

**IBDP COURSE OVERVIEW (2020- 2021)**  
**SCHOOL CODE: 049091**

**GROUP 1: ENGLISH LANGUAGE AND LITERATURE**

Course Duration DP1 28 weeks DP2 25 Weeks

**Course General Description**

Studies in English language and literature courses explore elements of language and literature. Each also focuses on the relationships between texts, readers and writers; on the range and functions of texts across geographical space and historical time; and on aspects of intertextuality. The study of literary, non-literary, visual and performance texts provides a focus for understanding how meaning is constructed within belief or value systems, and how it is negotiated across multiple perspectives generated by single or multiple readers. Thinking critically about texts, as well as responding to, producing or performing them, leads to an understanding of how language sustains or challenges ways of thinking and being. The study additionally builds an awareness that all texts may be understood in relation to their form, content, purpose, audience and their associated contexts, such as social, historical and cultural circumstances.

**Course Aims and Goals**

The aims in studies in language and literature are to enable students to:

1. engage with a range of texts, in a variety of media and forms, from different periods, styles, and cultures
2. develop skills in listening, speaking, reading, writing, viewing, presenting and performing
3. develop skills in interpretation, analysis and evaluation
4. develop sensitivity to the formal and aesthetic qualities of texts and an appreciation of how they contribute to diverse responses and open up multiple meanings
5. develop an understanding of relationships between texts and a variety of perspectives, cultural contexts, and local and global issues and an appreciation of how they contribute to diverse responses and open up multiple meanings
6. develop an understanding of the relationships between studies in language and literature and other disciplines
7. communicate and collaborate in a confident and creative way
8. foster a lifelong interest in and enjoyment of language and literature.

**Course Objectives:**

| <b>Assessment objective</b>           | <b>Which component addresses this assessment objective?</b> | <b>How is the assessment objective addressed?</b>   |
|---------------------------------------|---|---|
| <b>Know, Understand and Interpret</b> | <b>Paper 1</b>  | The response to a previously unseen non-literary passage requires students to show their knowledge and understanding of texts and text types and their ability to establish their own interpretation from the text and to come to conclusions about it. |
|                                       | <b>Paper 2</b>  | The essay on two works requires students to show their knowledge and understanding of the works and interpret their implications, and their similarities and differences, in connection with a given focus.   |
|                                       | <b>Internal Assessment</b>                                  | Students are required to demonstrate knowledge and understanding of one non-literary text and one work in their course of studies and interpret them in relation to a global issue.   |
|                                       | <b>HL Essay</b>   | Students are required to demonstrate knowledge and understanding of one of the texts or works studied in relation to a line of inquiry they have selected.  |
| <b>Analyse and Evaluate</b>           | <b>Paper 1</b>  | Students are required to explore a previously unseen non-literary passage and write a response to it analysing and evaluating how the writer's choices have contributed to meaning.   |

|                    |                            |  |
|--------------------|----------------------------|--|
|                    | <b>Paper 2</b>             | Students are required to write a comparative analysis and evaluation of two of the works studied in terms of the demands of a given question.  |
|                    | <b>Internal Assessment</b> | Students are required to evaluate one non-literary text and one work studied in terms of a global issue present in both of them and analyse and evaluate how their unique perspectives are constructed by means of the authors' choices. |
|                    | <b>HL Essay</b>            | Students are required to analyse and evaluate one of the texts or works studied in relation to a line of inquiry of their own choice.  |
| <b>Communicate</b> | <b>Paper 1</b>             | Students are required to write a formal, well-organized and well-focused response using language appropriate to a formal essay.  |
|                    | <b>Paper 2</b>             | Students are required to write a formal essay which is well-organized, which offers a balanced comparison between two works, and which is clearly focused on a given question.   |
|                    | <b>Internal Assessment</b> | Students are required to deliver a well-organized, coherent, convincing and balanced oral which focuses on a global issue of their own choice.   |
|                    | <b>HL Essay</b>            | Students are required to write a formal essay exploring a line of inquiry in relation to a text or work. The essay should be formal, well-structured and should evidence good citation and referencing skills.                           |

#### Course Main Resources:

- Prescribed Texts: A View from the Bridge by Arthur Miller
- Prescribed Texts: Persepolis - The Story of a Childhood and the Story of a Return by Marjane Satrapi

#### Links with Diploma Programme Teachers

Developing critical thinking skill is imperative for teaching and learning in the 21<sup>st</sup> century. TOK can be summarised as the acquisition and production of knowledge or in simpler terms, how do we what we know. It also leads us to a broader concept of discussing issues which concern the world. In fact, the new TOK curriculum focuses on making the subject relatable to subject by focussing on the world around us. During department meetings, while discussing the units being taught at various levels, we will discuss how to inculcate the habit questioning in our students, where they learn to question and reflect upon various issues like war, discrimination, world peace etc in order to create sensitive citizens of tomorrow.

#### Assessment Components

Internal assessment will be briefly introduced during the orientation week just to provide a glimpse of the task at hand. Formally the internal assessment will be introduced towards the end of 2nd term of year 1. Sample IA will be used to explain the formal requirements. Sample IA marking will help the students to unpack the assessment criterion.

| <b>Year 1</b>           | <b>Activity / Plan</b>   |
|-------------------------|--|
| July                    | Introduction to IB. English Lang & Lit, Assessment Criteria, Portfolio |
| July/August/ September  | Representation, Transformation & Perspective                           |
| October /November       | Creativity & Communication   |
| November                | Portfolio Review & Revision for Term Exams                             |
| December                | Term 1 Exams   |
| January/ February       | Creativity & Communication & Introduce the HL Essay                    |
| March                   | Portfolio Review & Revision for Term Exams                             |
| April – May             | Term 2 Exams   |
| <b>Year 2</b>           | <b>Activity / Plan</b>   |
| July /August/ September | Identity & Culture   |
| October/ November       | Final IO SL  |
| November                | Portfolio Review & Revision for Term Exams                             |
| December                | Term 1 Exams   |
| January                 | Revision<br>Final Written Task (HL only)                               |
| January/February        | Final IO HL  |

**International Mindedness**

Intertextuality – Culture

Students will understand the cultural differences in different parts of the world to sensitise them to the gender differences in political set up (with reference to Marjane Satrapi's Persepolis).

Task: Students will be shown the following videos and asked to express their views about the cultural set up and gender issues shared in the video.

Vidéo : <https://www.youtube.com/watch?v=Ud7drkKt2mo> ; <https://www.youtube.com/watch?v=atYAj-lmJBk>**Development of the IB Learner Profile**

Open-Minded – While looking at the Units on Perspectives students will be able to appreciate that there are multiple perspectives while dealing with a single issue, for example in the graphic novel, Persepolis, the writer Marjane Satrapi wants to convey the message to the world that Iran is a country with a rich heritage and culture and should not be perceived only as a land of religious bigotry.

**Course Syllabus**

| Unit title  | Duration (teaching periods)             | Unit content (topics)  | Objectives   | Assessment tools; Assessment criteria  | Summative assessment                                | ATL   | LP and CAS/Service links   | Links with TOK/Critical thinking  | Links with other subjects/interdisciplinary links                        |
|---|---|--|--|--|---|---|----------------------------|---|--|
| DP 1<br>Unit 1<br><br>Representation & Perspectives | 8 weeks<br>(July 2020)                  | Photography by Steve McCurry<br><br>Advertisements – Gender Bias<br><br>Cartoons | 1. Engage with a range of texts, in a variety of media and forms, from different periods, styles, and cultures<br>2. Develop skills in interpretation, analysis and evaluation   | Know, understand and interpret:<br>• a range of texts, works and/or performances, and their meanings and implications<br>contexts in which texts are written and/or received<br>elements of literary, stylistic, rhetorical, visual and/or performance craft | Oral Presentation<br><br>Textual Analysis (Paper 1) | Critical Thinking<br><br>Communication      | Thinkers<br><br>Reflective | KQ -<br>To what extent is our perspective influenced by our beliefs and faith?                      | Art (Style)<br><br>Psychology (Human Behaviour)<br><br>History (Context) |
| DP 1<br>Unit 2<br><br>Culture/ Identity             | 10 weeks<br>(September – November 2020) | Graphic Novel – Persepolis by Marjane Satrapi                                    | Develop sensitivity to the formal and aesthetic qualities of texts<br><br>Develop an understanding of relationships between texts and a variety of perspectives, cultural contexts, and local and global issues and an appreciation of how | Know, understand and interpret:<br>contexts in which texts are written and/or received<br>elements of literary, stylistic, rhetorical, visual and/or performance craft   | Comparative Essay Writing (Paper 2)                 | Communication Skills<br><br>Self-Management | Open-minded                | KQ – In what way do ethics and values determine our relationships with individuals and the society? | Art (Graphics)<br><br>History (Background & Context)                     |

|                                |                                     |  |   |   |   |   |                                  |   |                              |
|--------------------------------|-------------------------------------|--|---|---|---|---|----------------------------------|---|------------------------------|
|                                |                                     |  | they contribute to diverse responses and open up multiple meanings  | features of text types and literary forms.<br><br>Analyse and evaluate:<br><br>ways in which the use of language creates meaning. uses and effects of literary, stylistic, rhetorical, visual or theatrical techniques. ways in which texts may offer perspectives on human concerns.   |   |   |                                  |   |                              |
| DP 1<br>Unit 3<br><br>Identity | 8 weeks<br>(January-<br>March 2021) | Drama- Black<br>Comedy by Peter<br>Shaffer | develop an understanding of relationships between texts and a variety of perspectives, cultural contexts, and local and global issues and an appreciation of how they contribute to diverse responses and open up multiple meanings<br>Develop sensitivity to the formal and aesthetic qualities of texts and an appreciation of how they contribute to diverse responses and open up multiple meanings | Know, understand and interpret:<br><br>contexts in which texts are written and/or received<br><br>elements of literary, stylistic, rhetorical, visual and/or performance craft<br><br>features of particular text types and literary forms.<br><br>Analyse and evaluate:<br><br>ways in which the use of language creates meaning<br><br>uses and effects of literary, stylistic, | Comparative<br>Essay Writing<br>(Paper 2) | Teaching<br>developed in local<br>and global<br>contexts<br><br>Thinking Skills | Knowledgeable and<br>Open-minded | To what extent does the indigenous knowledge systems determine influence the way people perceive the world. | Psychology (Human Behaviour) |

|   |                                      |   |   |  |                                    |  |                                |  |  |
|---|--------------------------------------|---|---|--|------------------------------------|--|--------------------------------|--|--|
|   |                                      |   |   | rhetorical, visual or theatrical techniques<br><br>ways in which texts may offer perspectives on human concerns.   |                                    |  |                                |  |  |
| <b>DP 2</b><br>Unit 1<br><br>Creativity | 4 weeks<br>(July- September 2021)    | Song Lyrics – Bob Dylan<br><br>Web – Series – Games of Throne | engage with a range of texts, in a variety of media and forms, from different periods, styles, and cultures<br>2.<br>develop skills in listening, speaking, reading, writing, viewing, presenting and performing  | Know, understand and interpret:<br>• a range of texts, works and/or performances, and their meanings and implications<br>• contexts in which texts are written and/or received<br>• elements of literary, stylistic, rhetorical, visual and/or performance craft features of particular text types and literary forms. | IO                                 | Communication Skills<br>Thinking Skills<br><br>Reflective Skills | Communicator<br><br>Reflective | To what extent is art representative or an imitation of real life?                 | History (Background & Context)<br><br>Art - (Creativity & Culture) |
| DP 2<br>Unit 2<br><br>Culture           | 4 weeks<br>(October – November 2021) | Short Stories by Anton Chekov                                 | Develop sensitivity to the formal and aesthetic qualities of texts and an appreciation of how they contribute to diverse responses and open up multiple meanings<br><br>Develop an understanding of relationships between texts and a variety of perspectives, cultural contexts, and local and | understand and interpret:<br><br>contexts in which texts are written and/or received<br><br>elements of literary, stylistic, rhetorical, visual and/or performance craft Features of particular text types and literary forms.   | IO/<br>Comparative Essay (Paper 2) | Teaching based on Enquiry<br><br>Thinking Skills                 | Reflective                     | In what way does our knowledge of human behaviour determined by sense perceptions? | History (Background & Context)<br><br>Psychology (Human Behaviour) |

|  |  |   |   |  |  |  |  |  |
|--|--|---|---|--|--|--|--|--|
|  |  | global issues and an appreciation of how they contribute to diverse responses and open up multiple meanings | Analyse and evaluate:<br>ways in which the use of language creates meaning<br><br>uses and effects of literary, stylistic, rhetorical, visual or theatrical techniques<br><br>ways in which texts may offer perspectives on human concerns. |  |  |  |  |  |
|--|--|---|---|--|--|--|--|--|

**GROUP 2: LANGUAGES ACQUISITION**

Course duration - DP1 28 weeks DP2 25 Weeks

**Course general description**

Learning to speak another's language means taking one's place in the human community. It means reaching out to others across cultural and linguistic boundaries. Language is far more than a system to be explained. It is our most important link to the world around us. Language is culture in motion. It is people interacting with people.

The ability to communicate in a variety of modes in more than one language is essential to the concept of an international education that promotes multilingualism and intercultural understanding, both of which are central to the IB's mission.

All IB programmes require the students to study, or study in, more than one language because we believe that communicating in more than one language provides excellent opportunities to develop intercultural understanding and respect.

The courses in the DP language acquisition subject group share some common aims, namely to:

- encourage students to gain competence in an additional language with the long-term goal of multilingualism
- enable students to develop lifelong learning skills
- encourage students to develop an awareness and understanding of the perspectives of people from other cultures.

## **Course aims and goals**

### **German/Spanish/Hindi/French**

The following aims are common to both language B and language ab initio.

1. Develop international mindedness through the study of languages, cultures, and ideas and issues of global significance.
2. Enable students to communicate in the language they have studied in a range of contexts and for a variety of purposes.
3. Encourage, through the study of texts and through social interaction, an awareness and appreciation of a variety of perspectives of people from diverse cultures.
4. Develop students' understanding of the relationship between the languages and cultures with which they are familiar.
5. Develop students' awareness of the importance of language in relation to other areas of knowledge.
6. Provide students, through language learning and the process of inquiry, with opportunities for intellectual engagement and the development of critical- and creative-thinking skills.
7. Provide students with a basis for further study, work and leisure through the use of an additional language.
8. Foster curiosity, creativity and a lifelong enjoyment of language learning.

## **Course objectives:**

### **SL and HL (French, German, Spanish, Hindi)**

Language B is a language acquisition course designed for students with some previous experience of the target language. In the language B course, students further develop their ability to communicate in the target language through the study of language, themes and texts. In doing so, they also develop conceptual understandings of how language works, as appropriate to the level of the course. Most language B subjects are available at both SL and HL.

The following assessment objectives are common to both language B and language ab initio. The level of difficulty of the assessments, and the expectations of student performance on the tasks, are what distinguishes the three modern language acquisition courses.

1. Communicate clearly and effectively in a range of contexts and for a variety of purposes.
2. Understand and use language appropriate to a range of interpersonal and/or intercultural contexts and audiences.
3. Understand and use language to express and respond to a range of ideas with fluency and accuracy.
4. Identify, organize and present ideas on a range of topics.
5. Understand, analyse and reflect upon a range of written, audio, visual and audio-visual texts.

### **AB INITIO (Spanish, German)**

IBDP AB INITIO is a two-year modern language program designed for students who do not have any prior knowledge of the target language but wish to study it. The Language Ab Initio course is organized into five themes: I and Myself, Experiences, Human Ingenuity, Social Organization and Sharing the Planet. Each theme has a list of subtopics that provide the students with opportunities to practice and explore the

language as well as to develop intercultural understanding through the development of receptive, productive and interactive skill, students should be able to respond and interact appropriately in a defined range of everyday situations.

**Course assessment structure and criteria:**

The assessments objectives are:

1. Communicate clearly and effectively in a range of contexts and for a variety of purposes
2. Understand and use language appropriate to a range of interpersonal and/or intercultural contexts and audiences.
3. Understand and use language to express and respond to a range of ideas with fluency and accuracy
4. Identify, organize and present ideas on a range of topics.
5. Understand, analyse and reflect upon a range of written, audio, visual and audio-visual texts.

**French**

| Assessment component   | Weighting  |
|--|------------|
| <b>External assessment (3 hours)</b>   | <b>75%</b> |
| <b>Paper 1 (1 hour 15 minutes)</b>   | <b>25%</b> |
| Productive skills—writing (30 marks)<br>One writing task of 250–400 words from a choice of three, each from a different theme, choosing a text type from among those listed in the examination instructions. |            |
| <b>Paper 2 (1 hour 45 minutes)</b>   | <b>50%</b> |
| Receptive skills—separate sections for listening and reading (65 marks)  |            |
| Listening comprehension (45 minutes) (25 marks)  | 25%        |
| Reading comprehension (1 hour) (40 marks)  | 25%        |
| Comprehension exercises on three audio passages and three written texts, drawn from all five themes.   |            |
| <b>Internal assessment</b>   | <b>25%</b> |
| This component is internally assessed by the teacher and externally moderated by the IB at the end of the course.  |            |
| <b>Individual oral assessment</b>  |            |
| A conversation with the teacher, based on a visual stimulus, followed by discussion based on an additional theme. (30 marks)   |            |

**Ab Initio German, Ab Initio Spanish**

| Assessment component  | Weighting  |
|---|------------|
| <b>External assessment (2 hours and 45 minutes)</b>   | <b>75%</b> |
| <b>Paper 1 (1 hour)</b>   | <b>25%</b> |
| Productive skills—writing (30 marks)<br>Two writing tasks of 70-150 words from a choice of three, choosing a text type for each task from among those listed in the examination instructions. |            |
| <b>Paper 2 (1 hour 45 minutes)</b>  | <b>50%</b> |
| Receptive skills—separate sections for listening and reading (65 marks)   |            |
| Listening comprehension (45 minutes) (25 marks)   | 25%        |
| Reading comprehension (1 hour) (40 marks)   | 25%        |

|   |            |
|---|------------|
| Comprehension exercises on three audio passages and three written texts, drawn from all five themes.  | 25%        |
| <b>Internal assessment</b><br>This component is internally assessed by the teacher and externally moderated by the IB at the end of the course.                   | <b>25%</b> |
| <b>Individual oral assessment</b><br>A conversation with the teacher, based on a visual stimulus, followed by discussion based on an additional theme. (30 marks) |            |

### Course main resources

|                |   |
|----------------|---|
| <b>French</b>  | <ol style="list-style-type: none"> <li>1. Le monde en français Coursebook 2nd edition-Cambridge University Press</li> <li>2. IB French B Course Book Pack: Oxford IB Diploma Programme 2nd edition-Oxford</li> <li>3. French B for the IB Diploma Second edition-Hodder Publication</li> <li>4. French B for the IB Diploma Grammar and Skills Workbook Second Edition- Hodder Education</li> <li>5. <a href="https://www.lepointdufle.net/">https://www.lepointdufle.net/</a></li> <li>6. <a href="https://www.podcastfrancaisfacile.com/">https://www.podcastfrancaisfacile.com/</a></li> <li>7. <a href="https://www.inthinking.net/">https://www.inthinking.net/</a></li> <li>8. <a href="https://www.memrise.com/course/80483/ib-french-vocabulary/">https://www.memrise.com/course/80483/ib-french-vocabulary/</a></li> <li>9. <a href="https://quizlet.com/295732173/ib-french-flash-cards/">https://quizlet.com/295732173/ib-french-flash-cards/</a></li> </ol>   |
| <b>German</b>  | <ol style="list-style-type: none"> <li>1. IBDP Cambridge Deutsch im Einsatz,</li> <li>2. Netzwerk A1- A2- B1, Studio D A1 -A2 –B1</li> <li>3. Schubert A1-A2-B1</li> <li>4. Menschen A1-A2-B1</li> <li>5. <a href="https://www.hueber.de/beste-freunde">https://www.hueber.de/beste-freunde</a></li> <li>6. <a href="https://www.hueber.de/menschen/unterrichtsservice">https://www.hueber.de/menschen/unterrichtsservice</a></li> <li>7. <a href="https://www.goethe.de/en/spr/kup/prf/prf/sd1.html">https://www.goethe.de/en/spr/kup/prf/prf/sd1.html</a></li> <li>8. <a href="https://www.goethe.de/en/spr/kup/prf/prf/gzsd2.html">https://www.goethe.de/en/spr/kup/prf/prf/gzsd2.html</a></li> <li>9. <a href="https://www.nthuleen.com/">https://www.nthuleen.com/</a></li> <li>10. <a href="https://www.dw.com/de/deutsch-lernen/s-2055">https://www.dw.com/de/deutsch-lernen/s-2055</a></li> <li>11. <a href="https://www.pasch-net.de/de/lernmaterial.html">https://www.pasch-net.de/de/lernmaterial.html</a></li> <li>12. <a href="https://lingua.com/de/deutsch/lesen/">https://lingua.com/de/deutsch/lesen/</a></li> </ol> |
| <b>Spanish</b> | <ol style="list-style-type: none"> <li>1. <i>Panorama Hispanohablante</i></li> <li>2. <i>Diverso, Diverso Activity book</i></li> <li>3. <a href="http://www.todoele.net/index.html">http://www.todoele.net/index.html</a></li> </ol>  |
| <b>Hindi</b>   | <ol style="list-style-type: none"> <li>1. Abhivyati <a href="https://www.abhivyakti-hindi.org/">https://www.abhivyakti-hindi.org/</a></li> <li>2. Hindi samay <a href="https://www.hindisamay.com/">https://www.hindisamay.com/</a></li> <li>3. Naveenatam hindi samaacaar</li> <li>4. <a href="https://hindi.webdunia.com/bbc-hindi-news">https://hindi.webdunia.com/bbc-hindi-news</a></li> </ol>   |

### TOK Links with Diploma Programme teachers

Theory of knowledge (TOK) is a course that is fundamentally about critical thinking and inquiry into the process of knowing rather than about learning a specific body of knowledge. The TOK course examines the nature of knowledge and how we know what we claim to know. It does this by encouraging students to analyse knowledge claims and explore questions about the construction of knowledge. The task of TOK is to emphasize connections between areas of shared knowledge and link them to personal knowledge in such a way that an individual becomes more aware of his or her own perspectives and how they might differ from others.

