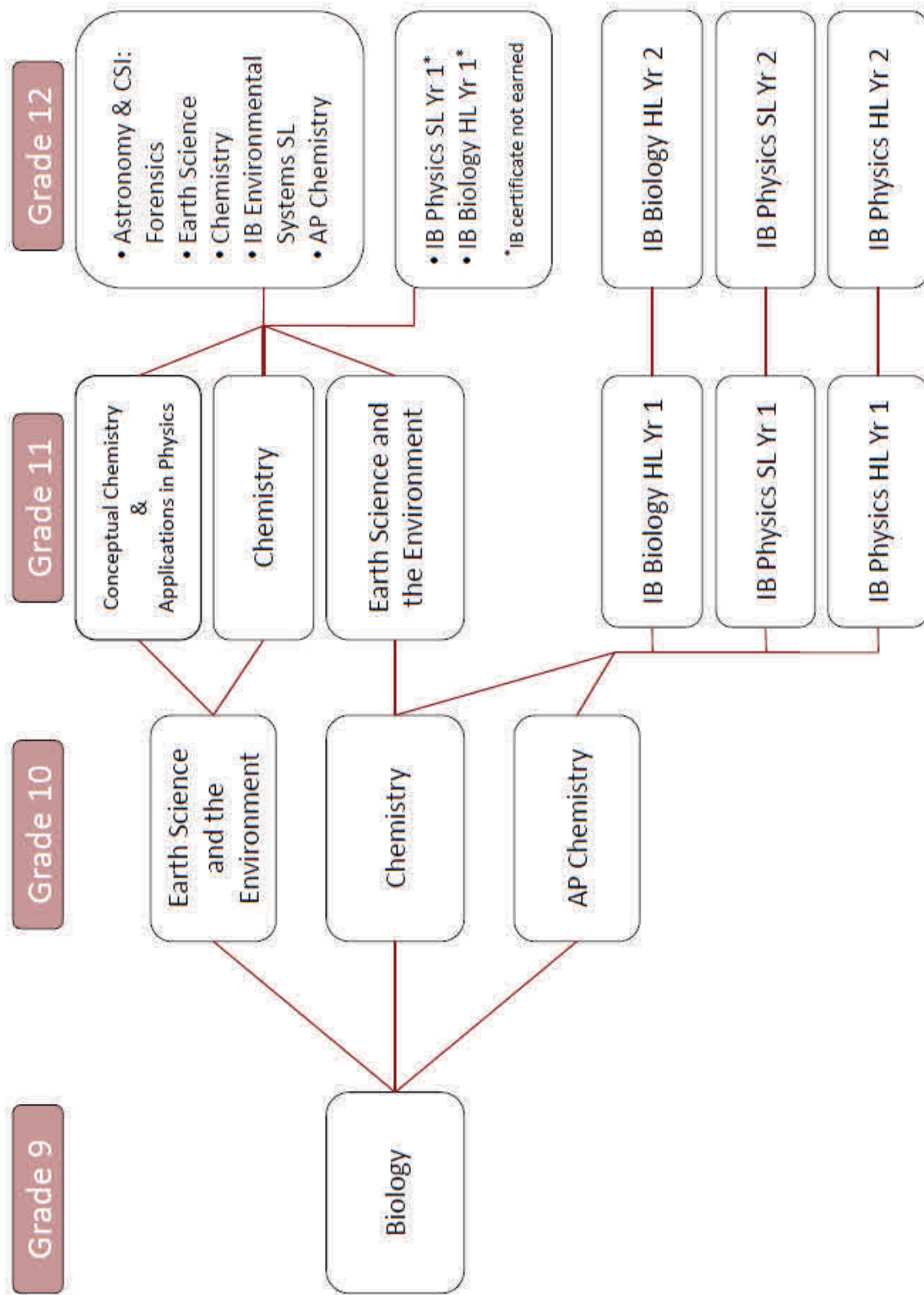


### PATHWAYS IN SCIENCE



# Science and Technology

The Harrison High School Science Department is dedicated to providing each student with a challenging four-year laboratory science program. The four core subjects of biology, earth science, chemistry and physics are offered through a variety of forums including college-level 2-year IB science courses. Through this rigorous program, students will meet the core science requirements for graduation and choose courses that both pique their interest and challenge them.

