency
- 2018 - 2nd place on the Shell Eco-Marathon Brazil
- 2019 - 3rd place Shell Eco-Marathon Brazil



TRINCABOTZ (ROBOTS)

- 2015 – 3rd place on the Submarine URC
- 2015 – 3rd place on the Winter Challenge XI
- 2015 – 2nd place on the Summer Challenge III
- 2016 – 2nd place on the Winter Challenge XII
- 2017 – Champion on the Ultimate Robot Combat
- 2017 – 3rd place on the RoboGames
- 2018 - Champion Winter Challenge
- 2018 - Champion International Robowars Techfest Bombay
- 2019 - Champion Iron Cup
- 2020 - Champion Iron Cup

FORMULA CEFAS (SPEED CARS)

- | | | |
|--|--|--|
| • 2010 – 9 th place on the FSAE | • 2014 – 5 th place on the FSAE | • 2018 - Champion on the FSAE |
| • 2011 – 6 th place on the FSAE | • 2015 – 9 th place on the FSAE | • 2019 - 18th place on the FSAE Lincoln-USA |
| • 2012 – 9 th place on the FSAE | • 2016 – 3 rd place on the FSAE | • 2019 - 5th place on the FSAE |
| • 2013 – 9 th place on the FSAE | • 2017 – 3 rd place on the FSAE | • 2019 - 44th place on the FSAE Michigan-USA |



International affairs

Actually, the international contacts carried out by CEFET-MG have started in the 60s, when teachers have been invited to attend some courses in The United States to deepen their understanding of technological level of teaching. Since it was a national program, the federal government signed a technical agreement with American furtherance agency - USAID. In the 70s, many other missions were carried out to European countries, mainly Germany and France. Nevertheless, it was in the 90s that the international partnerships were considered as an institutional policy, hence appearing

on the official budget of CEFET-MG. Then, technical agreements were signed with universities of applied sciences of Germany and France.

Since 2005, the International Affairs Office has been responsible to propose a new policy for CEFET-MG. As a result, other bilateral agreements were signed aiming not only the student mobility, but also the development of joint research projects and the interchange of professors and researchers.



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The first part of the paper discusses the importance of understanding the local context in which the intervention is being implemented. This includes a thorough understanding of the community's culture, values, and beliefs, as well as the local health system and the role of the community health worker. The second part of the paper describes the intervention itself, which is a community-based approach to improving maternal and child health outcomes. This involves a series of activities, including home visits, group meetings, and the use of educational materials. The third part of the paper presents the results of the intervention, which show a significant improvement in maternal and child health outcomes. The final part of the paper discusses the implications of the findings for future research and practice.



BRAZIL