Different activities would be conducted in class to encourage the students to analyse knowledge claims and explore questions about the construction of knowledge. One such activity is listed below:

In the IBDP German B Classroom:

Theme: Identities

The topic « Stereotypes » would be introduced in the class through a reading comprehension text which is based on the same topic. The students would be given an impulse for the TOK « to what extent do the main protagonists in the text influenced by the typical Germans? »

The same would be followed by a discussion « who are the typical Germans? »

After discussions on the above questions, the students would work in groups and present their perspectives to the following TOK questions:

1. « To what extent stereotypes affect our cultural identities? »
2. « To what extent our stereotypical behaviours affect our social relationships? »

### **Assessment components**

#### **IBDP SL**

Orientation would be conducted in the beginning of the session in the month of July, wherein the internal and external assessment requirements would be explained along with the subject overview and the curriculum.

- The preparation for the IB external and internal assessment is an ongoing process. Various methods like quizzes, presentations, picture description are used in the classroom to make the students well equipped with the IB assessment requirements.
- In order to prepare the students for the IA and final exams, regular formative tasks would be incorporated in the classroom, in order to make the students aware and well equipped with the assessment criterion. Tasks would include presentation, picture descriptions, writing skills, comprehending written text, comprehending audio texts.
- The Final internal assessments will be conducted in the month of October/November 2021.

| <b>Year 1</b>                 | <b>Topic</b>  |
|-------------------------------|---|
| <b>July</b>                   | Introduction to IB German/Hindi/French/Spanish B Standard Language/ Higher Level  |
| <b>July/August/ September</b> | Theme: Identities <ul style="list-style-type: none"> <li>• Formative tasks (2 tasks)</li> <li>• Summative task</li> </ul>     |
| <b>October /November</b>      | Theme: Experiences <ul style="list-style-type: none"> <li>• Formative Tasks (2 Tasks)</li> <li>• Summative Task</li> </ul>    |
| <b>December</b>               | <b>Term 1 Exams</b>   |
| January/ February/March       | Theme: Human Ingenuity <ul style="list-style-type: none"> <li>• Formative Task (2 Tasks)</li> <li>• Summative Task</li> </ul> |
| <b>April</b>                  | <b>Mock Interactive Oral to be conducted</b>  |
| <b>April – May</b>            | <b>Term 2 Exams</b>   |
| Year 2                        | Theme   |
| July /August/ September       | Social Organisation<br>Formative Tasks<br>Summative Task  |

|          |  |
|----------|--|
| October  | Theme: Sharing the Planet<br>Mock Interactive Oral to be conducted |
| November | Final IA to be conducted   |
| December | Term 1 Exams   |
| January  | Theme: Sharing the Planet (contd.)                                 |
| February | Revision and Past year paper practice                              |
| March    | Mocks  |

### International mindedness

The students will discuss how bullying has become a widespread phenomenon especially with the advent of social media. They will watch a video about how to prevent bullying in school. They will discuss their personal experiences and suggest measures to spread awareness about bullying in their own school.

### Development of the IB learner profile

Through the course it is also expected that students will develop the attributes of the learner profile.

Students would be reading and researching on the various festivals and cuisine in the German/French/Spanish -speaking countries. They would communicate about the same and draw a contrast about the same with their own culture. They would then compare the festivals in Germany/France/Spain with that in India.

**Suggested Activity:** Students write a description about a German/French/Spanish festival, giving their opinions about the festival to a friend in the form of an E-Mail. They would then compare between the way the festival is held in target country and in their own country. They would draw a contrast based on socio-cultural importance of the two festivals, the customs related to the two. This would help to enhance their communicative skills and improve their reflective skills.

Some Links: Summary of different festivals in Germany: [www.derweg.org/feste/kultur/](http://www.derweg.org/feste/kultur/)

Frankfurt am Main Weihnachtsmarkt : [www.youtube.com/watch?v=89S2MO52nQI](http://www.youtube.com/watch?v=89S2MO52nQI)

### Course syllabus

#### IBDP Ab Initio German/Spanish

| Unit title | Duration (teaching periods) | Unit content (topics)  | Objectives  | Assessment tools; Assessment criteria   | Summative assessment   | ATL                                    | LP and CAS/Service links  | Links with TOK/Critical thinking   | Links with other subjects/interdisciplinary links |
|------------|-----------------------------|--|---|---|--|--|---------------------------|--|---|
| Identities | 25                          | -Personal Attributes<br>- Personal relationships<br>-Eating and drinking<br>-Physical well-being | -Communicate clearly and effectively in a range of contexts and for a variety of purposes.<br>-Understand and use language appropriate to a range of interpersonal and/or intercultural contexts and audiences.<br>-Understand and use language to express and respond to a range | Assessment would be based on 3 components:<br>1- Productive skills (One writing task) (70–150 words)<br>2-Listening comprehension<br>3-Reading Comprehension<br>The writing skill assessment will be based on 3 criteria<br>A- Language<br>B- Message<br>C-Conceptual understanding | 1- Productive skills (One writing task) (70 – 150)<br>2- Listening comprehension (3 audios)<br>3- Reading Comprehension (3 passages) | Communication Skills<br>-Social Skills | Open minder<br>Risk taker | How does language help us interact with others?<br>Do we always need to speak the same language to make a connection?<br>Is spoken language the only language? | Science   |

|                 |    |  |   |  |   |  |   |  |   |
|-----------------|----|--|---|--|---|--|---|--|---|
|                 |    |  | of ideas with fluency and accuracy.<br><br>-Identify, organize and present ideas on a range of topics.  |  |   |  |   |  |   |
| Experiences     | 20 | -Daily routine<br>-Leisure<br>-Holidays<br>-Festival and celebrations                        | -Communicate clearly and effectively in a range of contexts and for a variety of purposes.<br><br>-Understand and use language appropriate to a range of interpersonal and/or intercultural contexts and audiences.<br>-Understand and use language to express and respond to a range of ideas with fluency and accuracy.<br><br>-Identify, organize and present ideas on a range of topics.                                    | Assessment would be based on 3 components:<br>1- Productive skills (One writing task) (70–150 words)<br>2- Listening comprehension (3 audios)<br>3- Reading Comprehension (3 passages)<br><br>The Receptive skills (Listening and reading) Will be divided in to two separate sections<br>the students understanding of three passage is assessed in this examination. | 1- Productive skills (One writing task) (70 – 150)<br>2- Listening comprehension (3 audios)<br>3- Reading Comprehension (3 passages)  | Thinking, Organisation and Communication skills  | Open minded, balanced, risk taker   | How is the language you use with friends, with your parents, with teachers, future employers different?  | Students will link their subject with Individual and societies. |
| Human Ingenuity | 22 | -Entertainment and Media<br>-Communication and Media<br>-Technology<br>-Artistic Expressions | -To develop international-mindedness through the study of the target language, cultures, and ideas and issues related to human ingenuity.<br>- To enable students to communicate in a range of contexts and for a variety of purposes.<br>-To encourage, through the study of texts and through social interaction, an awareness and appreciation of a variety of perspectives of people with the ability of critical thinking. | Assessment will be based on 3 skills; productive skills, Receptive skills and interactive skills.<br>The marking criteria is based on Language, message and conceptual understanding   | Will be based on productive skills – a writing paragraph (250-400 words), speaking about the development of technology and its impact in the world, and on receptive skills- listening audio texts and answering the questions. | Research skills: Media and information literacy skills; Make connections between various sources of information. Identify primary and secondary sources. | Inquirer: Students will nurture their curiosity, developing skills for inquiry and research. They will know how to learn independently and with others. They will research and learn with enthusiasm and sustain their love of learning about the different types of media, | They will critically analyse how do the media change the way we relate to each other and how technology play an important role to influence our lives. | Students will link their subject with science and technology.   |

|                     |    |  |   |   |  |   |  |  |  |
|---------------------|----|--|---|---|--|---|--|--|--|
|                     |    |  | <p>-To develop students' understanding of the relationship between the languages and cultures with which they are familiar.</p> <p>-To develop students' awareness of the importance of language in relation to other areas of knowledge.</p>   |   |  |   | They will teach other fellow students to be aware of fake news that spread violence.   |  |  |
| Social Organization | 23 | <p>-Neighborhood</p> <p>-Education</p> <p>-The workplace</p> <p>-Social issues</p>       | <p>-Read, write and speak about their city and what is in a city</p> <p>-Explore the cultural differences between school systems, classroom activities and expectation.</p> <p>-Talk and write about what they do on weekdays and weekends.</p> <p>-Read, listen and comprehend about social issues like pollution, poverty, illness and disease.</p> | <p>Assessment will be based on 3 skills; productive skills, Receptive skills and interactive skills.</p> <p>The marking criteria is based on Language, message and conceptual understanding</p> | <p>1- Productive skills (One writing task) (70 – 150)</p> <p>2- Listening comprehension (3 audios)</p> <p>3- Reading Comprehension (3 passages)</p>  | <p>Research skills: Media and information literacy skills; Make connections between various sources of information. Identify primary and secondary sources.</p>                     | <p>Thinker: Students will nurture their curiosity, developing skills for thinking and research. They will know how to learn independently and with others.</p> | <p>They will critically analyse how do the social issues change the way we relate to each other and how education and society play an important role to influence our lives.</p> | <p>Students will link their subject with Individual and societies.</p> |
| Sharing the planet  | 23 | <p>-Climate</p> <p>-Physical geography</p> <p>-The environment</p> <p>-Global issues</p> | <p>-To provide students, through language learning and the process of inquiry, with opportunities for intellectual engagement to save the planet and the development of critical- and creative- thinking skills.</p> <p>-To develop students' awareness of the importance of language in relation to other areas of knowledge.</p>                    | <p>Assessment will be based on 3 skills; productive skills, Receptive skills and interactive skills.</p> <p>The marking criteria is based on Language, message and conceptual understanding</p> | <p>Will be based on productive skills – a writing paragraph (250-400 words), speaking about the sustainable development, and on receptive skills- will answer based on texts related to 'sharing the planet'</p> | <p>Thinking skill: -Students will practise observing carefully in order to recognize the problem our planet is facing now. -They will gather and organize relevant information,</p> | <p>Thinker, Communicator</p>   | <p>They will critically analyse how do the media change the way we relate to each other and how technology play an important role to influence our lives.</p>                    | <p>Students will link this unit with environmental science.</p>        |

| Unit title  | Duration (teaching periods) | Unit content (topics)  | Objectives  | Assessment tools; Assessment criteria  | Summative assessment  | ATL   | LP and CAS/Service links | Links with TOK/Critical thinking   | Links with other subjects/interdisciplinary links |
|-------------|-----------------------------|--|---|--|---|---|--------------------------|--|---|
| Identities  | 25                          | -Lifestyle<br>-Health and well being<br>-Beliefs and values<br>-Subcultures<br>-Language and identity                      | Understand and use language appropriate to a range of interpersonal and/or intercultural contexts and audiences<br>Understand and use language to express and respond to a range of ideas with fluency and accuracy<br>Identify, organize and present ideas on a range of topics<br>Understand, analyse and reflect upon a range of written, audio, visual and audio-visual texts | Assessment would be based on 3 components:<br>1- Productive skills (One writing task)<br>HL (450 – 600 words)<br>SL (250 – 400 words)<br>2- Listening comprehension<br>3- Reading Comprehension<br>The writing skill assessment will be based on 3 criterions<br>A- Language<br>B- Message<br>C- conceptual understanding<br>The Receptive skills (Listening and reading)<br>Will be divided in to two separate sections<br>. the students understanding of the six passage is assessed in this examination.                   | Assessment would be based on 3 components:<br>1- Productive skills (One writing task)<br>HL (450 – 600 words)<br>SL (250 – 400 words)<br>2- Listening comprehension (3 audios)<br>3- Reading Comprehension (3 passages) | Thinking, Communication, Research                             | Balanced, communication  | To what extent culture influence the identity of an individual?<br>Do we always need to speak the same language to make a connection?<br>Is spoken language the only language?             | Science (Biology), History, Psychology            |
| Experiences | 22                          | -Leisure activities<br>-Holidays and travel<br>-Life stories<br>-Rites of passage<br>-Customs and traditions<br>-Migration | -Communicate clearly and effectively in a range of contexts and for a variety of purposes<br>-Understand and use language appropriate to a range of interpersonal and/or intercultural contexts and audiences<br>-Understand and use language to express and respond to a range   | <b>Externally 3 components will be assessed</b> namely<br>1.Productive Skills- <b>Writing</b><br>Wherein One writing task of 250–400 words from a choice of three, each from a different theme, choosing a text type from among those listed in the examination instructions.<br><b>There are three assessment criteria.</b><br>a. Language<br>b. Message<br>c. Conceptual Understanding<br>2.Receptive skills—separate sections for <b>listening and reading</b><br>Comprehension exercises on three audio passages and three | Assessment would be based on 3 components:<br>1- Productive skills (One writing task)<br>HL (450 – 600 words)<br>SL (250 – 400 words)<br>2- Listening comprehension (3 audios)<br>3- Reading Comprehension (3 passages) | -Social Skills<br>-Research skills<br>-Self-management skills | Risk-takers              | -KQ-Can leisure activities allow individuals to have personal experiences?<br>- KQ-How are values encoded differently in different languages (for example, family, friendship, authority)? | Arts  |

|                 |    |  |   |  |   |                                       |          |   |  |
|-----------------|----|--|---|--|---|---------------------------------------|----------|---|--|
|                 |    |  | of ideas with fluency and accuracy<br>-Identify, organize and present ideas on a range of topics.   | written texts, drawn from all five themes.   |   |                                       |          |   |  |
| Human Ingenuity | 23 | Entertainment<br>Transport<br>Communication and Media<br>Technology<br>Scientific Innovation | -Communicate clearly and effectively in a range of contexts and for a variety of purposes<br>-Understand and use language to express and respond to a range of ideas with fluency and accuracy<br>-Identify, organize and present ideas on a range of topics.<br>-Understand, analyse and reflect upon a range of written, audio, visual and audio-visual texts | Externally 3 components will be assessed namely<br>1.Productive Skills-Writing<br>Wherein One writing task of 250–400 words from a choice of three, each from a different theme, choosing a text type from among those listed in the examination instructions.<br>2.Receptive skills separate sections for listening and reading<br>Comprehension exercises on three audio passages and three written texts, drawn from all five themes. | Assessment would be based on 3 components:<br>1- Productive skills (One writing task)<br>HL (450 – 600 words)<br>SL (250 – 400 words)<br>2- Listening comprehension (3 audios)<br>3- Reading Comprehension (3 passages) | Research skills, communicative skills | Balanced | -To what extent human innovations have affected mankind?<br>-To what extent the advertisement influences your purchasing pattern? | Biology<br>Geography<br>Physical Education |

**IBDP Language B Year 2 (French/German/Spanish/Hindi)**

| Unit title          | Duration (teaching periods) | Unit content (topics)   | Objectives   | Assessment tools; Assessment criteria   | Summative assessment  | ATL   | LP and CAS/Service links     | Links with TOK/Critical thinking  | Unit title                   |
|---------------------|-----------------------------|---|--|---|---|---|------------------------------|---|------------------------------|
| Social Organisation | 23                          | - Social relationships<br>-Community<br>-Social engagement<br>-Education<br>- The working world | -Communicate clearly and effectively in a range of contexts and for a variety of purposes<br>-Understand and use language appropriate to a range of interpersonal and/or | <b>Externally 3 components will be assessed</b> namely<br>1.Productive Skills- <b>Writing</b><br>Wherein One writing task of 250–400 words from a choice of three, each from a different theme, choosing a text type from among those listed in the examination instructions.<br><b>There are three assessment criteria.</b><br>a. Language | Assessment would be based on 3 components:<br>1- Productive skills (One writing task)<br>HL (450 – 600 words)<br>SL (250 – 400 words) | -Social skills<br>- Communication skills<br>-Self Management skills | Open-Minded<br>Communicators | KQ – In what way does ethics and values determine our relationships with individuals and the society?<br><br>KQ-Can our values change our | Psychology (Human Behaviour) |

|                    |    |   |  |  |  |   |                             |  |                       |
|--------------------|----|---|--|--|--|---|-----------------------------|--|-----------------------|
|                    |    | -Law and order  | intercultural contexts and audiences<br>-Understand and use language to express and respond to a range of ideas with fluency and accuracy<br>-Identify, organize and present ideas on a range of topics.   | b. Message<br>c. Conceptual Understanding<br><br>2.Receptive skills—separate sections for <b>listening and reading</b><br>Comprehension exercises on three audio passages and three written texts, drawn from all five themes.   | 2- Listening comprehension (3 audios)<br><br>3- Reading Comprehension (3 passages)   |   |                             | perception of things?  |                       |
| Sharing the planet | 23 | -The environment<br>-Human Rights<br>-Peace and conflict<br>-Equality<br>-Globalisation | -Communicate clearly and effectively in a range of contexts and for a variety of purposes<br><br>-Understand and use language appropriate to a range of interpersonal and/or intercultural contexts and audiences<br>-Identify, organize and present ideas on a range of topics. | <b>There are three assessment criteria.</b><br>a. Language<br>b. Message<br>c. Conceptual Understanding<br><br>2.Receptive skills—separate sections for <b>listening and reading</b><br>Comprehension exercises on three audio passages and three written texts, drawn from all five themes. | Assessment would be based on 3 components:<br>1- Productive skills<br>2- Listening comprehension (3 audios)<br><br>3- Reading Comprehension (3 passages) | Communication skills<br><br>Social skills | Caretakers,<br><br>balanced | They will critically analyse how does the media change the way we relate to each other and how technology play an important role to influence our lives. | Environmental Science |

**GROUP 3: INDIVIDUALS AND SOCIETIES**

**BUSINESS MANAGEMENT**

Course duration: DP1 28 weeks DP2 25 Weeks

**Course general description:**

The Diploma Programme business management course is designed to develop students' knowledge and understanding of business management theories, as well as their ability to apply a range of tools and techniques. Students learn to analyse, discuss and evaluate business activities at local, national and international levels. The course covers a range of organizations from all sectors, as well as the socio-cultural and economic contexts in which those organizations operate.