## BIOLOGY

*Course No.: 421      Grades Offered: 9-12  
Credit: 1.0 (9 periods per 6-day cycle)  
Examination: Regents Exam*

The Biology course goes beyond the New York State Regents syllabus by providing an intensive, in-depth study of living organisms and their interactions with the environment. Advanced topics include the biochemical cellular structures and functions of living organisms, reproduction and the continuation of species, genetic transmission of traits, evolution of species, life functions in humans, and balance in nature. Inquiry, investigation, and analysis techniques are developed through laboratory experiments and projects. Students are required to complete at least 1200 minutes of hands-on laboratory work with satisfactory written reports to be eligible to take the *Living Environment Regents* examination in June. The course will challenge students' science thinking skills in order to prepare them for success in advanced science courses.

## CHEMISTRY

*Course No.: 431      Grades Offered: 10-12  
Credit: 1.0 (8 periods per 6-day cycle)  
Examination: Regents Exam  
Recommended: Successful completion of one year of Biology and Integrated Algebra*

Chemistry is a laboratory course designed to provide students with in-depth investigations into the central topics of chemistry: inorganic chemistry, matter and energy, atomic structure, bonding, the mole concept, solutions, ionization, acids and bases, salts, kinetics and equilibrium, oxidation and reduction reactions, and an introduction to nuclear and organic

chemistry. Laboratory activities, demonstrations, and technology integration enhance a "hands-on" approach. This course meets the New York State Regents standards for Chemistry. Students are required to complete at least 1200 minutes of hands-on laboratory work with satisfactory written reports to be eligible to take the *Chemistry Regents* examination in June. The course will challenge students' science thinking skills in order to prepare students for success in advanced science courses.

## EARTH SCIENCE AND THE ENVIRONMENT

*Course No.: 450      Grades Offered: 10-12  
Credit: 1.0 (9 periods per 6-day cycle)  
Examination: Regents Exam*

Earth Science and the Environment is an inquiry-based lab science that explores the processes that influence our planet. The curriculum centers on in-depth investigation of Earth's atmosphere, land masses and oceans, their physical properties and the processes that govern them. The curriculum includes advanced topics in geology, astronomy and meteorology, and concepts explored will be applied to current environmental problems. Through case-study exploration, lab-based activities, reading, discussion, fieldwork, and technology-based activities, students explore the science behind the interdependence of Earth's systems, population dynamics, and environmental quality. Students are required to complete at least 1200 minutes of hands-on laboratory work with satisfactory written reports to be eligible to take the *Earth Science Regents* examination in June. The course will challenge students' science thinking skills in order to prepare students for success in advanced science courses.

## ADVANCED PLACEMENT & INTERNATIONAL BACCALAUREATE COURSES

### AP CHEMISTRY

*Course No.: 433      Grades Offered: 10-12  
Credit: 1.0 (9 periods per 6-day cycle)  
Examination: AP exam and Regents exam  
Recommended: Successful completion of Chemistry and advanced math course preferred*

AP Chemistry is designed to offer a rigorous and challenging course that addresses the chemistry and chemical principles typical of college and university general chemistry courses. This course provides students with the opportunity to participate in the extended study of many topics introduced in the College Board's Advanced Placement Chemistry Examination courses. Students are required to participate in the College Board's Advanced Placement Chemistry Examination in May, which may lead to college credit and/or higher-level placement in college courses. Success in this course and the AP assessment may lead to college credit and/or higher-level placement. Students are also required to complete at least 1200 minutes of hands-on laboratory work with satisfactory written reports to be eligible to take the *Chemistry Regents* examination in June.