**Course aims and goals:**

1. Encourage the systematic and critical study of human experience and behaviour; physical, economic and social environments; the history and development of social and cultural institutions
2. Develop in the student the capacity to identify, analyse critically and evaluate theories, concepts and arguments about the nature and activities of the individual and society
3. Enable the student to collect, describe and analyse data used in studies of society, and to test hypotheses and interpret complex data and source material
4. Promote the appreciation of the way in which learning is relevant to both the culture in which the student lives and the cultures of other societies
5. Develop an awareness in the student that human attitudes and opinions are widely diverse and that a study of society requires an appreciation of such diversity
6. Enable the student to recognize that the content and methodologies of the individuals and societies subjects are contestable and that their study requires the tolerance of uncertainty.

**Course objectives:**

By the end of the business management course, students are expected to reach the following assessment objectives.

AO1 -Demonstrate knowledge and understanding of:

- the business management tools, techniques and theories specified in the syllabus content
- the six concepts that underpin the subject
- real-world business problems, issues and decisions
- the HL extension topics (HL only).

AO2- Demonstrate application and analysis of:

- knowledge and skills to a variety of real-world and fictional business situations
- business decisions by explaining the issue(s) at stake, selecting and interpreting data, and applying appropriate tools, techniques, theories and concepts
- the HL extension topics (HL only).

AO3-Demonstrate synthesis and evaluation of:

- business strategies and practices, showing evidence of critical thinking
- business decisions, formulating recommendations
- the HL extension topics (HL only).

AO4- Demonstrate a variety of appropriate skills to:

- produce well-structured written material using business terminology
- select and use quantitative and qualitative business tools, techniques and methods
- select and use business material, from a range of primary and secondary sources.

**Course assessment structure and criteria****Assessment outline—SL**

| Assessment Component                              | Weighing |
|---|----------|
| External Assessment External assessment (3 hours) | 75 %     |

|  |     |
|--|-----|
| <p><b>Paper 1 (1 hour and 15 minutes)</b><br/> Based on a case study issued in advance, with additional unseen material for section B.<br/> Assessment objectives 1, 2, 3, 4 (40 marks)<br/> Section A<br/> Syllabus content: Units 1–5<br/> Students answer two of three structured questions based on the pre-seen case study. (10 marks per question)<br/> Section B<br/> Syllabus content: Units 1–5<br/> Students answer one compulsory structured question primarily based on the additional stimulus material. (20 marks)</p>   | 30% |
| <p><b>Paper 2 (1 hour and 45 minutes)</b><br/> <b>Assessment objectives 1, 2, 3, 4 (50 marks)</b><br/> Section A<br/> Syllabus content: Units 1–5<br/> Students answer one of two structured questions based on stimulus material with a quantitative focus. (10 marks)<br/> Section B<br/> Syllabus content: Units 1–5<br/> Students answer one of three structured questions based on stimulus material. (20 marks)<br/> Section C<br/> Syllabus content: Units 1–5<br/> Students answer one of three extended response questions primarily based on two concepts that underpin the course. (20 marks)</p> | 45% |
| <p><b>Internal assessment (15 teaching hours)</b><br/> This component is internally assessed by the teacher and externally moderated by the IB at the end of the course.<br/> Written commentary<br/> Students produce a written commentary based on three to five supporting documents about a real issue or problem facing a particular organization.<br/> <b>Maximum 1500 words. (25 marks)</b></p>   | 25% |

**Assessment outline—HL**

| <b>Assessment Component</b>  | <b>Weighing</b> |
|--|-----------------|
| External assessment (4 hours and 30 minutes)   | 75 %            |
| <p><b>Paper 1 (2 hour and 15 minutes)</b><br/> Based on a case study issued in advance, with additional unseen material for sections B and C.<br/> <b>Assessment objectives 1, 2, 3, 4 (60 marks)</b><br/> Section A<br/> Syllabus content: Units 1–5 including HL extension topics<br/> Students answer two of three structured questions based on the pre-seen case study. (10 marks per question)<br/> Section B<br/> Syllabus content: Units 1–5 including HL extension topics<br/> Students answer one compulsory structured question primarily based on the additional stimulus material. (20 marks)<br/> Section C<br/> Syllabus content: Units 1–5 including HL extension topics</p> | 35%             |

|  |     |
|--|-----|
| Students answer one compulsory extended response question primarily based on the additional stimulus material. (20 marks)  |     |
| <b>Paper 2 (2 hour and 15 minutes)</b><br><b>Assessment objectives 1, 2, 3, 4 (70 marks)</b><br>Section A<br>Syllabus content: Units 1–5 including HL extension topics<br>Students answer one of two structured questions based on stimulus material with a quantitative focus. (10 marks)<br>Section B<br>Syllabus content: Units 1–5 including HL extension topics<br>Students answer two of three structured questions based on stimulus material. (20 marks per question)<br>Section C<br>Syllabus content: Units 1–5 including HL extension topics<br>Students answer one of three extended response questions primarily based on two concepts that underpin the course. (20 marks) | 40% |
| <b>Internal assessment (30 teaching hours)</b><br>This component is internally assessed by the teacher and externally moderated by the IB at the end of the course.<br>Research project<br>Students research and report on an issue facing an organization or a decision to be made by an organization (or several organizations).<br><b>Maximum 2000 words. (25 marks)</b>  | 25% |

#### Internal Assessment Timeline HL/SL

| <b>Year 1</b>                  | <b>Activity / Plan</b>                                      | <b>Duration</b> |
|--------------------------------|---|-----------------|
| April                          | Introduction to IA  | 0.5 hour        |
|                                | Assessment criteria   | 0.5 hour        |
|                                | Sample IA discussion  | 0.5 hour        |
|                                | Sample IA marking   | 0.5 hour        |
| April                          | Research Question ideas sharing                             | 0.5 hour        |
| May                            | Finalise the RQ   | 0.5 hour        |
| May                            | Research Proposal – submission                              | 1 hour          |
| June                           | Collection of data  | 4 hours         |
| <u>Year 2</u>                  |   |                 |
| July                           | Candidates work on the first draft based on data collected. | 6 hours         |
|                                | Written report – 1 <sup>st</sup> Draft due                  |                 |
| September 1 <sup>st</sup> week |   |                 |
| October 2 <sup>nd</sup> week   | Feedback on 1 <sup>st</sup> draft                           | 1 hour          |
| January 1 <sup>st</sup> week   | Final Draft   | 5 hours         |
| February                       | IA submission to DPC  |                 |
|                                | <b>Total</b>  | <b>20 hours</b> |

#### Course main resources:

##### Textbooks:

Business Management for the IB Diploma coursebook – Peter Stimpson & Alex smith.

Paul Hoang 3rd edition

##### Other Resources

<https://prezi.com>, Past paper booklet

**Website links:**[www.youtube.com](http://www.youtube.com),[www.ted.com](http://www.ted.com),

Times 100 case studies.com Mindtools.com

**Other platforms**<https://www.inthinking.net/>[www.kognity.com](http://www.kognity.com)**Links with TOK**

| Topic                       | Link with TOK (including description of lesson plan)   |
|-----------------------------|--|
| 4.7 International Marketing | <p>TOK Link: Discuss the role of language in marketing a product in international markets.</p> <p>Task:</p> <p>Students will be split into groups of 3. Each group to undertake research on specific company of their choice &amp; make notes of the different strategies used by them across regions in the world. They need to highlight how business strategies undergo a change due to language/ cultural barriers. Students present their findings to the entire class.</p> <p>A YouTube video will be used to consolidate the learning of how the words/ slogan in English language can have different/ contrasting meaning across regions/ cultures.</p> <p>Using the learning, student will be asked to write extended response to discuss the role of language in marketing a product in international markets.</p> |

**International mindedness**

| Topic                | Contribution to the development of international mindedness (including resources you will use)  |
|----------------------|---|
| External Environment | <p>Students engage in investigating the nature of the business environment across globe and cultures. They collaborate and reflect on their findings with each other to show intercultural understanding. Making connections across the globe helps students to understand that the world is much larger community in which they live in.</p> <p>Task: Learners are divided into four groups. Each group research on one example from the following types of international agreements:</p> <ol style="list-style-type: none"> <li>1. International treaties (e.g. Maastricht)</li> <li>2. Free trade agreements (e.g. NAFTA)</li> <li>3. Climate change agreements (e.g. Kyoto)</li> <li>4. Common currency agreements (e.g. Euro)</li> </ol> <p>Each group then designs a poster showing the potential benefits and costs to domestic businesses as an impact of these treaties. After, poster making students will discuss their ideas with other groups. It will help the student to develop International mindedness as they will discuss an issue, which is globally related with countries.</p> |

**Development of the IB learner profile**

| Topic | Contribution to the development of the attribute(s) of the IB learner profile |
|-------|---|
|-------|---|

|                           |   |
|---------------------------|---|
| Organizational Objectives | <p>IB learner profile link: Be reflective and be a thinker.</p> <p>Students will be asked to revisit the IB mission statement and attempt the task given below:</p> <p>The IBO mission statement states that: 'The International Baccalaureate aim understanding and respect. 'Think and reflect on the extent to which Business Management addresses the IB mission statement'.</p> <p>Teacher to encourage students to share their opinions to the entire class. Post discussion students are divided into groups and showcase their understanding on a chart paper showing clear connections between business management, IB mission statement and IB learner profile.</p> |
|---------------------------|---|

**Course syllabus:**

| Unit title                               | Duration (teaching periods)  | Unit content (topics)   | Objectives   | Assessment tools; Assessment criteria   | Summative assessment  | ATL                                 | LP and CAS/Service links   | Links with TOK/Critical thinking  | Unit title                           |
|--|--|---|--|---|---|-------------------------------------|--|---|--------------------------------------|
| 1<br>Business Organization & Environment | 3 block lessons<br><br>4 block lessons<br><br>3 block lessons<br><br>4 block lessons<br><br>8 block lessons<br><br>12 blocks<br><br>12 block lessons | 1.1 Introduction to business management<br>1.2 Types of organizations<br>1.3 Organizational objectives<br>1.4 Stakeholders<br>1.5 External environment<br>1.6 Growth and evolution<br>1.7 Organizational planning tools | AO 2<br>AO 3<br><br>AO2<br>AO3<br><br>AO1, AO2, AO3<br><br>AO2, AO3, AO4<br><br>AO2, AO3 | AO1 Demonstrate knowledge and understanding of:<br>the business management tools, techniques and theories specified in the syllabus content.<br><br>AO2<br>Demonstrate application and analysis of:<br>the business management tools, techniques and theories specified in the syllabus content<br><br>AO3 Demonstrate synthesis and evaluation of:<br>business strategies and practices, showing evidence of critical thinking<br><br>AO4 Demonstrate variety of appropriate skills to:<br>select and use quantitative and qualitative business tools, techniques and methods<br><br>Formative assessments:<br>Unit 1.2 Flip Teaching (comment based.) | End of unit assessment based upon the unit related segment of past exam paper. Term exams based upon IB Exam past paper | Thinking and self-management skills | Students can prepare posters depicting the impact of business operations on Environment and put them up in school<br><br>2. Students create a business plan of a social enterprise involved social causes such as Zero wastage and promoting healthy eating habits. Also, the money generated from business can be used for a social cause<br>Eg- setting up a juice shop based upon zero waste. | How do assumptions about what a business is and how a business works vary by industry and location, and what implications does this have for business actors?<br><br>To what extent are the language and customs of business management based on the English language and Western tradition, and what implications does this have for business cultures | IBDP-Economics-Factors of production |

|                       |                 |  |                    |  |  |                                     |   |  |  |
|-----------------------|-----------------|--|--------------------|--|--|-------------------------------------|---|--|--|
|                       |                 |  |                    | Unit 1.7<br>Case study (comment based)   |  |                                     | broad and balanced range of disciplines.  | around the world?  |  |
|                       |                 |  | AO2, AO3, AO4      | Other formatives include research work, class discussions.   |  |                                     |   | To what extent do intuition, imagination and reason factor into the decision to set up a new business? |  |
|                       |                 |  |                    |  |  |                                     |   | Is business decision-making art or science?  |  |
| 3. Finance & Accounts | 2 block lessons | 3.1 Sources of finance                         |                    | AO1 Demonstrate knowledge and understanding of:  | End of unit assessment based upon the unit related segment of past exam paper. and term exams based upon Exam past paper | Thinking and self-management skills | Preparing Financial documents, such as cash flow forecast, income statement, Balance sheet and ratios for fund raising business of Juice shop   | Do financial statements reflect the "truth" about a business?  | IBDP-Economics - Costs and Revenue, Calculation of breakeven |
|                       | 4 block lessons | 3.2 Costs and revenues                         | AO2, AO1, AO3      | the business management tools, techniques and theories specified in the syllabus content.  |  |                                     |   |  |  |
|                       | 4 block lessons | 3.3 Break-even analysis                        |                    |  |  |                                     |   |  |  |
|                       | 4 block lessons | 3.4 Final accounts (some HL)                   |                    |  |  |                                     |   |  |  |
|                       | 4 block lessons | 3.5 Profitability and liquidity ratio analysis | AO2                | AO2 Demonstrate application and analysis of:   |  |                                     |   | Many businesses are introducing metrics about their  |  |
|                       | 4 block lessons | 3.6 Efficiency ratio analysis (HL)             |                    |  |  |                                     |   | environmental, social or ethical performance on the side of financial information.                     |  |
|                       | 4 block lessons | 3.7 Cash flow                                  |                    |  |  |                                     |   | Can well-being, or other social variables, be measured?  |  |
|                       | 4 block lessons | 3.8 Investment appraisal                       |                    |  |  |                                     |   | How certain is the information we get from financial   |  |
|                       | 8 block lessons | 3.9 Budgets (HL only)                          | AO2, AO3, AO4      | business decisions by explaining the issue(s) at stake, selecting and interpreting data, and applying appropriate tools, techniques, theories and concepts |  |                                     | They develop their natural curiosity. They acquire the skills necessary to conduct inquiry and research and show independence in learning. They actively enjoy learning and this love of learning will be sustained throughout their lives. |  |  |
|                       | 7 block lessons |  | AO1, AO2, AO3, AO4 | AO3 Demonstrate synthesis and evaluation of: business decisions, formulating recommendations   |  |                                     |   |  |  |
|                       | 7 block lessons |  |                    |  |  |                                     |   |  |  |
|                       | 7 block lessons |  | AO2, AO3, AO4      | AO4 Demonstrate a variety of appropriate skills to: select and use quantitative and qualitative business tools, techniques and methods                     |  |                                     |   |  |  |
|                       | 8 block lessons |  |                    |  |  |                                     |   |  |  |

|              |                  |   |                    |   |  |  |  |  |   |
|--------------|------------------|---|--------------------|---|--|--|--|--|---|
|              | 6 block lessons  |   | AO2, AO3, AO4      | Formative Assessment: Case Study Unit 3.4, 3.5, 3.6 (comment based)   |  |  |  | statements? For example, could we know in advance if an investment will be successful?   |   |
|              | 4 block lessons  |   | AO2, AO3, AO4      | Students will be solving a problem on the board Unit 3.3, 3.8 (Comment based)<br>Other formatives include class discussions, quiz and research work.  |  |  |  |  |   |
| 4. Marketing | 2 block lesson   | 4.1 The role of marketing   | AO1, AO2, AO3, AO4 | <b>AO1</b> - Demonstrate knowledge and understanding of the business management tools, techniques and theories specified in the syllabus content  | End of unit assessment based upon the unit related segment of past exam paper. and term exams based upon Exam past paper | communication and self-management skills | Development of AD campaigns for social enterprise mentioned above<br>Creating social awareness about the consumer rights and responsibilities  | The four Ps and seven Ps frameworks suggest that marketing has four or seven aspects, all of which can be described with a word that starts with a P. How helpful are such analytical frameworks to you as a knowledge-seeker? | IBDP- English – Communication in advertising<br>Economics- Primary and secondary research, Sale forecasting |
|              | 6 block lesson   | 4.2 Marketing planning (including introduction to the four Ps)  |                    |   |  |  |  |  |   |
|              | 4 block lessons  | 4.3 Sales forecasting (HL only)<br>4.4 Market research<br>4.5 The four Ps (product, price, promotion, place)<br>4.6 The extended marketing mix of seven Ps (HL only)<br>4.7 International marketing (HL only) | AO1, AO2, AO3, AO4 | <b>AO2</b> - Demonstrate application and analysis of business decisions by explaining the issue(s) at stake, selecting and interpreting data, and applying appropriate tools, techniques, theories and concepts |  |  | <b>Learner Profile:</b><br><b>Communicators.</b><br>They understand and express ideas and information confidently and creatively in more than one language and in a variety of modes of communication. They work effectively and willingly in collaboration with others. |  |   |
|              | 4 block lessons  | 4.8 E-commerce  | AO3, AO4           | <b>AO3</b> - Demonstrate synthesis and evaluation of business strategies and practices, showing evidence of critical thinking and business decisions, formulating recommendations                               |  |  |  | Many ads use scientific language. What does this tell us about the hierarchy of different areas of knowledge?  |   |
|              | 10 block lessons |   | AO2, AO3           | <b>AO4</b> - Demonstrate a variety of appropriate skills to select and use quantitative and qualitative business tools, techniques and methods  |  |  |  | The observer effect is a common problem in the social sciences whereby   |   |
|              | 6 block lessons  |   | AO2, AO3, AO4      | Formative Assessments - Class Presentation (4.4)- comment based   |  |  |  |  |   |

|   |  |  |
|---|--|--|
| <p>6<br/>block lessons</p> <p>4<br/>block lessons</p> | <p>AO3, AO2, AO4</p> <p>Case Study: 4.5, 4,6<br/>Comment based</p> <p>Other FA's include class discussions</p> | <p>knowledge of being researched influences how people answer questions and behave. What problems does the observer effect create for market research?</p> <p>In market research, how might the language used in polls and questionnaires influence consumers and businesses' conclusions?</p> <p>Is it possible to measure brand loyalty?</p> <p>To what extent is consumer behavior rational?<br/>Is the decision to develop CSR objectives solely a marketing strategy?</p> <p>To what extent are marketing practices a reflection of the values of a given time and culture?</p> |
|---|--|--|

|                  |                           |  |                    |  |  |  |   |  |  |
|------------------|---------------------------|--|--------------------|--|--|--|---|--|--|
| Year 2           |                           |  |                    |  |  |  |   |  |  |
| 2.Human Resource | 2 block lessons           | 2.1 Functions and the evolution of human resource management | AO1, AO2, AO3      | AO1: Demonstrate knowledge and understanding of the business management tools, techniques and theories specified in the syllabus content and the six concepts that underpin the subject  | End of unit assessment based upon the unit related segment of past exam paper. and term exams based upon Exam past paper | communication and self-management skills | Team formation and delegation of roles and responsibilities for the social enterprise. Conducting training of team upon the use of equipment etc.   | The pace of change in modern business is high and what is important to know is not static. How do individuals and organizations cope with change and new demands?  | IBDP Economics – Labour productivity and Motivation.<br><br>Psychology: Theories of motivation and Industrial Relation |
|                  | 5 block lessons           | 2.2 Organizational structure                                 |                    | AO2 : Demonstrate application and analysis of knowledge and skills to a variety of real-world and fictional business situations and business decisions by explaining the issue(s) at stake, selecting and interpreting data, and applying appropriate tools, techniques, theories and concepts |  |  | Preparing posters to spread the importance of proper working condition and the importance of cooperation at the workplace   |  |  |
|                  | 4 block lessons (HL only) | 2.3 Leadership and management                                |                    |  |  |  |   |  |  |
|                  | 4 block lessons           | 2.4 Motivation   | AO1, AO2, AO3, AO4 |  |  |  |   |  |  |
|                  | 4 block lessons           | 2.5 Organizational (corporate) culture                       | AO2, AO3           |  |  |  | <b>Learner Profile: Caring</b><br>They show empathy, compassion and respect towards the needs and feelings of others. They have a personal commitment to service, and act to make a positive difference to the lives of others and to the environment | "Knowledge is power." If this saying is true, how does it affect different stakeholders' ability to contribute to business decision-making?  |  |
|                  | 4 block lessons           | 2.6 Industrial/employee relations (HL only)                  | AO2, AO3           | AO3: Demonstrate synthesis and evaluation of business strategies and practices, showing evidence of critical thinking, business decisions, formulating recommendations   |  |  |   |  |  |
|                  | 4 block lessons           |  | AO1, AO2, AO3      | AO4: Demonstrate a variety of appropriate skills to produce well-structured written material using business terminology and select and use quantitative and qualitative business tools, techniques and methods   |  |  |   |  |  |
|                  |                           |  | AO2, AO3           | Formative Assessment include:<br>Case study (2.4) comment based<br>Research upon Leadership styles of famous leaders (2.3) comment based.<br>Other FA's include class discussions, quiz, debate.   |  |  |   | In large businesses, many stakeholders are far from the center of decision-making. What challenges does an organizational or a geographical distance create for understanding the concerns of individual |  |



|                         |                 |   |               |  |  |  |   |  |   |
|-------------------------|-----------------|---|---------------|--|--|--|---|--|---|
| 5.Operations Management | 3 block lessons | 5.1 The role of operations management   | AO1, AO2, AO3 | AO1 Demonstrate knowledge and Understanding of the business management tools, techniques and theories specified in the syllabus content  | End of unit assessment based upon the unit related segment of past exam paper. and term exams based upon Exam past paper | communication and self-management skills | Making you tube video for the safety essentials at the factory floor. Also, how can the worker minimize the wastage of resources such as electricity. | Is there a difference between a product that consumers perceive to be of good quality and one that businesses know is? What ethical dilemmas does the information advantage businesses have over consumers pose? | IBDP – Design and Technology Total Quality management and Lean production |
|                         | 3 block lessons | 5.2 Production methods<br>5.3 Lean production and quality management (HL only)  |               |  |  |  |   |  |   |
|                         | 4 block lessons | 5.4 Location<br>5.5 Production planning (HL only)<br>5.6 Research and development (HL<br>5.7 Crisis management and contingency planning (HL only) | AO2, AO3      | AO2 Demonstrate application and analysis of knowledge and skills to a variety of real-world and fictional business situations  |  |  |   |  |   |
|                         | 5 block lessons |   |               | AO3 Demonstrate synthesis and evaluation business decisions, formulating recommendations   |  |  |   |  |   |
|                         | 4 block lessons |   |               | AO4 Demonstrate a variety of appropriate skills  |  |  |   |  |   |
|                         | 4 block lessons |   |               | produce well-structured written material using business terminology  |  |  |   |  |   |
|                         | 4 block lessons |   |               | Formative Assessment:<br>Unit 5.3 Case Study (comment based)<br>Unit 5.7<br>Students will plan for crisis, like COVID 19, like what steps to be taken to make the work least affected and making the human resource feel secure. |  |  |   |  |   |
|                         |                 |   |               |  |  |  |   | Is there such a thing as an optimal production method? What evidence and whose experiences could business leaders look at  |   |

|  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  | <p>to decide on this?<br/>Environmental costs of production are often referred to as "externalities" as they harm third parties. How does our formulation of problems affect our sense of responsibility for solving them?<br/>What ways of knowing do you think business leaders use in deciding where to locate their production?<br/>What is the role of creativity, imagination and emotion in a business context?</p> |
|--|--|--|--|--|--|--|--|--|

## ECONOMICS

Course duration: DP1 28 weeks DP2 25 Weeks

### Course general description:

Economics is an exciting, dynamic subject that allows students to develop an understanding of the complexities and interdependence of economic activities in a rapidly changing world. Given the rapidly changing world, economic activity and its outcomes are constantly in flux. Therefore, students are encouraged, throughout the course, to research current real-world issues. Through their own inquiry, it is expected that students will be able to appreciate both the values and limitations of economic models in explaining real-world economic behavior and outcomes.

By focusing on the six real-world issues through the nine key concepts (scarcity, choice, efficiency, equity, economic well-being, sustainability, change, interdependence and intervention), students of the economics course will develop the knowledge, skills, values and attitudes that will encourage them to act responsibly as global citizens.

### Course Aims

The aims of the economics course at SL and HL are to enable students to:

- Develop a critical understanding of a range of economic theories, models, ideas and tools in the areas of microeconomics, macroeconomics and the global economy.
- Apply economic theories, models, ideas and tools and analyze economic data to understand and engage with real-world economic issues and problems facing individuals and societies.
- Develop a conceptual understanding of individuals' and societies' economic choices, interactions, challenges and consequences of economic decision-making.

### Course objectives:

#### AO1 Knowledge and understanding

- Demonstrate knowledge and understanding of the common SL/HL syllabus
- Demonstrate knowledge and understanding of current economic issues and data
- At HL only: demonstrate knowledge and understanding of the extension topics

#### AO2 Application and analysis

- Apply economic concepts and theories to real-world situations
- Identify and interpret economic data
- Analyze how economic information is used effectively in particular contexts
  - In the internal assessment task: explain the link between key economic concepts and economic commentaries
  - At HL only: demonstrate application and analysis of the extension topics

#### AO3 Synthesis and evaluation

- Examine economic concepts and theories
- Use economic concepts and examples to construct and present an argument
- Discuss and evaluate economic information and theories
- At HL only: demonstrate economic synthesis and evaluation of the extension topics select and use economic data using economic theory to make policy recommendations.

#### AO4 Use and application of appropriate skills

- Produce well-structured written material, using appropriate economic theory, concepts and terminology
- Produce and use diagrams to help explain economic theory, concepts and real-world issues
- Select, interpret and analyses appropriate extracts from the news media
- Interpret appropriate data sets
- Use quantitative techniques to identify, explain and analyse economic relationships.

### Course assessment structure and criteria:

#### Assessment outline SL

| <b>Assessment Component</b>   | <b>Weighing</b> |
|---|-----------------|
| <b>External Assessment (3 hours)</b>  | <b>70 %</b>     |
| <b>Paper 1 (1 hour 15 minutes)</b><br>An extended response paper (25 marks)<br>Assessment Objectives AO1, Ao2, Ao3, AO4<br>Syllabus Content (excluding HL material)<br>Students answer one question from a choice of three (25 marks)                                   | 30%             |
| <b>Paper 2 (1 hour and 45 minutes)</b><br>A data response paper (40 marks)<br>Assessment Objectives AO1, Ao2, Ao3, AO4<br>Syllabus Content (excluding HL material). Includes some quantitative sections<br>Students answer one question from a choice of two (40 marks) | 40%             |
| <b>Internal Assessment (20 teaching hours)</b><br>This component is externally assessed by the teacher and externally moderated by the IB at the end of the course.   | <b>30%</b>      |

### Assessment outline HL

| <b>Assessment Component</b>   | <b>Weighing</b> |
|---|-----------------|
| <b>External Assessment (4 hours and 45 minutes)</b>   | <b>80 %</b>     |
| <b>Paper 1 (1 hour 15 minutes)</b><br>An extended response paper (25 marks)<br>Assessment Objectives AO1, Ao2, Ao3, AO4<br>Syllabus Content (including HL material)<br>Students answer one question from a choice of three (25 marks)   | 20%             |
| <b>Paper 2 (1 hour and 45 minutes)</b><br>A data response paper (40 marks)<br>Assessment Objectives AO1, Ao2, Ao3, AO4<br>Syllabus Content (including HL material). Includes some quantitative sections<br>Students answer one question from a choice of two (40 marks)                           | 30%             |
| <b>Paper 3 (1 hour and 45 minutes)</b><br>A policy paper (60 marks)<br>Assessment Objectives AO1, Ao2, Ao3, AO4<br>Syllabus Content (including HL extension material).<br>Includes some quantitative and qualitative sections<br>Students answer two compulsory questions (30 marks per question) | 30%             |
| <b>Internal Assessment (20 teaching hours)</b><br>This component is externally assessed by the teacher and externally moderated by the IB at the end of the course.   | <b>20%</b>      |

### **Course main resources:**

**Books:**

Cambridge Economics for IB Diploma by Ellie Tragakes

Oxford Economics Course Companion by Jocelyn Blink and Ian Dorton

**Websites:**

<https://www.inthinking.net/inthinking/teacher-resources.htm>

<https://www.tutor2u.net/economics>

<https://internationalbaccalaureate.force.com/ibportal/IBPortalLogin?startURL=%2Fibportal%2F>

**Teacher Platforms:**

Kognity

ManageBac

**Links with Diploma Programme teachers/ Critical thinking**

IBDP Economics provides links to real-life applications, where appropriate, that allow students to contextualize their learning. The topics in the course have many applications to other disciplines. Economics concepts are taught in a real-world context where appropriate to help students understand local and global phenomena. Students will be given the right content and context for them to be able to interpret the given concept in the global sense.

For Example, Freakonomics Podcast: Maddest Men of All. Episode about behavioral Economics

To what degree are our decisions motivated by reason? And to what degree are they motivated by emotion? Is it ethical for someone to use their knowledge of our emotional decision making to push us to decide they want us to make (i.e. buy something we otherwise wouldn't?)

**Assessment components**

Assessment is an integral part of teaching and learning. Both external and internal assessment are used in IB Diploma Programme. IB and Cambridge examiners mark work produced for external assessment, while work produced for internal assessment is marked by teachers and externally moderated by the IB and Cambridge.

Formative assessment informs both teaching and learning. It is concerned with providing accurate and helpful feedback to students and teachers on the kind of learning taking place and the nature of students' strengths and weaknesses in order to help develop students' understanding and capabilities. Formative assessment can also help to improve teaching quality, as it can provide information to monitor progress towards meeting the course aims and objectives.

FAs like quiz, debates, pen-paper test, poster making, group projects, written assignment etc. would be given throughout the course. Minimum two FAs per unit would be conducted. Larger units may be divided into smaller parts.

Summative assessment gives an overview of previous learning and is concerned with measuring student achievement. SA would be conducted at the end of the unit. The nature of assessment may be pen-paper test/exam based on past papers, project works etc.

Students will be assessed throughout the course using various assessment tools as discussed above. Internal assessment is an integral part of the course and is compulsory for both SL and HL students. Both SL and HL economics students produce a portfolio of three commentaries based on articles from published news media. Each article must be based on a different section of the syllabus (microeconomics, macroeconomics, international economics and development economics). Important dates are mentioned below in the table:

**Internal Assessment Timeline HL/SL**

| Particulars                     | Deadline   |
|---------------------------------|------------|
| Introduction to commentaries    | 14-09-2020 |
| 1st Commentary                  | 28-02-2020 |
| 2nd Commentary                  | 30-08-2020 |
| 3rd Commentary                  | 31-01-2021 |
| Portfolio submission with forms | 10-02-2021 |

**International mindedness**

| Topic  | Contribution to the development of international mindedness (including resources you will use)   |
|--|--|
| Unit 4<br>Global Economy<br><br>Topic 4.2<br>Types of Trade Protection | Students, in groups, shall select a country of their choice and research on the types of protectionist barriers imposed by/ on them. This shall be followed by a discussion with other group members about the impact of these barriers on the consumers, producers and government of their countries. Students shall evaluate the overall economic impact in the form of a written report. Through this activity, the learners shall gain understanding of the challenges faced by other nations in trade. In the capacity of an economist, they shall then come up with possible strategies too boost their exports and hence trade. |

### Development of learner profile

IB learners strive to become inquirers, knowledgeable, thinkers, communicators, principled, open-minded, caring, risk-takers, balanced and reflective. For instance,

#### Learner profile Inquirer

#### Unit 2: Microeconomics

Students will be divided in groups of three. Each group will be assigned a specific type of market structure. They will be given block lessons to discuss amongst themselves the key characteristics, and research on some real-life examples of the specific market structure. Post discussion students will prepare a PowerPoint presentation and showcase their understanding of the market structure. Through this activity the learners will engage themselves in research and become inquirers.

#### Course syllabus:

| Unit title                            | Duration (teaching periods)    | Unit content (topics)  | Objectives                            | Assessment tools; Assessment criteria  | Summative assessment                                    | ATL             | LP and CAS/Service links  | Links with TOK   | Links with other subjects/interdisciplinary links |
|---------------------------------------|--------------------------------|--|---------------------------------------|--|---|-----------------|---|--|---|
| 1<br><b>Introduction to economics</b> | 8 blocks                       | 1.1 What is economics?<br>1.2 How do economists approach the world?  | Discussed above.<br>All AO1, AO2, AO3 | Assessment Tools: <b>FAs</b> include quiz, debate, discussion, poster, group activities, pen-paper tests | Grasp based Assessments<br>Term end Exams<br>Mock exams | Social skills   | LP: Knowledgeable   | TOK:<br>This is just the introduction                        |   |
| 2<br><b>Microeconomics</b>            | SL: 30 blocks<br>HL: 60 blocks | 2.1 Demand ( <b>includes HL only sub-topics</b> )<br>2.2 Supply ( <b>includes HL only sub-topics</b> )<br>2.3 Competitive market equilibrium<br>2.4 Critique of the maximizing behaviour of consumers and producers<br>2.5 Elasticity of demand ( <b>includes HL only sub-topics</b> )<br>2.6 Elasticity of supply ( <b>includes HL only sub-topics</b> )<br>2.7 Role of government in microeconomics ( <b>includes HL only calculation</b> )<br>2.8 Market failure—externalities and common pool or common access |                                       |  | Grasp based Assessments<br>Term end Exams<br>Mock exams | Thinking skills | Inquirer, caring<br><br>CAS link: Visit to the Yamuna and nearby industrial area to see the impact of contamination and Working for cleaning of it, either by associating with NGO or writing blogs etc. to spread awareness.<br><br>What actions could students, as individuals, take to promote | TOK: How reliable is our knowledge regarding climate change? | Business Management, Psychology, Math             |

|                             |                                |   |  |  |   |                               |   |   |                                |
|-----------------------------|--------------------------------|---|--|--|---|-------------------------------|---|---|--------------------------------|
|                             |                                | resources <b>(includes HL only calculation)</b><br>2.9 Market failure—public goods, asymmetric information, market power, the market’s inability to achieve equity <b>(HL only)</b>   |  |  |   | environmental sustainability? |   |   |                                |
| 3 <b>Macroeconomics</b>     | SL: 34 blocks<br>HL: 64 blocks | 3.1 Measuring economic activity and illustrating its variations<br>3.2 Variations in economic activity—aggregate demand and aggregate supply<br>3.3 Macroeconomic objectives <b>(includes HL only calculation)</b><br>3.4 Economics of inequality and poverty <b>(includes HL only calculation)</b><br>3.5 Demand management (demand side policies)—monetary policy <b>(includes HL only sub-topics)</b><br>3.6 Demand management—fiscal policy<br>3.7 Supply-side policies   |  |  | Grasp based Assessments<br><br>Term end Exams<br>Mock exams | Critical thinking             | LP: Inquirer<br><br>CAS: Participation in MUNs, debates   | TOK: There are often conflicts between important macroeconomic objectives. What kind of knowledge criteria should policymakers use to make decisions in favour of pursuing one objective over another?      | History, Global Politics       |
| 4 <b>The global economy</b> | SL: 38 Blocks<br>HL: 55 Blocks | 4.1 Benefits of international trade <b>(includes HL only subtopics and calculation)</b><br>4.2 Types of trade protection <b>(includes HL only calculations)</b><br>4.3 Arguments for and against trade control/protection<br>4.4 Economic integration<br>4.5 Exchange rates <b>(includes HL only sub-topic)</b><br>4.6 Balance of payments <b>(includes HL only sub-topics)</b><br>4.7 Sustainable development <b>(includes HL only sub-topic)</b><br>4.8 Measuring development<br>4.9 Barriers to economic growth and/or economic development<br>4.10 Economic growth and/or economic development strategies |  |  | Grasp based Assessments<br><br>Term end Exams<br>Mock exams | Research skills               | Open minded<br><br>CAS: Visit to government schools/slums to help and educate them.<br><br>What actions could students, as individuals, take to promote environmental sustainability? | TOK links: How reliable is our knowledge regarding climate change?<br><br>Do more economically developed countries (MEDCs) have a moral obligation to assist less economically developed countries (LEDCs)? | Global Politics, History, Math |

### GROUP 3: INDIVIDUALS AND SOCIETIES HISTORY

Course duration DP1 28 weeks DP2 25 Weeks

**Course general description:**

History is the study of the past. It is an extremely important subject because it helps us to understand why the world is as it is now and is the best guide to what future events may hold. The IGCSE course will focus on Modern History from the 20th Century onwards. The aim of the course is to help students in their ability to understand and relate to the past. It will also help to develop skills of analysis and interpretation and

the creation of logical argument. These skills will be developed alongside a clear understanding of international issues and their relationship. The DP history course requires students to study and compare examples from different regions of the world, helping to foster international mindedness. Teachers have a great deal of freedom to choose relevant examples to explore with their students, helping to ensure that the course meets their students' needs and interests regardless of their location or context.

**Course aims and goals:**

- Develop an understanding of, and continuing interest in, the past.
- Encourage students to engage with multiple perspectives and to appreciate the complex nature of historical concepts, issues, events and developments.
- Promote international mindedness through the study of history from more than one region of the world.
- Develop an understanding of history as a discipline and to develop historical consciousness including.
- A sense of chronology and context, and an understanding of different historical perspectives.
- Develop key historical skills, including engaging effectively with sources.
- Increase students' understanding of themselves and of contemporary society by encouraging reflection on the past.