### IB ENVIRONMENTAL SYSTEMS AND SOCIETIES SL

*Course No.: 464      Grades Offered: 11-12  
Credit: 1.0 (9 periods per 6-day cycle)  
IB Assessments: Students will sit for the IB Environmental Systems and Societies SL External Assessment and submit Internal Assessments by the end of this one-year course.  
Recommended: Successful completion of two years of Regents science; Biology and Chemistry preferred*

IB Environmental Systems and Societies SL is a one-year course devoted to enriching student knowledge of the interrelations between the environment and societies both locally and globally. This approach will enable students to adopt an informed personal response to environmental issues faced by society evaluating them from a scientific, ethical and socio-political aspect. Main

# Science and Technology

topics of study in this course will include a detailed study of ecosystems, conservation and biodiversity, pollution and global warming and the environmental value systems. In addition, the course will encompass extensive hands-on laboratory activities which will contribute to the IB Internal Assessment. Success in this course and the IB assessments may lead to college credit and/or higher-level placement.

**Note:** Because this is an interdisciplinary course, students can study this course as either an IB Group 3 or Group 4 course allowing for flexibility and other opportunities to meet the requirements of the IB Diploma.

## IB BIOLOGY HL YEAR 1

Course No.: 424 Grades Offered: 11-12

Credit: 1.0 (8 periods per 6-day cycle)

Recommended: Successful completion of two years of Regents science: Biology and Chemistry preferred

## IB BIOLOGY HL YEAR 2

Course No.: 425 Grades Offered: 12

Credit: 1.0 (8 periods per 6-day cycle)

Pre-requisite: Successful completion of IB Biology HL Year 1

*Examination:* At the end of year 1, students will sit for a local final exam.

*IB Assessments:* At the end of year 2, students will sit for the IB Biology HL External Assessment. During the 2-year course, students will be assessed with IB Biology HL Internal Assessments and the Group 4 Project.

IB Biology HL is a two-year course devoted to enriching student knowledge of biology as well as deepening student understanding of science as a process permeated by different cultural and sociopolitical global environments. Main topics of study in this course will include evolution, cell biology, biochemistry, cellular energetics, Mendelian and molecular genetics, botany, zoology, human physiology, and neurobiology. The course will also emphasize the philosophical challenges presented by advancements in biological research and how these advancements affect global societies and cultures. Students will be expected to grow as reflective, open-minded, creative inquirers - what engaged scientists

must be in order to be successful at their craft. In addition, the course will encompass extensive hands-on laboratory activities which will contribute to the IB Internal Assessment as well as the practical assessment of each student. Such lab work will involve spectrophotometry, microscopy, DNA isolation, DNA and protein gel electrophoresis, protein chromatography, bacterial transformation, and respirometry amongst others. Within the two-year course, students will complete an IB group 4 project with students enrolled in IB Physics and IB Design Technology. Success in this course and the IB assessments may lead to college credit and/or higher-level placement.

**Important Note:** Seniors also have the option of taking this course for 1 year. If students decide to do this, they will not be able to take IB Assessments and earn a Certificate Diploma in IB Biology HL.

## IB PHYSICS SL YEAR 1

Course No.: 444 Grades Offered: 11-12

Credit: 1.0 (8 periods per 6-day cycle)

Recommended: Successful completion of two years of Regents science: Biology and Chemistry preferred

Math Pre- and/or Co-requisite: Successful completion of Integrated Algebra, Geometry and Trigonometry

## IB PHYSICS SL YEAR 2

Course No.: 445 Grades Offered: 12

Credit: 1.0 (8 periods per 6-day cycle)

Pre-requisite: Successful completion of IB Physics SL Year 1

*Examination:* At the end of year 1, students will sit for the Regents Exam in Physics.

*IB Assessments:* At the end of year 2, students will sit for the IB Physics SL External Assessment. During the 2-year course, students will be assessed with IB Physics SL Internal Assessments and the Group 4 Project.