**Course objectives:**

|                   | SL  | HL  |
|-------------------|---|---|
| <b>Assessment</b> | <ul style="list-style-type: none"> <li>• Paper 1: A source-based paper set on the prescribed subjects</li> <li>• Paper 2: An essay paper based on the world history topics</li> <li>• Internal assessment (IA): A historical investigation</li> </ul> | <ul style="list-style-type: none"> <li>• Paper 1: A source-based paper set on the prescribed subjects</li> <li>• Paper 2: An essay paper based on the world history topics</li> <li>• Paper 3: An essay paper on one of the four HL regional options</li> <li>• Internal assessment (IA): A historical investigation</li> </ul> |

**Assessment objective 1: Knowledge and understanding**

- Demonstrate detailed, relevant and accurate historical knowledge.
- Demonstrate understanding of historical concepts and context.
- Demonstrate understanding of historical sources. (Internal assessment and paper 1)

**Assessment objective 2: Application and analysis**

- Formulate clear and coherent arguments.
- Use relevant historical knowledge to effectively support analysis.
- Analyse and interpret a variety of sources. (Internal assessment and paper 1)

**Assessment objective 3: Synthesis and evaluation**

- Integrate evidence and analysis to produce a coherent response.
- Evaluate different perspectives on historical issues and events and integrate this evaluation effectively into a response.
- Evaluate sources as historical evidence, recognizing their value and limitations. (Internal assessment and paper 1)
- Synthesize information from a selection of relevant sources. (Internal assessment and paper 1)

**Assessment objective 4: Use and application of appropriate skills**

- Structure and develop focused essays that respond effectively to the demands of a question.
- Reflect on the methods used by, and challenges facing, the historian. (Internal assessment)
- Formulate an appropriate, focused question to guide a historical inquiry. (Internal assessment)
- Demonstrate evidence of research skills, organization, referencing and selection of appropriate sources. (Internal assessment)

## Assessment Outline SL

| Assessment component   | Weighting                |
|--|--------------------------|
| <b>External assessment (2 hours 30 minutes)</b><br><b>Paper 1 (1 hour)</b><br>Source-based paper based on the five prescribed subjects. Choose <b>one</b> prescribed subject from a choice of five. Answer four structured questions. (24 marks)   | <b>75%</b><br><b>30%</b> |
| <b>Paper 2 (1 hour 30 minutes)</b><br>Essay paper based on the 12 world history topics. Answer two essay questions on two different topics. (30 marks)   | <b>45%</b>               |
| <b>Internal assessment (20 hours)</b><br>This component is internally assessed by the teacher and externally moderated by the IB at the end of the course.<br><b>Historical investigation</b><br>Students are required to complete a historical investigation into a topic of their choice. (25 marks) | <b>25%</b>               |

## Assessment Outline HL

| Assessment component   | Weighting                |
|--|--------------------------|
| <b>External assessment (5 hours)</b><br><b>Paper 1 (1 hour)</b><br>Source-based paper based on the five prescribed subjects. Choose <b>one</b> prescribed subject from a choice of five. Answer four structured questions. (24 marks)  | <b>80%</b><br><b>20%</b> |
| <b>Paper 2 (1 hour 30 minutes)</b><br>Essay paper based on the 12 world history topics. Answer two essay questions on two different topics. (30 marks)   | <b>25%</b>               |
| <b>Paper 3 (2 hours 30 minutes)</b><br>Separate papers for each of the four regional options. For the selected region, answer three essay questions. (45 marks)  | <b>35%</b>               |
| <b>Internal assessment (20 hours)</b><br>This component is internally assessed by the teacher and externally moderated by the IB at the end of the course.<br><b>Historical investigation</b><br>Students are required to complete a historical investigation into a topic of their choice. (25 marks) | <b>20%</b>               |

### Course main resources:

#### Textbooks

Hodder, Oxford, Cambridge, Longman, web blogs and IB documents and resources.

#### Websites

<https://ibresources.org/ib-past-papers/>

<https://sites.google.com/site/historicalinvestigation/parts-of-the-investigation/part-a>

#### Online forum

Inthinking subject site

Kognity

Weebly.com

### Resources

IB Prepared

IB Academy

### Links with Diploma Programme teachers

History is one of the eight areas of knowledge that are at the center of the TOK course. It is an interesting area of knowledge because it raises questions such as how far we can speak with certainty about anything in the past, and whether historians' accounts are necessarily subjective. All the elements of the history course provide excellent scope for making links to TOK. However, the most explicit link to TOK comes in the internal assessment task (see the "Internal assessment" section of this guide). Students are required to reflect on what completing their historical investigation taught them about the role of methods used by, and challenges facing, the historian. This provides excellent links to TOK, where students will, for example, compare the methods used to gain knowledge in history with the methods used to gain knowledge in other areas of knowledge.

Examples of discussion questions that can be used to make links to TOK include the following.

- What is the role of the historian?
- What methods do historians use to gain knowledge?
- Is it possible to describe historical events in an unbiased way?
- Do we learn from history?
- What is the difference between bias and selection?
- Who decides which events are historically significant?
- To what extent does studying history help us to better understand ourselves in the present?
- What is the role of individuals in history?
- How does the context within which historians live affect historical knowledge?

### Assessment components

Students will be introduced to the assessment criteria of the course early on and these will be regularly referred to in terms of the skills being developed throughout the learning process. Students would have a clear understanding of how they will be assessed, and the expectations of the course. In the formatives with at least two per unit teacher's feedback is crucial and will allow students to monitor their progress and reflect upon their learning and skills development.

First formative will be within 20 days of starting of course followed by second formative and summative at the end of each unit.

Both the internal and external assessment tasks of IBDP History reflect the aims of the course. Being able to demonstrate, analyzing, critical thinking and research skills which is essential to History and the assessments are designed to facilitate this. The internal assessment exploration is an opportunity for students to demonstrate their understanding and insights into an area of historical developments that is of interest to them, and to participate in an activity which gives them an insight into what it means to be a historian.

### Internal assessment (IA): A historical investigation.

| Particulars           | Deadline                      |
|-----------------------|-------------------------------|
| 1 <sup>st</sup> Draft | 25 <sup>th</sup> July 2020    |
| 2 <sup>nd</sup> Draft | November 2020                 |
| Final Draft           | 18 <sup>th</sup> January 2020 |

### International mindedness

History students are engaged in class discussion and debates on topics like Cold War and Authoritarian states where these discussions bring different perspectives and ideas and developments of the past leading to the growth of modern politics and world.

## Development of the IB learner profile

- Communication: Taking part in debates and class discussions; being able to communicate insights and ideas; using and interpreting content specific resources to achieve goals
- Research: Finding, interpreting and judging sources relevant for the research; seek a range of perspectives from multiple and varied sources; organize, synthesize and make connections between the various sources
- Self-Management: Managing time and tasks effectively; coping with difficulties; reflecting on personal strengths and weaknesses
- Thinking: Analyzing and evaluating issues and ideas; generating novel ideas and considering new perspectives; using skills and knowledge in multiple contexts

## Course Syllabus

| Unit title  | Duration (teaching periods) | Unit content (topics)   | Objectives   | Assessment tools; Assessment criteria  | Summative assessment | ATL  | LP and CAS/Service links   | Links with TOK/Critical thinking  | Links with other subjects/interdisciplinary links  |
|---|-----------------------------|---|--|--|----------------------|--|--|---|--|
| SL topics: Prescribed subjects (one to be studied)<br>The move to global war  |                             | Japan<br>The impact of nationalism and militarism<br>Japanese expansion in South-east Asia, 1931-1941<br>The international response to Japanese expansion, 1931-1941<br>Germany & Italy<br>Impact of Fascism and Nazism on Italian and German foreign policy.<br>German and Italian challenges and expansion and diplomatic alignment in post-war Europe.<br>International aggression and policies towards Germany and Italy. | Understand the growth of nationalism and power in Japan between 1931-1941.<br>Analyse the intervention with the west.  | Demonstrate an understanding of the historical sources.<br>Interpret and analyse information from a variety of sources.<br>compare information between sources<br>evaluate sources for their value and limitations.<br>synthesize evidence from the sources with your own detailed knowledge of the topic. | Pen and paper test   | Communication, Research, thinking skills                             | Learners caring and thinker. understand the hardships of the people in the war                             | In pairs consider the skills you have used to answer source-based questions: interpreting the message of each source. extrapolating information and evaluating the provenance and content of a source. Discuss how these are sources are to the methods used by historians to gain knowledge. | English and theatre – Role played by different writers and books written related to the contemporary period.   |
| World history topics (two to be studied)<br>Authoritarian states (20 <sup>th</sup> century)<br>The Cold War: superpower tensions and rivalries (20 <sup>th</sup> century) |                             | Germany- Hitler<br>The emergence of the authoritarian state in Germany, 1919–1934<br>Hitler’s consolidation of power, 1934–1935<br>The aims and results of Nazi policies<br>Italy-Mussolini rises to power.<br>Mussolini consolidation of power.<br>Cuba – Castro<br>Castro’s rise to power 1959 59   | Understand the rise of dictators.<br>Discuss their policies and control of power.<br>Analyse the control of power.<br>Understand the rivalry between two Super-powers. | Compare and contrast<br>Identify similarities and differences relating to a specific factor or event<br>Discuss<br>Review a range of arguments<br>Evaluate<br>Weigh up strengths and limitations. In an essay  | Pen and paper test   | Communication, Research, thinking, social and self-management skills | Caring and sympathetic towards the hardships of the people under authoritarian rule and cold war conflicts | In pairs review the given sources. Look at the historians views and the primary accounts and photographs. When historians work on developing their accounts of historical events how do they select their sources? How do they  | Theatre – Movies based on authoritarian rulers like Hitler and on cold war conflicts apocalypse now, 71 into the fire, green berets, operation finale etc. |

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|  |  | <p>Castro's consolidation and maintenance of power, 1959–1962<br/>Castro's domestic policies</p> <p>Cold War conflicts tensions – Russian and USA<br/>Europe -Berlin blockade (1948–1949), Berlin Wall (1958–1961); USSR and eastern Europe (1981–1989)<br/>The Americas: Cuban Missile Crisis (1962)</p> | <p>Tensions involved and the factors which led to cold war.</p>  | <p>question this is often expressed as “successes and failures”<br/>Examine<br/>Consider an argument or assumption and make a judgment as to the validity of either<br/>To what extent<br/>This usually refers to a quotation or a statement, inviting you to agree or disagree with it</p> |                           |   |  | <p>select what events and actions are significant? Discuss the difference between selection and bias.</p>         |  |
| <p>HL options:<br/>Depth studies (one to be studied)<br/>History of Europe</p> |  | <p>Europe and the First World War<br/>Inter-war domestic developments in European states (1918–1939)<br/>Diplomacy in Europe (1919–1945)</p>  | <p>European diplomacy and the changing balance of power after 1871.<br/>Foreign policy of allied powers.<br/>Impact of the First World War.<br/>Reasons behind the failure of the Paris Peace Conference.<br/>Case study and rise of dictators.<br/>Inter-war years and the factors leading to second world war.</p> | <p>Hamburger Long essay writing strategy,<br/>Debate, Class discussion, Peer teaching.</p>  | <p>Pen and paper test</p> | <p>Communication, Research, thinking, social and self-management skills</p> | <p>Empathy to the soldiers who died in the war and the hardships of the families during the Inter-war years in Europe.</p> | <p>Discuss the views and perspectives of different writers through books and sources based on WWI &amp; WWII.</p> | <p>Mathematics – Identify the death ratio during the war period in Europe.</p> |

**GROUP 3: INDIVIDUALS AND SOCIETIES**

**PSYCHOLOGY COURSE OVERVIEW**

Course duration    DP1 28 weeks    DP2 25 Weeks

### **Course general description**

Psychology is the rigorous and systematic study of mental processes and behaviour. It is a complex subject which draws on concepts, methods and understandings from several different disciplines. There is no single approach that would describe or explain mental processes and behaviour on its own as human beings are complex animals, with highly developed frontal lobes, cognitive abilities, involved social structures and cultures. The study of behaviour and mental processes requires a multidisciplinary approach and the use of a variety of research techniques whilst recognizing that behaviour is not a static phenomenon, it is adaptive, and as the world, societies and challenges facing societies change, so does behaviour.

### **Course aims and goals:**

The aims of the psychology course at SL and at HL are to:

1. Develop an understanding of the biological, cognitive and sociocultural factors affecting mental processes and behaviour.
2. Apply an understanding of the biological, cognitive and sociocultural factors affecting mental processes and behaviour to at least one applied area of study.
3. Understand diverse methods of inquiry.
4. Understand the importance of ethical practice in psychological research in general and observe ethical practice in their own inquiries.
5. Ensure that ethical practices are upheld in all psychological inquiry and discussion.
6. Develop an awareness of how psychological research can be applied to address real-world problems and promote positive change.

### **Course objectives:**

By the end of the psychology course at SL or at HL, students will be expected to demonstrate the following:

AO1 - Knowledge and comprehension of specified content

- Demonstrate knowledge and comprehension of key terms and concepts in psychology.
- Demonstrate knowledge and comprehension of a range of psychological theories and research studies.
- Demonstrate knowledge and comprehension of the biological, cognitive and sociocultural approaches to mental processes and behaviour.
- Demonstrate knowledge and comprehension of research methods used in psychology.

AO2- Application and analysis

- Demonstrate an ability to use examples of psychological research and psychological concepts to formulate an argument in response to a specific question.
- Demonstrate application and analysis of a range of psychological theories and research studies.
- Demonstrate application and analysis of the knowledge relevant to areas of applied psychology.
- At HL only, analyse qualitative and quantitative research in psychology.

AO3 - Synthesis and evaluation

- Evaluate the contribution of psychological theories to understanding human psychology.
- Evaluate the contribution of research to understanding human psychology.
- Evaluate the contribution of the theories and research in areas of applied psychology.
- At HL only, evaluate research scenarios from a methodological and ethical perspective.

AO4- Selection and use of skills appropriate to psychology

- Demonstrate the acquisition of skills required for experimental design, data collection and presentation, data analysis and the evaluation of a simple experiment while demonstrating ethical practice.
- Work in a group to design a method for a simple experimental investigation, organize the investigation and record the required data for a simple experiment.
- Write a report of a simple experiment.

### **Course assessment structure and criteria:**

### Difference between HL and SL

There are three main distinctions between HL and SL course. The HL students will study 3 extra units for paper. The role of animal research in understanding human behaviour, cognitive processing in the digital world and influence of globalization on individual's identities, attitudes and behaviour. SL students are required to study one option while HL students' study two options. This differentiation is reflected in paper 2 of the external assessment. Both SL and HL students will be expected to show their understanding of approaches to research in the internal assessment and for criterion D (critical thinking) in paper 1 section B and paper 2 responses. Additionally, HL students will be directly assessed on their understanding of approaches to research in paper 3 of the external assessment. This will cover both qualitative and quantitative research methods.

| Syllabus component  | SL (hrs)               | Weighting | HL (hrs) | Weighting | Paper duration and marks  |
|---|------------------------|-----------|----------|-----------|---|
| Paper – 1 (HL&SL)<br>Core<br>Biological approach to understanding behaviour<br>Cognitive approach to understanding behaviour<br>Sociocultural approach to understanding behaviour | 90                     | 50%       | 120      | 40%       | 2 hours both HL and SL<br><br>49 marks for HL and SL            |
| Paper 2 (HL&SL)<br>Options<br>Abnormal Psychology<br>Psychology of human relationships  | 20                     | 25%       | 40       | 20%       | 2 hours for HL and 1 hour for SL<br>HL- 44 marks<br>SL-22 marks |
| Paper 3 (Only for HL)<br>Approaches' to research  | 20 (taught for the IA) | -         | 60       | 20%       | 1 hour – this paper is only for HL- 24 marks                    |
| Internal assessment Experimental study  | 20                     | 25%       | 20       | 20%       | Written report – 22 marks for both HL and SL                    |
| Total teaching hours  | 150                    |           | 240      |           |   |

### Course main resources:

#### Books:

1. Psychology for the 21<sup>st</sup> century (Jennie Brooks Jamison)
2. Psychology IB Diploma Programme (Alexy Popov, Lee Parker, Darren Seath)
3. Psychology IB Diploma (Julia Willerton, Jean-Marc Lawton, Simon Green, John Gammon)
4. Pearson Baccalaureate (Alan Law Christos Halkiopoulos Christan Bryan)

#### Websites:

<https://psychcentral.com/>

<http://www.holah.karoo.net/as.htm>

<https://www.simplypsychology.org/biological-psychology.htm>

#### Online forum

Inthinking subject site, Kognity

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| Topic – experimental vs non-experimental methods in Psychology | <p><b>Learning objective:</b> -</p> <ol style="list-style-type: none"> <li>1. Describe the experimental and non-experimental methods</li> <li>2. Outline the important differences between the experimental and non-experimental method</li> </ol> <p><b>Key vocabulary:</b> - Lab experiment, field experiment, natural experiment, correlational studies, interview, observations and case studies, hypothesis, independent variable, dependent variable, controls, demand characteristics, experimenters bias, participants expectations.</p> <p><b>Resources-</b> PPT, videos, textbook</p> <p><b>Activity -</b> Discussion on TOK and ways of knowing: -</p> |
|--|---|

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|  | <ol style="list-style-type: none"> <li>1. How do you know that the experimental method is a valid method of gaining knowledge?</li> <li>2. How do you know that non-experimental methods like the interview, observation or case study are valid method of gaining knowledge?</li> <li>3. Is it possible to decide whether some ways of knowing are better than others?</li> </ol> <p><b>Starter: - BOBO DOLL EXPERIMENT ON AGGRESSION.</b></p> <p>Day 1-</p> <ul style="list-style-type: none"> <li>• A video will be shown, and some questions related to it will be asked.</li> <li>• Pupil will be familiarised with the various methods in Psychology.</li> <li>• A discussion on the nature of the subject. "Why Psychology is a Science".</li> </ul> <p>Day 2-</p> <ul style="list-style-type: none"> <li>• TOK questions related to the topic will be discussed.</li> <li>• Further knowledge of research methods will be given.</li> <li>• Home assignment allotted individual assignments for presentations</li> </ul> <p>Day 3-</p> <ul style="list-style-type: none"> <li>• Presentation by the students.</li> <li>• Self and peer assessment</li> <li>• Writing reflections</li> </ul> |
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#### Assessment component – Internal assessment

| Year 1                             | Activity / Plan  | Duration        |
|------------------------------------|--|-----------------|
| March                              | Introduction to IA   | 1 hour          |
|                                    | Assessment criteria  | 0.5 hour        |
|                                    | Sample IA discussion                                       | 0.5 hour        |
|                                    | Sample IA marking  | 1 hour          |
| March                              | Ideas sharing about the researches that can be replicated. | 0.5 hour        |
| March                              | Finalise the RQ  | 0.5 hour        |
| April                              | Research Proposal – submission                             | 2 hours         |
| Year 2<br>9 <sup>th</sup> Nov 2021 | Written report – 1 <sup>st</sup> Draft                     | 7 hours         |
| November                           | Feedback on 1 <sup>st</sup> draft                          | 2 hours         |
| 28 <sup>th</sup> January 2022      | Final Draft  | 5 hours         |
| January                            | IA submission to DPC                                       |                 |
|                                    | <b>Total</b>   | <b>20 hours</b> |

#### Link to international mindedness

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| Topic  | Contribution to the development of international mindedness (including resources you will use)   |
| Unit: Socio-cultural approaches to behaviour | <p>Often, when people in western cultures talk about eastern cultures, the role of saving face is seen as a key difference between these cultures. The importance is placed on not lowering one's status and not on being embarrassed by failures.</p> <p>Is the fear of losing face exclusively an eastern trait? Does it ever appear in western culture?</p> |

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| Subtopic: cultural dimensions of behaviour | <p>How the need not to lose face affect an individual's behaviour?</p> <p>Reason- because the topic 'cultural dimensions of behaviour' gives the pupil an understanding of how different cultural values and norms can affect one's behaviour. Direct comparisons of cultures can be made easily through this topic. Students will get insight on how different societies are governed by different norms which also influence their behaviour.</p> <p>Web resources from a link of Hofstede's website on cultural dimension- students will dimension – (comparing countries profile e.g. America, India, Japan, China, UK) and make comparisons between the dimensions. They will reflect on the ways these dimensions influence on individual's behaviour.</p> |
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### Development of the IB learner profile

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| Topic  | Contribution to the development of the attribute(s) of the IB learner profile  |
| Unit: Cognitive approaches to behaviour<br>Subtopic: - reconstructive memory theory and its application in studying eyewitness testimony | <p>Be a researcher – Carry out a simple replication of Loftus and Palmer (1974) research. In your research you need to state the hypothesis, operationalise the independent variable, operationalise the dependent variable, describe the procedure. Identify tools for data collection and analysis, write an article on your research and display it on the school notice board.</p> <p>This activity will help the pupil to develop research, self-management and communication skills. (80 mins)</p> |

### Course Syllabus

| Unit title                          | Duration (teaching periods) | Unit content (topics)  | Objectives   | Assessment tools; Assessment criteria  | Summative assessment | ATL   | LP and CAS/Service links  | Links with TOK/Critical thinking  | Links with other subjects/interdisciplinary links  |
|-------------------------------------|-----------------------------|--|--|--|----------------------|---|---|---|--|
| Approaches to researching behaviour | 25 Lessons                  | Case studies<br>Naturalistic observations<br>Interviews<br>Experiments<br>Field experiment<br>Quasi-experiment<br>Correlational research | AO1<br>Knowledge and comprehension of the specified content<br>AO2 | Written assessment, conducting a mock IA, Making posters<br>Demonstrate knowledge and comprehension of psychological research methods<br>At HL only, analyse qualitative psychological research in terms of methodological, reflexive and ethical issues involved in research<br>Evaluate research methods used to investigate behaviour<br>Demonstrate the acquisition of knowledge and skills required for experimental design, data | Project work         | This unit encourages students to be <b>critical thinkers- developing thinking skills</b> with regard to the value of psychological research. They will learn strategies for evaluating theories and studies. They will also discuss implications of research, <b>reflecting</b> on what the findings of research studies may mean for themselves or for our school community. Being able to represent data effectively is part of being a <b>good communicator-</b> | Carry a survey in school to investigate the influence of social networking sites on students from grade 9 to grade 12 and prepare a presentation to communicate its harmful effects during school assembly – service or prepare posters to communicate the result of the study- Creativity<br>CCCRE | This unit introduces some important concepts relevant to TOK. First, is psychology a science? Why or why not? And does it matter? The difference between quantitative and qualitative data - is one superior to the other? And ethical considerations in psychological research. Does the | Global perspectives – primary and secondary methods of research.<br>Sociology IGCSE – research methods |

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|  |                   | <p>Naturalistic observations</p> <p>Elements of researching behaviour</p> <p>Analysing data</p> <p>Evaluating research</p> <p>Drawing conclusions</p>  | <p>Application and analysis</p> <p>AO3- synthesis and evaluation</p>                                   | <p>collection and presentation, data analysis and interpretation</p>   |  | <p><b>developing communication skills</b></p>  |   | <p>end justify the means?</p>   |             |
| <p>Cognitive approaches to behaviour</p> | <p>25 Lessons</p> | <p>Models of memory</p> <p>Schema theory</p> <p>Thinking and decision making</p> <p>constructive memory.</p> <p>Biases in thinking and decision making</p> <p>influence of emotions on cognitive processes</p> <p><b>HL extension</b></p> <p>The influences of digital technology on cognitive processes</p> <p>Methods used to study the interaction between digital technology and cognitive processes.</p> <p>The positive and negative effects</p> | <p><b>A01 Knowledge and comprehension of specified content</b></p> <p><b>A02</b></p> <p><b>A03</b></p> | <p>Quiz, written paper, Group presentation</p> <p>Demonstrate knowledge and comprehension of key terms and concepts in cognitive psychology</p> <p>Demonstrate knowledge and comprehension of a range of appropriately identified psychological theories and research studies</p> <p>Demonstrate knowledge and comprehension of the cognitive approaches</p> <p>Demonstrate an ability to use examples of psychological research and psychological concepts to formulate an argument in response to a specific question.</p> | <p>Question paper (exam style questions)</p> | <p>Communication skills – since they will be asked to present their ideas in graphical form.</p> <p>Research skills – as they will be asked to research on the nature of multi-tasking</p> | <p>The HL focus on technology invites students to consider how they could improve the way our community lives and works with technology. In addition, we have a peer tutoring program. The knowledge and understanding gained in this unit with regard to memory and how we learn should serve as good "professional development" for our student tutors. - It will cover the service strand of CAS</p> | <p>In this unit, we look in depth at the question of the reliability of memory. The theory of reconstructive memory as well as how this affects what we know and who we are is a large part of the unit. We also spend a lot of time on schema theory in which we learn about how cognitive filters often determine our behaviour based on experience. Another important area of study is cognitive biases. This is well linked to the question of how rational/logical we are.</p> | <p>None</p> |

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|  |            | of modern technology on cognitive processes  |   |  |   |   |  |  |  |
| Socio-cultural approaches to understanding behaviour | 25 Lessons | Social identity theory<br>Social cognitive theory<br><br>Stereotypes<br>Culture and its influence on behaviour<br>And Cognition<br><br>Cultural dimensions<br>Enculturation<br>Acculturation<br><br><b>HL extension</b><br>How globalization may influence behaviour<br>The effect of the interaction of local and global influences on behaviour.<br>The effect of the interaction of local and global influences on behaviour.<br>Methods used to study the influences of globalization on behaviour | <b>A01 Knowledge and comprehension of specified content</b><br><br><b>A02 Application and analysis</b><br><br><b>A03 Synthesis and evaluation</b> | Discussion, debate, quiz, reading assignments, written assessment<br>Demonstrate knowledge and comprehension of key terms and concepts in Socio-cultural approaches to psychology.<br><br>Demonstrate an ability to use examples of psychological research and psychological concepts to formulate an argument in response to a specific question.<br><br>Evaluate the contribution of psychological theories to understanding human behaviour.<br>Evaluate the contribution of research to understanding human behaviour. | Carrying out an observational study and writing its analysis (Assessment based on GRASPS) | They are asked to apply theories to new experiences hence, developing their thinking skills. In our seminars, they are <b>communicators</b> , expressing what they have learned but also listening and reacting to the ideas and evidence presented by their peers. | We discuss how cultural dimensions may affect the way people think about the environment. Spreading awareness about the change that we all can make in our behaviour to protect our environment through play or presentation – creativity and service strands will be covered in CAS | There are several potential links to TOK. The role of culture and how we learn our culture are interesting links to knowledge. In addition, the emic vs etic approach to research is a good link to inductive and deductive ways of knowing. | Sociology IGCSE – group dynamics, identity and stereotyping                      |
| Year 2 Biological approaches to behaviour            | 25 lessons | Techniques used to study the brain in relation to behaviour.   |   | Debate, individual presentation, project, written assessment, reading assignments demonstrate knowledge and comprehension of key terms and concepts in psychology  | GRASPS assessment   | Students are asked to be researcher (for example, in our research on biological explanations of sexuality) and develop <b>knowledge</b> (conceptual understanding) relevant   | CAS project could be based on educating the community about the effects of stress (or sleep) on learning and providing advice for improving  | We discuss about the benefits of a reductionist argument over a holistic argument. Finally,  | Biology – understanding of nervous system, hormones, neurotransmitters, genetics |

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|  | <p>Localization</p> <p>Neuroplasticity</p> <p>Neurotransmitters and their effect on behaviour</p> <p>The effects of hormones on human behaviour</p> <p>Pheromones and behaviour</p> <p>Genes and behaviour</p> <p>Genetic similarities</p> <p>Evolutionary explanation for behaviour</p> <p><b>HL extension</b></p> <p>The value of animal models in Psychology research</p> <p>Whether animal research can provide insight into human behaviour.</p> <p>Ethical considerations in animal research.</p> | <p><b>AO1 Knowledge and comprehension of specified content</b></p> <p><b>AO2 Application and analysis</b></p> <p><b>AO3 Synthesis and evaluation</b></p> | <p>demonstrate knowledge and comprehension of a range of appropriately identified psychological theories and research studies</p> <p>demonstrate knowledge and comprehension of the biological, cognitive and sociocultural approaches</p> <p>demonstrate an ability to use examples of psychological research and psychological concepts to formulate an argument in response to a specific question at HL</p> <p>only, analyse qualitative psychological research in terms of methodological, reflexive and ethical issues involved in research</p> <p>discuss how biological, cognitive and sociocultural approaches can be used to explain behaviour.</p> |  | <p>to the biological approach. They are asked to apply theories to new experiences as <b>thinking skills</b>. In our seminars, they are <b>communication skills</b> expressing what they have learned but also listening and reacting to the ideas and evidence presented by their peers</p> | <p>learning through understanding the role of biology. It will cover creativity and service strand</p> | <p>biology is a very different area of knowledge from the social science - and how these two areas of knowledge interact in psychology is fundamental to understanding the field.</p> |  |
|--|---|--|---|--|--|--|---|--|

|                                     |            |  |  |  |   |  |   |   |  |
|-------------------------------------|------------|--|--|--|---|--|---|---|--|
| Approaches to researching behaviour | 25 Lessons | Qualitative research<br>Quantitative research<br>Research design<br>Sampling techniques<br>Ethical consideration<br>Credibility<br>Bias<br>Generalization<br>Triangulation | <b>AO1 Knowledge and comprehension of specified content</b><br><br><b>AO2 Application and analysis</b><br><br><b>AO3</b><br><br><b>AO4</b> | Written assessment, reading assignments<br>Demonstrate knowledge and comprehension of psychological research methods<br>At HL only, analyse qualitative psychological research in terms of methodological, reflexive and ethical issues involved in research<br><br>Demonstrate the acquisition of knowledge and skills required for experimental design, data collection and presentation, data analysis and interpretation   | Answer questions based on the research piece.                             | This unit encourages students to be critical <b>thinkers</b> with regard to the value of psychological research. They will learn strategies for evaluating theories and studies.   | Spreading awareness about the ethical practices being followed across the world while doing animal experimentation – poster, presentations – creativity and service strands will be covered through this activity   |   | Global perspectives – primary and secondary method of research. Sociology IGCSE – research methods |
| Abnormality and behaviour           | 15 lessons | Explanation for disorder<br>Prevalence rates and disorder(s)<br>Biological treatment<br>Psychological treatment<br>The role of culture in treatment assessing the          | <b>AO1 Knowledge and comprehension of specified content</b><br><br><b>AO2 Application and analysis</b>                                     | Written assignment, reading assignment, worksheets, presentations<br>demonstrate knowledge and comprehension of key terms and concepts in psychology<br>demonstrate knowledge and comprehension of research methods used in psychology<br>demonstrate an ability to use examples of psychological research and psychological concepts to formulate an argument in response to a specific question<br>demonstrate application and analysis of the knowledge relevant to areas of applied psychology at HL only. | Project – preparing presentation and presenting it in front of the class. | <b>Thinking:</b> Students will apply diagnostic criteria in order to make a diagnosis. In addition, they will develop their own criteria in order to judge wellness and normalcy.<br><b>Social:</b> Students will work together as a team to propose a diagnosis for a patient with a complex set of symptoms. | A key outcome of this unit is the development of empathy for those living with mental health problems. There is also a focus on the potential stigma that people diagnosed with mental illness may face - both in the developed and developing world. We discuss changes that we think society could make to best support those living with mental illness. Discussion in the school community in form of special assembly – creativity | They will be looking at the balance between reductionist (biological and cognitive) and holistic (sociocultural) approaches to mental health. Finally, they will be looking at the question of measurement - who decides whether a therapy is successful? The question of outcome-based research vs process-based research will also be discussed, with the goal of | Studying the role of social factors on behaviour – sociology IGCSE                                 |

|                    |            |  |   |   |   |  |   |  |   |
|--------------------|------------|--|---|---|---|--|---|--|---|
|                    |            | effectiveness of treatment (s)   |   |   |   |  |   | understanding that there are different ways to interpret/understand the efficacy of treatment.   |   |
| Human relationship | 15 Lessons | Formation of personal relationship<br>Role of communication<br>Explanation for why relationships change or end.<br>Co-operation and competition<br>Prejudice and discrimination<br>Origins of conflict and conflict resolution<br>By- standardise<br>Prosocial behaviour<br>Promoting pro-social behaviour | <b>AO3 Synthesis and evaluation</b><br><br><b>AO1 Knowledge and comprehension of specified content</b><br><br><b>AO2 Application and analysis</b><br><br><b>AO3</b> | Demonstrate knowledge and comprehension of a range of psychological theories and research studies<br><br>Demonstrate knowledge and comprehension of the biological, cognitive and sociocultural approaches to mental processes and behaviour<br><br>Demonstrate knowledge and comprehension of research methods used in psychology<br><br>Demonstrate an ability to use examples of psychological research and psychological concepts to formulate an argument in response to a specific question<br><br>Analyse qualitative psychological research in terms of methodological, reflexive and ethical issues involved in research<br><br>Demonstrate application and analysis of a range of psychological theories and research studies | End of the unit assessment – written test | <b>Research:</b> Students are asked to design an experiment to test a hypothesis. In addition, they will carry out research to investigate the role that social media and “filter bubbles” may be playing in societal conflict.<br><br><b>Social:</b> Students are asked to give feedback to other groups on their experimental designs. In addition, students will work together in preparation for the essay assessment as well as in preparation for the seminar. | Write an article for school notice board explaining Gottman’s findings about why relationships change or end – creativity | The origins of prejudice and group conflict are investigated through the three core areas of knowledge - biological, cognitive and sociocultural - looking at the question from both a reductionist and a holistic perspective. We also discuss the ethical considerations in studying conflict and the question of the validity of such research - whether done under controlled conditions or using interviews in real conflict situations. We also discuss the question of whether we can ever be free from prejudice and the extent to which we can be objective in conflict situations. | Sociology IGCSE- Prejudice and discrimination |

## GROUP 4: SCIENCES

### **Course general description:**

**PHYSICS: *Physics is the most fundamental of the experimental sciences, as it*** seeks to explain the universe itself, from the very smallest particles to the vast distances between galaxies. Despite the exciting and extraordinary development of ideas throughout the history of physics, observations remain essential to the very core of the subject. Models are developed to try to understand observations, and these themselves can become theories that attempt to explain the observations.

CHEMISTRY: ***Chemistry is considered the central sciences of all.*** Chemistry gives its students an extensive and inclusive experience in the experimental nature of Chemistry, a science based on the use of the scientific method to answer questions about the composition, structure and properties of all the things around us. Observation is at the very core of chemistry and sometimes it requires decisions as to what to look for. The advancement of science has grown tremendously both in size and complexity, therefore, it is practically possible for an individual to attain proficiency in both areas. However, both are so much dependent on each other and complement each other as well. Being the central science chemistry is inherently inter-disciplinary in nature and it spontaneously encompasses and emphasises on 'How' nature of the subject instead, 'What'.

**BIOLOGY:** Biology is the study of life. The first organisms appeared on the planet over 3 billion years ago and, through reproduction and natural selection, have given rise to the 8 million or so different species alive today. Biologists attempt to understand the living world at all levels using many different approaches and techniques. At one end of the scale is the cell, its molecular construction and complex metabolic reactions. At the other end of the scale biologists investigate the interactions that make whole ecosystems function.

**Course aims and goals:**

**DP: Through studying biology, chemistry or physics, students should become aware of how scientists work and** communicate with each other. While the scientific method may take on a wide variety of forms, it is the

emphasis on a practical approach through experimental work that characterizes these subjects. **The aims enable students, through the overarching theme of the Nature of science, to:**

1. appreciate scientific study and creativity within a global context through stimulating and challenging opportunities
2. acquire a body of knowledge, methods and techniques that characterize science and technology
3. apply and use a body of knowledge, methods and techniques that characterize science and technology
4. develop an ability to analyse, evaluate and synthesize scientific information
5. develop a critical awareness of the need for, and the value of, effective collaboration and communication during scientific activities
6. develop experimental and investigative scientific skills including the use of current technologies
7. develop and apply 21st-century communication skills in the study of science
8. become critically aware, as global citizens, of the ethical implications of using science and technology
9. develop an appreciation of the possibilities and limitations of science and technology
10. develop an understanding of the relationships between scientific disciplines and their influence on other areas of knowledge.

**Course objectives:**

**DP** - The assessment objectives for biology, chemistry and physics reflect those parts of the aims that will be formally assessed either internally or externally. These assessments will centre upon the nature of science. It is the intention of these courses that students are able to fulfil the following assessment objectives:

**AO1. Demonstrate knowledge and understanding of:**

- a. facts, concepts and terminology
- b. methodologies and techniques
- c. communicating scientific information.

**AO2. Apply:**

- a. facts, concepts and terminology
- b. methodologies and techniques
- c. methods of communicating scientific information.

**AO3. Formulate, analyse and evaluate:**

- a. hypotheses, research questions and predictions

- b. methodologies and techniques
- c. primary and secondary data
- d. scientific explanations.

**AO4. Demonstrate the appropriate research, experimental, and personal skills** necessary to carry out insightful and ethical investigations.

**Course assessment structure and criteria:**

**In IBDP, the formative and summative are conducted.**

1. Formative assessment - Formative assessment informs both teaching and learning. It is concerned with providing accurate and helpful feedback to students and teachers on the kind of learning taking place and the nature of students' strengths and weaknesses in order to help develop students' understanding and capabilities. Formative assessment can also help to improve teaching quality, as it can provide information to monitor progress towards meeting the course aims and objectives. In sciences, lab activities play vital roles for formative assessments. Formative will be held at least two per unit, which be comment based and posted on Manage Bac.
2. Summative Assessment- Summative assessment gives an overview of previous learning and is concerned with measuring student achievement. Summative assessment takes place at the end of the teaching and learning process and provides students with an opportunity to show what they have learned. It also shows how effectively students understand the central idea of the unit. Summative assessments are used to determine a grade/mark for a student. Summative assessment gives an overview of previous learning and is concerned with measuring student achievement. Summative will be held at the end of every unit.
3. End of the term assessment: MCQ and structured questions based on assessment objectives.

**Assessment criteria for IBP:**

**IBDP:** The following tables show the approximate percentage weighting in a typical examination session for each of the assessment objectives across each of the components. This may differ from the allocation of time devoted to each of the assessment objectives in class.

Assessment outline—SL

| Component           | Overall weighting (%) | Approximate weighting of objectives (%) |    | Duration (hours) |
|---------------------|-----------------------|---|----|------------------|
|                     |                       | 1+2                                     | 3  |                  |
| Paper 1             | 20                    | 10                                      | 10 | ¾                |
| Paper 2             | 40                    | 20                                      | 20 | 1¼               |
| Paper 3             | 20                    | 10                                      | 10 | 1                |
| Internal assessment | 20                    | Covers objectives 1, 2, 3 and 4         |    | 10               |

Assessment outline—HL

| Component                  | Overall weighting (%) | Approximate weighting of objectives (%) |    | Duration (hours) |
|----------------------------|-----------------------|---|----|------------------|
|                            |                       | 1+2                                     | 3  |                  |
| <b>Paper 1</b>             | 20                    | 10                                      | 10 | 1                |
| <b>Paper 2</b>             | 36                    | 18                                      | 18 | 2¼               |
| <b>Paper 3</b>             | 24                    | 12                                      | 12 | 1¼               |
| <b>Internal assessment</b> | 20                    | Covers objectives 1, 2, 3 and 4         |    | 10               |

Internal assessment component: Duration: 10 hours      Weighting: 20%

Students should be familiar with the following key terms and phrases used in examination questions, which are to be understood as described below. Although these terms will be used frequently in examination questions, other terms may be used to direct students to present an argument in a specific way.