IB Physics SL is a two-year study of topics in classical and modern physics. Algebra and Trigonometry are used in this course. Problem-solving and experimental skills are developed in the context of physics as an international and multi-disciplinary pursuit. Topics covered include: motion, energy, thermal physics, waves, electricity, nuclear physics, power generation and "green" energy. This course will also empha-

size the ethical challenges presented by applications of physical research to our society, such as energy use and the proliferation of nuclear weapons. Students will be expected to grow as reflective, open-minded, creative inquirers. In addition, the course will encompass extensive hands-on laboratory activities which will contribute to the IB Internal Assessment and allow students to complete 1200 minutes of hands-on laboratory work with satisfactory written reports required to be eligible to take the Physics Regents examination in June. Within the two-year course, students will complete an IB group 4 project with students enrolled in IB Physics HL, IB Biology HL and IB Design Technology. Success in this course and the IB assessments may lead to college credit and/or higher-level placement.

**Important Note:** Seniors also have the option of taking this course for 1 year. If students decide to do this, they will not be able to take IB Assessments and earn a Certificate Diploma in IB Physics SL but they will sit for the Regents' physics exam in June.

## IB PHYSICS HL YEAR 1

Course No.: 446 Grades Offered: 11

Credit: 1.0 (8 periods per 6-day cycle)

Recommended: Successful completion of two years of Regents science: Biology and Chemistry preferred

Math Prerequisites: Successful completion of Integrated Algebra, Integrated Geometry and Integrated Trigonometry

## IB PHYSICS HL YEAR 2

Course No.: 447 Grades Offered: 12

Credit: 1.0 (8 periods per 6-day cycle)

Pre-requisite: Successful completion of IB Physics HL Year 1

*Examination:* At the end of year 1, students will sit for the Regents Exam in Physics.

*IB Assessments:* At the end of year 2, students will sit for the IB Physics HL External Assessment. During the 2-year course, students will be assessed with IB Physics HL Internal Assessments and the Group 4 Project.

IB Physics HL is an in-depth two year study of many topics in classical and modern physics. Fluency in algebra and trigonometry is expected for the course. Problem solving and experimental skills are developed in the con-

# Science and Technology

text of physics as an international and multi-disciplinary pursuit. Topics covered include: motion, energy, thermal physics, waves, electricity, magnetism, induction, radiation and optical instruments, quantum physics, nuclear physics, special and general relativity, power generation and "green" energy. This course will also emphasize the ethical challenges presented by applications of physical research to our society, such as energy use and the proliferation of nuclear weapons. Students will be expected to grow as reflective, open-minded, creative inquirers. In addition, the course will encompass extensive hands-on laboratory activities which will contribute to the IB Internal Assessment. Since many more topics are covered in the HL course compared to the SL course, and since the questions and problems encountered will be more involved and complex, students should expect the pace to be more intense than in the SL course, and as a result, a greater level of independent work is required for success. In addition, the course will encompass extensive hands-on laboratory activities which will contribute to the IB Internal Assessment and allow students to complete 1200 minutes of hands-on laboratory work with satisfactory written reports required to be eligible to take the Physics Regents examination in June. Within the two-year course, students will complete an IB group 4 project with students enrolled in IB Physics SL, IB Biology HL and IB Design Technology. Success in this course and the IB assessments may lead to college credit and/or higher-level placement.

## SEMESTER COURSES

### APPLICATIONS IN PHYSICS

*Course No: 442 Grades Offered: 11-12  
Credit: 0.5 (One-semester; 6 periods per 6-day cycle)*

*Examination: Final Project*

*Recommended: Successful completion of two years of high school science*

*\*This course cannot be taken by a student who has already been successful in another physics course.*

This course introduces the basic principles of physics through the study of Motion, Energy, Electricity, Magnetism

and Light and their applications to everyday life. Students will explore these topics through investigations, discussions, demonstrations, and projects. Some arithmetic and basic algebra will be used in this course.

### CONCEPTS IN CHEMISTRY

*Course No: 434 Grades Offered: 11-12  
Credit: 0.5 (One-Semester; 6 periods per 6-day cycle)*

*Examination: School Exam*

*Recommended: Successful completion of two years of high school science*

*\*This course cannot be taken by a student who has already been successful in another chemistry course.*

This course introduces the basic principles of chemistry through the study of matter and energy, atomic structure, bonding and chemical reactions, properties of solutions and an introduction to nuclear and organic chemistry. Students will explore these topics through investigations, discussions, demonstrations, and projects. Some arithmetic and basic algebra will be used in this course.

### ASTRONOMY

*Course No.: 451 Grades Offered: 12  
Credit: 0.5 (One-Semester; 6 periods per 6-day cycle)*

*Examination: Final Project*

*Recommended: Successful completion of two years of high school science; Earth Science preferred.*

Astronomy is a one-semester course in which students use a hands-on approach to explore fundamental concepts in astronomy. Topics covered include planets and the solar system, stars, galaxies, satellites, and astronomical technology. Planetarium projections are used to introduce and reinforce course topics.

### CSI: FORENSICS CRIMINAL SCIENCE

*Course No.: 454 Grades Offered: 12  
Credit: 0.5 (One-Semester; 6 periods per 6-day cycle)*

*Examination: School Exam*

*Recommended: Successful completion of two years of high school science; Biology preferred.*

Forensic Science is a one-semester course designed to capture students' interests by applying science skills to a contemporary professional field--law

enforcement. Concepts taught are reinforced when students collect physical evidence from simulated crime scenes and analyze collected samples in the lab. Materials for laboratory tests and analysis will be presented as "unknowns" wherever possible. Students will discuss simulated crime scene investigations available through the internet, television drama, and history.

## HARRISON SCIENCE RESEARCH

### The Three-Year Span of the Science Research Course

In order to assist Harrison students to become proficient and independent science researchers, Harrison High School has designed a three-year program of study for interested students. Students in their sophomore year begin the process of conducting their own independently developed science research by concentrating on learning a number of research and associated skills including how to present and manage time. This process continues to become refined as students transition to their junior year. At this point in the program, students begin to experiment and collect data and refine hypotheses. Some competitions, such as the JSHS and the ISEF may be entered. In their final transition to senior year, students in the program write their research paper based on the format used in scientific journal articles. Students are also expected to present their final research paper to the Harrison community, are encouraged to enter competitions and make an attempt to publish their research paper.

**Note:** *Students may elect to take this course for college credit and earn up to 12 credits through the University at Albany "University in the High School" program in Science Research II and III if specific criteria are met.*

#### HARRISON SCIENCE RESEARCH I

*Course No.: 460      Grades Offered: 10-12  
Credit: 0.5 (Alternate Day All Year)  
Examination: Project and Presentation*

In this introductory course, students learn the fundamentals of The Scientific Method including researching topics, hypothesizing, controlled experimenting and data analysis. A major portion of this course will include in-depth research of a topic of interest and networking with scientists in that field of study. To achieve this, students also learn search techniques for finding literature, time management, and the importance of detailed record keeping. This course prepares students for the more detailed and independent research completed by students in Harrison Research II and III.

#### HARRISON SCIENCE RESEARCH II AND III

*Course No.: 458 (II) 462 (III)      Grades Offered: 11-12  
Credit: 0.5 (Alternate Day All Year)  
Examination: Project and Presentation  
Recommended: Introduction to Science Research*

The Harrison Science Research program invites all students to participate in authentic and original scientific research. This course encourages students to work with research scientists and professionals within their chosen area of interest. Students may conduct independent research in mathematics, life science, physical science, psychology, or the social sciences and are required to use technology to organize research (presentation software and data management systems). Students maintain a portfolio of their work, which provides the basis for assessment. All students prepare to enter local, regional, national, and in-

## Technology

Design & Drawing for Production (1)

Integrated Technology (1)

- IB Design Technology SL Year 1 (1)
- IB Design Technology HL Year 1 (1)