Assessment objective 1 - Command term: Define, Draw, Label, List, Measure, State, Write down

Assessment objective 2 - Command term: Annotate, Apply, Calculate, Describe, Distinguish, Estimate, Formulate, Identify, Outline, Plot

Assessment objective 3 - Command term: Analyse, Comment, Compare, Compare and contrast, Construct, Deduce, Demonstrate, Derive, Design, Determine, Discuss, Evaluate, Explain, Hence, Hence or otherwise, Justify, Predict, Show, Show that, Sketch, Solve, Suggest

#### **Course main resources:**

**DP Physics:** •Physics for the IB Diploma Sixth Edition 2014, K. A. Tsokos Cambridge University Press

•Pearson Baccalaureate: Higher Level Physics for the IB Diploma by Chris Hamper

•IB Physics Course Book: Oxford IB Diploma Programme by Michael Bowen-Jones and Author David Homer

**DP Chemistry:** Oxford IB Diploma programme: Chemistry Course Companion

By Brian Murphy, David Tarcy and Sergey Bylikin. ISBN: 978-0-19-839212-5

**DP Biology** – *Pearson Higher level Biology by Alan Damon, Randy McGonegal, Patricia Tosto, William Ward*

*Oxford IB Diploma Programme Biology Course Companion by Andrew Allott and David Mindorff*

#### **Links with Diploma Programme teachers**

All Programme teachers should be familiar with TOK as they have to make connections with TOK questions in their own courses. They can also suggest some theoretical concerns that could be taken further in the TOK classroom. Within this context, how do you plan to work with your colleagues to ensure that TOK becomes a real link among all of them?

#### **DP Sciences:**

TOK lessons can support students in their study of science, just as the study of science can support students in their TOK course. TOK provides a space for students to engage in stimulating wider discussions about questions such as what it means for a discipline to be a science, or whether there should be ethical constraints on the pursuit of scientific knowledge. It also provides an opportunity for students to reflect on the methodologies of science, and how these compare to the methodologies of other areas of knowledge.

It is now widely accepted that there is no one scientific method, in the strict Popperian sense. Instead, the sciences utilize a variety of approaches in order to produce explanations for the behaviour of the natural world. The different scientific disciplines share a common focus on utilizing inductive and deductive reasoning, on the importance of evidence, and so on. Students are encouraged to compare and contrast these methods with the methods found in, for example, the arts or in history.

In this way there are rich opportunities for students to make links between their science and TOK courses. One way in which science teachers can help students to make these links to TOK is by drawing students' attention to knowledge questions that arise from their subject content. Knowledge questions are open-ended questions about knowledge such as:

- How do we distinguish science from pseudoscience?
- When performing experiments, what is the relationship between a scientist's expectation and their perception?
- How does scientific knowledge progress?
- What is the role of imagination and intuition in the sciences?
- What are the similarities and differences in methods in the natural sciences and the human sciences?

Examples of relevant knowledge questions are provided throughout this guide within the sub-topics in the syllabus content. Teachers can also find suggestions of interesting knowledge questions for discussion in the "Areas of knowledge" and "Knowledge frameworks" sections of the TOK guide. Students should be encouraged to raise and discuss such knowledge questions in both their science and TOK classes.

### **Assessment components**

*Briefly explain how and when you will work on them. Include the date when you will first introduce the assessment components to your students. Explain the different stages, the timeline and how students will be prepared to undertake both.*

Students will be introduced to the assessment criteria of the course early on and these will be regularly referred to in terms of the skills being developed throughout the learning process. Students would have a clear understanding of how they will be assessed, and the expectations of the course. In the formatives with at least two per unit teacher's feedback is crucial and will allow students to monitor their progress and reflect upon their learning and skills development.

First formative will be within 15 days of starting of course and summative at the end of each unit.

Both the internal and external assessment tasks of IBDP physics reflect the aims of the course. Integral to the experience of students in any of the group 4 courses is their experience in the classroom laboratory or in the field. Practical activities allow students to interact directly with natural phenomena and secondary data sources. These experiences provide the students with the opportunity to design investigations, collect data, develop manipulative skills, analyse results, collaborate with peers and evaluate and communicate their findings. Experiments can be used to introduce a topic, investigate a phenomenon or allow students to consider and examine questions and curiosities.

Internal assessment enables students to demonstrate the application of their skills and knowledge, and to pursue their personal interests, without the time limitations and other constraints that are associated with written examinations. The internal assessment should, as far as possible, be woven into normal classroom teaching and not be a separate activity conducted after a course has been taught.

### **International mindedness**

*Every course should contribute to the development of international mindedness in students. As an example of how you would do this, choose one topic from your outline that would allow your students to analyse it from different cultural perspectives. Briefly explain the reason for your choice and what resources you will use to achieve this goal.*

#### **Chemistry: Topic - An example: from Chemical Bonding**

While teaching Chemical bonding, we discuss Lewis dot structural formula and structural formula of various molecules and ozone as well. This sub-topic also gives us liberty to discuss the stability of molecules that can be explained using some chemical properties of the molecules. Thus, chemical bonding provides context for thinking about international mindedness through the story of depletion of ozone layer as follows: Like starting the questions:

How did ozone layer deplete over a period?

Does depletion of ozone layer can be associate with scientific advancement or scientific failure? How have global community worked together to reduce the depletion of ozone layer further?

Students would review the following (taken from IB chemistry guide)

[https://undsci.berkeley.edu/flowchart\\_noninteractive.php](https://undsci.berkeley.edu/flowchart_noninteractive.php) and then following video will be shared with students to discuss further:

[https://www.youtube.com/watch?feature=player\\_embedded&v=AU0eNa4GrgU#at=946](https://www.youtube.com/watch?feature=player_embedded&v=AU0eNa4GrgU#at=946)

They see the relation between the scientific discovery pathways to the incident (ozone layer depletion) and give their opinion on 'Role of Scientific community in combating the problems created through discovery to recovery. Students make use of words like in the image below to write their reflections



### Physics: Topic: Sources of energy

Students will be asked to express their views on the following statement.

"The production of energy through alternative energy resources demands new levels of international collaboration."

Discussion with the students:

- The production of energy from fossil fuels has a clear impact on the world we live in and therefore involves global thinking.
- The geographic concentrations of fossil fuels have led to political conflict and economic inequalities.
- Why different alternative sources are used in different countries in different ways.
- Solving problems relevant to energy transformations in the context of present generating systems.

Students will be asked to reflect and conclude about the alternative forms of energy being explored by the international Community.

**BIOLOGY- TOPIC –CELL BIOLOGY** - Stem cell research has depended on the work of teams of scientists in many countries who share results thereby speeding up the rate of progress. However, national governments are influenced by local, cultural and religious traditions that impact on the work of scientists and the use of stem cells in therapy.

### CLASS ACTIVITY-

Students will be asked to research as to which countries support stem cell research using human embryos is permitted and in which countries it is considered as illegal. Students will research and then discuss in the class.

### Development of the IB learner profile

*Through the course it is also expected that students will develop the attributes of the learner profile. As an example of how you would do this, choose one topic from your course outline and explain how the contents and related skills would pursue the development of any attribute(s) of the learner profile that you will identify.*

Learner profile is being developed in the following way

One of the important attributes that IB teachers like to develop in their students is Thinker. It is imperative for the teachers to develop critical and creative thinking skills in students and over and above developing the Transfer skills i.e. applying the learnt knowledge, concepts and skills in solving real-life problems. There are number of opportunities available in IBDP sciences whereby, Transfer skills can be developed in students through different activities. An example below illustrates the same:

### Developing Transfer skills in students -Unit Redox Processes

Volumetric analysis(titration) is one of the most essential analytical techniques in chemistry. It gives us quantitative data to draw conclusions and look for possible solutions. Students would use volumetric analysis to analyse in different situations (Cl<sub>2</sub> content in swimming pool water and sugar in sprite etc.) to understand how titration is used in various real-life situations. Biodiversity is very important to sustain ecosystem of a body. Students are encouraged to use Winkler's method to determine the amount of Dissolved Oxygen (DO) for a water body in their respective communities. Students are asked to find out the possible reasons behind the poor dissolved oxygen in a water and propose plausible solutions to the local communities and extend it as CAS activity and show the possible improvement in the DO of the water body over a period of 1 year.

### TOPIC – MOLECULAR BIOLOGY-

#### Activity-

Design an experiment to investigate the effect of alcohol concentration on the permeability of cell membrane in beet root.

#### Development of IB Learner Profile-

**Inquiry and Thinking** - For designing the experiment the students need to do some research on the topic and then think about various aspects to design the experiment ,like apparatus required, variables to be measured and controlled, limits within which independent variable is changed ( example range of alcohol concentration).

**Risk taker-** while designing the experiment the students are not sure whether the methodology they designed will work or not.

**Reflective** – after their investigation the students evaluate what went well, what did not. This help them in future experiments

#### Course syllabus: Physics

| Unit title                              | Duration (teaching periods) | Unit content (topics)   | Objectives               | Assessment tools; Assessment criteria                                    | Summative assessment  | ATL   | LP and CAS/Service links  | Links with TOK/Critical thinking   | Links with other subjects/interdisciplinary links  |
|---|-----------------------------|---|--------------------------|--|---|---|---|--|--|
| Topic 1: Measurements and uncertainties | 5 hours                     | 1.1 – Measurements in physics <ul style="list-style-type: none"> <li>• Fundamental and derived SI units</li> <li>• Scientific notation and metric multipliers, • Significant figures</li> <li>• Orders of magnitude, • Estimation</li> </ul> 1.2 – Uncertainties and errors <ul style="list-style-type: none"> <li>• Random and systematic errors</li> <li>• Absolute, fractional and percentage uncertainties, • Error bars</li> </ul> | AO1<br>AO2<br>AO3<br>AO4 | Formative assessments, Presentation, Lab activity, Summative assessment, | Paper 1 (MCQ), Paper 3<br>Lab Activity: To find density of given object and carry out error analysis with appropriate graph | Lab Activity: <b>Thinking skill – Critical thinking</b><br>Students should be able to apply critical thinking skills in order to be able to Formulate, analyse and evaluate uncertainties | Thinker<br><br>Student will be able to develop critical thinking ability by analysing and evaluating their data collection during the lab activity. | To what extent does having a common standard approach to measurement facilitate the sharing of knowledge in physics? | Uncertainties and error bars are the parts of data processing which is applied to chemistry and Biology as well. Vectors are related to Mathematics. |

|                    |              |  |                          |  |   |  |   |   |   |
|--------------------|--------------|--|--------------------------|--|---|--|---|---|---|
|                    |              | <ul style="list-style-type: none"> <li>Uncertainty of gradient and intercepts</li> </ul> <p>1.3 – Vectors and scalars quantities, resolution of vectors</p>  |                          |  |   |  |   |   |   |
| Topic<br>Mechanics | 2:<br>22 hrs | <p>2.1 – Motion</p> <ul style="list-style-type: none"> <li>Distance and displacement, Speed and velocity, Acceleration, Graphs describing motion, Equations of motion for uniform acceleration, Projectile motion, Fluid resistance and terminal speed</li> </ul> <p>2.2 – Forces</p> <ul style="list-style-type: none"> <li>Objects as point particles, Free-body diagrams, • Translational equilibrium, • Newton’s laws of motion, • Solid friction</li> </ul> <p>2.3 – Work, energy and power</p> <ul style="list-style-type: none"> <li>Kinetic energy,</li> <li>Gravitational potential energy,</li> <li>Elastic potential energy,</li> <li>Work done as energy transfer,</li> <li>Power as rate of energy transfer,</li> <li>Principle of conservation of energy,</li> <li>Efficiency</li> </ul> <p>2.4 – Momentum and impulse</p> <ul style="list-style-type: none"> <li>Newton’s second law expressed in terms of rate of change of momentum</li> <li>Impulse and force–time graphs</li> <li>Conservation of linear momentum</li> <li>Elastic collisions, inelastic collisions and explosions</li> </ul> | AO1<br>AO2<br>AO3<br>AO4 | Formative assessments, Presentation, Lab activity, Summative assessment, | Paper 1 (MCQ), Paper 2<br>Structured Lab Activity: Investigate factors that may affect range and maximum height of the projectile | <b>Thinking skill – Critical thinking</b><br><br>Students should be able to apply critical thinking skills, reading and writing skills in order to be able to Formulate, analyse and evaluate SHM. | Thinker<br>Student will be able to develop critical thinking ability by analysing and evaluating their data collection during the lab activity. | The independence of horizontal and vertical motion in projectile motion seems to be counter intuitive.<br>How do scientists work around their intuitions? | Graphs and gradients are related to Mathematics |

|                             |        |  |                          |  |  |   |  |  |   |
|-----------------------------|--------|--|--------------------------|--|--|---|--|--|---|
| Topic 3:<br>Thermal physics | 11 hrs | <p>3.1 – Thermal concepts</p> <ul style="list-style-type: none"> <li>• Molecular theory of solids, liquids and gases</li> <li>• Temperature and absolute temperature</li> <li>• Internal energy</li> <li>• Specific heat capacity</li> <li>• Phase change</li> <li>• Specific latent heat</li> </ul> <p>3.2 – Modelling a gas</p> <ul style="list-style-type: none"> <li>• Pressure</li> <li>• Equation of state for an ideal gas</li> <li>• Kinetic model of an ideal gas</li> <li>• Mole, molar mass and the Avogadro constant</li> <li>• Differences between real and ideal gases</li> </ul>  | AO1<br>AO2<br>AO3<br>AO4 | Formative assessments, Presentation, Lab activity, Summative assessment, | Paper 1 (MCQ), Paper 2<br>Structured Investigate Rate of Cooling of tap water  | Thinking skill – Critical thinking<br>Communication skills - <b>Reading</b> , writing and using language to gather and communicate information<br>Students should be able to apply critical thinking skills, reading and writing skills in order to be able to Formulate, analyse and evaluate Thermal concepts | Risk takers:<br><br>Student will be able to develop risk-taking ability by designing their own lab. Some will be encouraged to choose design lab under unknown situations without worrying about the success/failure of the investigation.                             | Observation through sense perception plays a key role in making measurements.<br><br>Does sense perception play different roles in different areas of knowledge?   | Mole concepts and ideal gases law related to the Chemistry  |
| Topic 4: Waves              | 15 hrs | <p>4.1 – Oscillations</p> <ul style="list-style-type: none"> <li>• Simple harmonic oscillations</li> <li>• Time period, frequency, amplitude, displacement and phase difference</li> <li>• Conditions for simple harmonic motion</li> </ul> <p>4.2 – Travelling waves</p> <ul style="list-style-type: none"> <li>• Travelling waves, Wavelength, frequency, period and wave speed</li> <li>• Transverse and longitudinal waves</li> <li>• The nature of electromagnetic waves, The nature of sound waves</li> </ul> <p>4.3 – Wave characteristics</p> <ul style="list-style-type: none"> <li>• Wave fronts and rays, Amplitude and intensity, Superposition, Polarization</li> </ul> <p>4.4 – Wave behaviour</p> | AO1<br>AO2<br>AO3<br>AO4 | Formative assessments, Presentation, Lab activity, Summative assessment, | Paper 1 (MCQ), Paper 2<br>Structured Lab Activity: Investigate a factor that may affect time period of a simple pendulum | <b>Thinking skill – Critical thinking Communication skills - Reading</b> , writing and using language to gather and communicate information<br><br>Students should be able to apply critical thinking skills, reading and writing skills in order to be able to Formulate, analyse and evaluate SHM.            | Thinker and communicator<br>Student will be able to develop thinking skills and communication skills by formulating, analysing and evaluating experimental outcomes-wherein students would use their critical thinking, reading and writing skills to investigate SHM. | Scientists often transfer their perception of tangible and visible concepts to explain similar non-visible concepts, such as in wave theory.<br><br>How do scientists explain concepts that have no tangible or visible quality? | Gradients of x-t graph and v-t graphs of SHM are used to draw v-t and a-t graph respectively is related to the Mathematics. |

|  |        |   |                          |  |  |  |   |   |  |
|--|--------|---|--------------------------|--|--|--|---|---|--|
|  |        | <ul style="list-style-type: none"> <li>Reflection and refraction, Snell's law, critical angle and total internal reflection, Diffraction through a single-slit and around objects</li> <li>Interference patterns, • Double-slit interference, • Path difference</li> </ul> <p>4.5 – Standing waves</p> <ul style="list-style-type: none"> <li>The nature of standing waves</li> <li>Boundary conditions</li> <li>Nodes and antinodes</li> </ul>   |                          |  |  |  |   |   |  |
| Topic 5: Electricity and magnetism       | 15 hrs | <p>5.1 – Electric fields</p> <ul style="list-style-type: none"> <li>Charge, • Electric field</li> <li>Coulomb's law, • Electric current</li> <li>Direct current (dc), • Potential difference</li> </ul> <p>5.2 – Heating effect of electric currents</p> <ul style="list-style-type: none"> <li>Circuit diagrams, • Kirchhoff's circuit laws</li> <li>Heating effect of current and its consequences</li> <li>Resistance expressed as <math>R = V/I</math></li> <li>Ohm's law, • Resistivity, • Power dissipation</li> </ul> <p>5.3 – Electric cells</p> <ul style="list-style-type: none"> <li>Cells, • Internal resistance</li> <li>Secondary cells, • Terminal potential difference, • Electromotive force (emf)</li> </ul> <p>5.4 – Magnetic effects of electric currents</p> <ul style="list-style-type: none"> <li>Magnetic fields, • Magnetic force</li> </ul> | AO1<br>AO2<br>AO3<br>AO4 | Formative assessments, Presentation, Lab activity, Summative assessment, | Paper 1 (MCQ), Paper 2<br>Structured Lab Activity: Investigating one or more of the factors that affect resistance | Social skills: Collaboration skills<br><br>Students should be able to apply Collaboration skills in order to be able to Formulate, analyse and evaluate relation between electric current and potential difference | Risk takers:<br><br>Student will be able to develop risk-taking ability by designing their own lab. Some will be encouraged to choose design lab under unknown situations without worrying about the success/ failure of the investigation. | Sense perception in early electrical investigations was key to classifying the effect of various power sources; however, this is fraught with possible irreversible consequences for the scientists involved. | Electrical cells and the electromotive force of a cell are related to Chemistry                                    |
| Topic 6: Circular motion and gravitation | 5 hrs  | <p>6.1 – Circular motion</p> <ul style="list-style-type: none"> <li>Period, frequency, angular displacement and angular velocity</li> <li>Centripetal force</li> </ul>  | AO1<br>AO2<br>AO3<br>AO4 | Formative assessments, Presentation, Lab activity,                       | Paper 1 (MCQ), Paper 2<br>Structured Lab Activity: Find the Centripetal force                                      | Social skills:<br>Students should be able to apply Collaboration skills in order to be able  | Student will be able to develop knowledge and understanding by formulating,   | Foucault's pendulum gives a simple observable proof of the rotation of the Earth, which is  | Derivation of orbital speed is related to Mathematics. Kepler's laws of planetary motion are related to Geography. |