- *IB Design Technology SL Year 2 (1)*
- *IB Design Technology HL Year 2 (1)*

### DESIGN AND DRAWING FOR PRODUCTION (DDP)

Course No.: 661 Grades Offered: 9-12  
Credit: 1.0 (6 periods per 6-day cycle)  
Examination: School Exam

Students will develop an understanding of the elements and principles that comprise the universal language of technical drawing and design. Students will use the creative design process to design, develop, and revise drawing plans to produce a three-dimensional model. Problem-solving using the design cycle will be emphasized. This class will examine both past and present applications of both architectural and product and package design. Students will learn Computer-Aided Design (CAD). This course fulfills the New York State Art requirement for graduation as well as provides a foundation of knowledge and skills for the International Baccalaureate Design Technology curriculum.

### INTEGRATED TECHNOLOGY

Course No.: 667 Grades Offered: 10-12  
Credit: 1.0 (6 periods per 6-day cycle)  
Examination: School Exam  
Prerequisite: Design and Drawing for Production

Students enrolled in Integrated Technology will continue their study of the human-made world in an integrative, hands-on environment. The primary focus of this course will be problem-solving in a variety of content areas and using a variety of tools and meth-

ods, in an effort to better understand the impact of technology on society. Major topics include Manufacturing, Architectural Design and Engineering. Students will work both independently and as members of teams. They will continue their study and use of AutoCAD software as a product documentation and communication tool. Students will be instructed in the safe and proper use of several power tools in order to create product prototypes and may also build scale models. This course is integral in the preparation of students to continue in the Technology strand in IB Design Technology.

### IB DESIGN TECHNOLOGY SL YEAR 1

Course No.: 670 Grades Offered: 11-12  
Credit: 1.0 (6 periods per 6-day cycle)  
Prerequisite: Design and Drawing for Production and Integrated Technology

### IB DESIGN TECHNOLOGY SL YEAR 2

Course No.: 672 Grades Offered: 12  
Credit: 1.0 (6 periods per 6-day cycle)  
Prerequisite: Successful completion of IB Design Technology SL Year 1

Examination: At the end of year 1, students will sit for a local final exam.

IB Assessments: At the end of year 2, students will sit for the IB Design Technology SL External Assessment. During the 2-year course, students will be assessed with IB Design Technology SL Internal Assessments and the Group 4 Project.

This 2-year course aims to teach students not only design and technology, but also how to adapt to new experi-

ences, how to approach problems with the appropriate skills and techniques to identify the problem's important elements and develop optimum solutions. Core topics included are the design cycle, product innovation, green design, materials, product design and development, evaluation, advanced manufacturing techniques, and sustainable development. Students will be given the opportunity to deal with realistic problems and to synthesize appropriate solutions which will require students to use extensive hands-on experimental and investigative design that will contribute to the IB Internal Assessment. Success in this course and the IB assessments may lead to college credit and/or higher-level placement.\*

### IB DESIGN TECHNOLOGY HL YEAR 1

Course No.: 671 Grades Offered: 11-12  
Credit: 1.0 (6 periods per 6-day cycle)  
Prerequisite: Design and Drawing for Production and Integrated Technology

### IB DESIGN TECHNOLOGY HL YEAR 2

Course No.: 673 Grades Offered: 12  
Credit: 1.0 (6 periods per 6-day cycle)  
Prerequisite: Successful completion of IB Design Technology HL Year 1

Examination: At the end of year 1, students will sit for a local final exam.

IB Assessments: At the end of year 2, students will sit for the IB Design Technology HL External Assessment. During the 2-year course, students will be assessed with IB Design Technology HL Internal Assessments and the Group 4 Project.

In this course, all of the topics described in the SL description above will be studied. In addition, students enrolled in the HL option will study energy, structures, mechanical design, advanced manufacturing techniques, and sustainable development.\*

**\*Important Note:** Seniors also have the option of taking IB Year 1 courses. If students decide to do this, they will not be able to take IB Assessments and earn a Certificate in IB Design Technology HL/SL.