|   |        |  |                          |   |  |  |   |  |  |
|---|--------|--|--------------------------|---|--|--|---|--|--|
|   |        | <ul style="list-style-type: none"> <li>Centripetal acceleration</li> </ul> <p>6.2 – Newton’s law of gravitation</p> <ul style="list-style-type: none"> <li>Newton’s law of gravitation</li> <li>Gravitational field strength</li> </ul>  |                          | Summative assessment,   | of rubber stopper page   | to Formulate, analyse and evaluate relation between electric current and potential difference  | analysing and evaluating a group activity wherein students would use their collaborative skills to understand Newton’s laws   | largely unobservable.  |  |
| Topic 7: Atomic, nuclear and particle physics | 14 hrs | <p>7.1 – Discrete energy and radioactivity</p> <ul style="list-style-type: none"> <li>Discrete energy and discrete energy levels, Transitions between energy levels, Radioactivedecay, Fundamental forces and their properties, • Alpha particles, beta particles and gamma rays, • Half-life, • Absorption characteristics of decay particles</li> </ul> <p>7.2 – Nuclear reactions</p> <ul style="list-style-type: none"> <li>Isotopes, • Background radiation</li> <li>The unified atomic mass unit, Mass defect and nuclear binding energy, Nuclear fission and nuclear fusion</li> </ul> <p>7.3 – The structure of matter</p> <ul style="list-style-type: none"> <li>Quarks, leptons and their antiparticles, • Hadrons, baryons and mesons, • The conservation laws of charge, baryon number, lepton number and strangeness</li> <li>The nature and range of the strong nuclear force, weak nuclear force and electromagnetic force, • Exchange particles, • Feynman diagrams</li> <li>Confinement, • The Higgs boson</li> </ul> | AO1<br>AO2<br>AO3<br>AO4 | Formative assessments, Presentation, Lab activity, Summative assessment | Paper 1 (MCQ), Paper 2<br>Structured Lab Activity: Investigating half-life | Self-Management<br>-Organization skills<br>- Managing time and tasks effectively<br>Students should be able to apply organization skills in order to be able to Formulate, analyse and evaluate half-life of an radioactive substances through a group activity. | Caring:<br>Student will be able to develop caring ability by helping each other in a group activity where a good partner would care about the results of the student. Many students struggle with physics and ask fellow students for help, a caring student will provide help in a way that will aid the learning process. | The role of luck/serendipity in successful scientific discovery is almost inevitably accompanied by a scientifically curious mind that will pursue the outcome of the “lucky” event. | Structure of atoms, Binding energy of nucleus, discrete energy level of nucleus and radioactivity are related to Chemistry |
| Topic 8: Energy production                    | 8 hrs  | <p>8.1 – Energy sources</p> <ul style="list-style-type: none"> <li>Specific energy and energy density of fuel sources</li> <li>Sankey diagrams</li> </ul>  | AO1<br>AO2<br>AO3        | Formative assessments,  | Paper 1 (MCQ), Paper 2<br>Structured Lab Activity:                         | Self-Management<br>-Organization skills  | Open minded:<br>Student will be able to develop open minded   | The use of nuclear energy inspires a range of emotional responses from   | Fossil fuels, renewable and non-renewable sources of energy are related to Chemistry and biology.                          |

|                               |        |  |                          |  |  |   |   |  |   |
|-------------------------------|--------|--|--------------------------|--|--|---|---|--|---|
|                               |        | <ul style="list-style-type: none"> <li>• Primary energy sources</li> <li>• Electricity as a secondary and versatile form of energy</li> <li>• Renewable and non-renewable energy sources</li> </ul> <p>8.2 – Thermal energy transfer</p> <ul style="list-style-type: none"> <li>• Conduction, convection and thermal radiation</li> <li>• Black-body radiation</li> <li>• Albedo and emissivity</li> <li>• The solar constant</li> <li>• The greenhouse effects</li> <li>• Energy balance in the Earth surface–atmosphere system</li> </ul>  | AO4                      | Presentation, Lab activity, Summative assessment,                        |  | - Managing time and tasks effectively<br>Students should be able to apply organization skills in order to be able to Formulate, analyse and evaluate energy balance through a group activity.   | ability by asking open ended questions related to climate changes and judicious use of energy resources.  | scientists and society.  |   |
| Topic 9: Wave phenomena (AHL) | 17 hrs | <p>9.1 – Simple harmonic motion</p> <ul style="list-style-type: none"> <li>• The defining equation of SHM</li> <li>• Energy changes</li> </ul> <p>9.2 – Single-slit diffraction</p> <ul style="list-style-type: none"> <li>• The nature of single-slit diffraction</li> </ul> <p>9.3 – Interference</p> <ul style="list-style-type: none"> <li>• Young's double-slit experiment</li> <li>• Modulation of two-slit interference pattern by one-slit diffraction effect</li> <li>• Multiple slit and diffraction grating interference patterns</li> <li>• Thin film interference</li> </ul> <p>9.4 – Resolution</p> <ul style="list-style-type: none"> <li>• The size of a diffracting aperture</li> <li>• The resolution of simple monochromatic two-source systems</li> </ul> <p>9.5 – Doppler effect</p> <ul style="list-style-type: none"> <li>• The Doppler effect for sound waves and light waves</li> </ul> | AO1<br>AO2<br>AO3<br>AO4 | Formative assessments, Presentation, Lab activity, Summative assessment, | Paper 1 (MCQ), Paper 2<br>Structured Lab Activity: Investigating Young's double-slit | Thinking skill – Critical thinking<br>Communication skills - Reading, writing and using language to gather and communicate information<br><br>Students should be able to apply critical thinking skills, reading and writing skills in order to be able to Formulate, analyse and evaluate double slits interference pattern. | Student will be able to develop thinking skills and communication skills by formulating, analysing and evaluating experimental outcomes-wherein students would use their critical thinking, reading and writing skills to investigate interference pattern. | Are explanations in science different from explanations in other areas of knowledge such as history? | Derivatives of velocity and acceleration of simple harmonic motion are related to Mathematics |
| Topic 10: Fields (AHL)        | 11 hrs | <p>10.1 – Describing fields</p> <ul style="list-style-type: none"> <li>• Gravitational fields</li> <li>• Electrostatic fields</li> <li>• Electric potential and gravitational potential</li> <li>• Field lines</li> </ul>  | AO1<br>AO2<br>AO3<br>AO4 | Formative assessments, Presentation, Lab activity, Summative assessment, | Paper 1 (MCQ), Paper 2<br>Structured   | Thinking skills   | Thinker   | Although gravitational and electrostatic forces decrease with the square of                          | Derivation of escape velocity and energy of satellite are related to Mathematics.             |

|   |        |  |                          |  |   |   |         |  |  |
|---|--------|--|--------------------------|--|---|---|---------|--|--|
|   |        | <ul style="list-style-type: none"> <li>Equipotential surfaces</li> <li>Potential and potential energy</li> <li>Potential gradient</li> <li>Potential difference</li> </ul> <p>10.2 – Fields at work</p> <ul style="list-style-type: none"> <li>Escape speed</li> <li>Orbital motion, orbital speed and orbital energy</li> <li>Forces and inverse-square law behaviour</li> </ul>  |                          |  |   |   |         | distance and will only become zero at infinite separation, from a practical standpoint they become negligible at much smaller distances.                   |  |
| Topic 11: Electromagnetic induction (AHL)   | 16 hrs | <p>11.1 – Electromagnetic induction</p> <ul style="list-style-type: none"> <li>Electromotive force (emf),</li> <li>Magnetic flux and magnetic flux linkage,</li> <li>Faraday's law of induction</li> <li>Lenz's law</li> </ul> <p>11.2 – Power generation and transmission</p> <ul style="list-style-type: none"> <li>Alternating current (ac) generators</li> <li>Average power and root mean square (rms) values of current and voltage,</li> <li>Transformers,</li> <li>Diode bridges,</li> <li>Half-wave and full-wave rectification</li> </ul> <p>11.3 – Capacitance</p> <ul style="list-style-type: none"> <li>Capacitance,</li> <li>Dielectric materials</li> <li>Capacitors in series and parallel</li> <li>Resistor-capacitor (RC) series circuits,</li> <li>Time constant</li> </ul> | AO1<br>AO2<br>AO3<br>AO4 | Formative assessments, Presentation, Lab activity, Summative assessment, | Paper 1 (MCQ), Paper 2<br>Structured Lab Activity: Investigating a diode bridge rectification | Self-Management<br>-Organization skills<br>- Managing time and tasks<br>Students should be able to apply organization skills in order to be able to Formulate, analyse and evaluate bridge rectifier. . | Caring  | Terminology used in electromagnetic field theory is extensive and can confuse people who are not directly involved.  | Mathematical derivation of emf of a generator is related to mathematics  |
| Topic 12: Quantum and nuclear physics (AHL) | 16 hrs | <p>12.1 – The interaction of matter with radiation</p> <ul style="list-style-type: none"> <li>Photons,</li> <li>The photoelectric effect</li> <li>Matter waves,</li> <li>Pair production and pair annihilation</li> <li>Quantization of angular momentum in the Bohr model for hydrogen</li> <li>The wave function</li> </ul>  | AO1<br>AO2<br>AO3<br>AO4 | Formative assessments, Presentation, Lab activity, Summative assessment, | Paper 1 (MCQ), Paper 2<br>Structured Lab Activity:  | <b>Thinking skill – Critical thinking</b><br><br>Students should be able to apply critical thinking skills in order to be able to Formulate, analyse and evaluate                                       | Thinker | The duality of matter and tunnelling are cases where the laws of classical physics are violated.<br><br>To what extent have advances in technology enabled | Rutherford experiments and laws of radioactivity are related to Chemistry whereas derivation of decay law is related to mathematics. |

|   |                            |  |                          |  |  |  |          |  |           |
|---|----------------------------|--|--------------------------|--|--|--|----------|--|-----------|
|   |                            | <ul style="list-style-type: none"> <li>• The uncertainty principle for energy and time and position and momentum</li> <li>• Tunnelling, potential barrier and factors affecting tunnelling probability</li> </ul> 12.2 – Nuclear physics <ul style="list-style-type: none"> <li>• Rutherford scattering and nuclear radius</li> <li>• Nuclear energy levels, • The neutrino, • The law of radioactive decay and the decay constant</li> </ul>  |                          |  |  | photoelectric effect.  |          | paradigm shifts in science?  |           |
| Option D:<br>Astrophysics<br>(SL & AHL) | SL – 15 hrs<br>AHL- 15 hrs | Core topics<br>D.1 – Stellar quantities <ul style="list-style-type: none"> <li>• Objects in the universe, • The nature of stars, • Astronomical distances, • Stellar parallax and its limitations, • Luminosity and apparent brightness</li> </ul> D.2 – Stellar characteristics and stellar evolution <ul style="list-style-type: none"> <li>• Stellar spectra, • Hertzsprung–Russell (HR) diagram, • Mass–luminosity relation for main sequence stars, • Cepheid variables, • Stellar evolution on HR diagrams, • Red giants, white dwarfs, neutron stars and black holes, • Chandrasekhar and Oppenheimer–Volkoff limits</li> </ul> D.3 – Cosmology <ul style="list-style-type: none"> <li>• The Big Bang model, • Cosmic microwave background (CMB) radiation, • Hubble’s law, • The accelerating universe and redshift (z)</li> <li>• The cosmic scale factor (R)</li> </ul> <b>Additional higher-level topics</b><br>D.4 – Stellar processes (HL only) <ul style="list-style-type: none"> <li>• The Jeans criterion, • Nuclear fusion, • Nucleosynthesis off the main sequence, • Type Ia and II supernovae</li> </ul> D.5 – Further cosmology (HL only) | AO1<br>AO2<br>AO3<br>AO4 | Formative assessments, Presentation, Lab activity, Summative assessment, | Paper 1 (MCQ), Paper 2<br>Structured Lab Activity: Hubble and the Expanding Universe | <b>Thinking skill – Critical thinking</b><br><br>Students should be able to apply critical thinking skills in order to be able to Formulate, analyse and evaluate expanding universe | Balanced | The information revealed through spectra needs a trained mind to be interpreted.<br><br>What is the role of interpretation in gaining knowledge in the natural sciences? How does this differ from the role of interpretation in other areas of knowledge? | Geography |

|  |  |   |  |  |  |  |  |  |  |
|--|--|---|--|--|--|--|--|--|--|
|  |  | <ul style="list-style-type: none"> <li>The cosmological principle,</li> <li>Rotation curves and the mass of galaxies,</li> <li>Dark matter,</li> <li>Fluctuations in the CMB, The cosmological origin of redshift, Critical density, Dark energy</li> </ul> |  |  |  |  |  |  |  |
|--|--|---|--|--|--|--|--|--|--|

### Course syllabus: Chemistry

| Unit title                     | Duration (teaching periods) | Unit content (topics)  | Objectives                             | Assessment tools; Assessment criteria                                   | Summative assessment   | ATL  | LP and CAS/Service links                                 | Links with TOK/Critical thinking  | Links with other subjects/interdisciplinary links                             |
|--------------------------------|-----------------------------|--|--|---|--|--|--|---|---|
| Stoichiometric relationships   | 14 hrs                      | a. Introduction to the particulate nature of matter and chemical change<br>b. The mole concept<br>c. Reacting masses and volumes   | 1(a,b)<br>2(b)<br>3(b,c)               | Written test<br>Lab work (criteria: Analysis and Evaluation)            | A written test to test their conceptual knowledge and critical thinking                                    | Thinking skills – Critical thinking and transfer skills  | Thinker  | The magnitude of Avogadro's constant is beyond the scale of our everyday experience. How does our everyday experience limit our intuition?                                  | NA  |
| Periodicity                    | 12 hrs                      | Periodic table<br>Periodic trends<br>3d row of transition elements<br>Coloured complexes   | A1(a,b,c)<br>A2(a)<br>A3(c,d)          | Written test<br>Secondary data-based lab work                           | Written assessment that includes adequate data-based questions (secondary data)                            | Thinking skills- Critical thinking skills<br>Social activities: Group activities                       | Thinker<br>Knowledgeable                                 | The predictive power of Mendeleev's Periodic Table illustrates the "risk-taking" nature of science. What is the demarcation between scientific and pseudoscientific claims? | Chemical bonding<br>Engineering products- Smart metal alloys in medical field |
| Chemical bonding and structure | 22                          | a. Ionic bonding and structure<br>b. Covalent bonding<br>c. Covalent structures<br>d. intermolecular forces<br>e. Metallic bonding<br>f. Covalent bonding and electron domain and molecular geometries<br>g. Hybridization | A1(a,b,c)<br>A2(a,c)<br>A3(c,d)        | Written test<br>A lab (Criteria: Exploration, analysis and evaluation)  | Investigation on factors affecting solubility of a compound<br>And a Written test covering the entire unit | Communication skills- Use of appropriate structures, dot structural formula, resonating structures etc | Communicator   | Does the need for resonance structures decrease the value or validity of Lewis (electron dot) theory?   | Medicinal chemistry   |
| Redox processes                | 15                          | a. Oxidation and reduction<br>b. electrolytic cells<br>c. electrochemical cells  | A1(a,b,c)<br>A2(a)<br>A3(a,b,c,d)<br>4 | Written tests<br>Lab work covering Exploration, Analysis and Evaluation | Written test to assess their critical thinking and transfer skills   | Critical thinking and Transfer skills<br>Social skill-Lab work in group                                | Thinker<br>Caring (disposal, safe handling of chemicals) | Oxidation states are useful when explaining redox reactions. Are artificial conversions a useful or valid way of clarifying knowledge?                                      | Physics- Electricity  |

|                      |    |  |                                  |  |  |   |  |  |  |
|----------------------|----|--|----------------------------------|--|--|---|--|--|--|
| Thermal chemistry    | 16 | a. Measuring energy changes<br>b. Hess's Law<br>c. Bond enthalpies<br>d. Energy cycles<br>e. Entropy and spontaneity   | 1(a,b)<br>2(a)<br>3(b,c,d)       | Written tests-<br>FAs<br>Labs covering<br>Analysis and<br>Evaluation                                   | Written Test<br>Any one lab<br>based on<br>either<br>determination<br>of enthalpy of<br>neutralization               | Communication<br>skills   | Communicator   | Evolution of the Earth<br>and concept of<br>spontaneity  | Thermal physics- How sign<br>conventions though sound<br>to be different but convey<br>the same meaning? |
| Equilibrium          | 12 | a. Equilibrium<br>b. The equilibrium law   | 1(a,b,c)<br>3(a,b,c,d)           | Written tests<br><br>Lab covering all<br>5 IA criteria   | Written test<br>and a Lab<br>(determination<br>of equilibrium<br>constant)   | Self-management<br>skills (time<br>management-<br>completing a<br>humongous task<br>within a stipulated<br>time period) | Balanced<br>(students need to<br>demonstrate<br>perseverance,<br>emotional<br>balance, time<br>management,<br>while completing<br>a lab)                 | NA   | NA   |
| Chemical kinetics    | 13 | a. Collision theory and rates of<br>reaction<br>b. Rate expression and reaction<br>mechanism<br>c. Activation energy   | 1(a, b, c)<br>2(a), 3(a, b, c d) | Labs based on<br>Exploration,<br>analysis,<br>Evaluation and<br>Communication                          | Written Test<br>Investigation-<br>Determination<br>of Rate<br>constant and<br>activation<br>energy of a<br>reaction) | Self-management<br>skills<br>(time management)  | Caring (safe<br>handling and<br>disposal of<br>chemicals)  | NA   | NA   |
| Acids and<br>Bases   | 18 | a. Theories of acids and bases<br>b. Properties of acids and bases<br>c. The pH scale<br>d. Strong and weak acids and<br>bases<br>e. Acid deposition<br>f. Lewis acids and bases<br>g. Calculations involving acids<br>and bases<br>h. pH curves | 1(a,b,c)<br>AO4                  | Written<br>assessments-<br>SA<br>Lab work-<br>covering<br>Analysis,<br>Evaluation and<br>Communication | Written test<br>Investigation  | Thinking skills –<br>Critical and transfer<br>skills  | Thinker<br>Caring (safe<br>handling and<br>disposal of<br>chemicals)   | Acid and base<br>behaviour can be<br>explained using<br>different theories. How<br>are the explanations in<br>chemistry different<br>from explanations in<br>other subjects such as<br>history? (important to<br>maintain multiplicity of<br>theories) | Chemical bonding<br>Medicinal chemistry  |
| Organic<br>chemistry |    | a. Fundamentals of organic<br>chemistry<br>b. Functional group chemistry<br>c. Types of organic reactions<br>d. Synthetic routes<br>e. Stereoisomerism   | 1(a, b, c)<br>2(a)<br>3(c, d)    | Written tests-<br>SA<br>Virtual labs-<br>covering<br>Analysis,<br>Evaluation and<br>Communication      | Written<br>Assessment  | Communication<br>skills – writing<br>mechanism,<br>structures,<br>nomenclature of<br>compounds                          | Knowledgeable –<br>acquiring different<br>knowledge and<br>acquiring different<br>types of<br>communication<br>skills (language of<br>organic chemistry) | Kekulé claimed that<br>the inspiration for the<br>cyclic structure of<br>benzene came from a<br>dream. What role do<br>the less analytical ways<br>of knowledge play in<br>the acquisition of<br>scientific knowledge?                                 | Medicinal chemistry  |

|                             |     |   |                   |  |               |  |   |  |  |
|-----------------------------|-----|---|-------------------|--|---------------|--|---|--|--|
| Measurement and uncertainty | 14  | a. Uncertainties and errors in measurement and results<br>b. Graphical techniques<br>c. Spectroscopic identification of organic compounds<br>d. Spectroscopic identification of organic compounds | A1(a, b, c)<br>A2 | Written assessments<br>The concepts would be however, tested under the Analysis and Evaluation parts of all labs | Written test  | Thinking skills-<br>Critical thinking skills.<br>Communication-<br>New terminologies     | Knowledgeable – acquisition of new knowledge<br>Thinker – Critical thinking ability   | Electromagnetic waves can transmit information beyond that of our sense perceptions. What are the limitations of sense perception as a way of knowing?   | Application of the concepts of this topic is used in nearly all Lab work.  |
| Option                      | TBD |   |                   |  |               |  |   |  |  |
| Option-ENERGY               | 25  | C.1 Energy sources<br>C.2 Fossil fuels<br>C.3 Nuclear fusion and fission<br>C.4 Solar energy<br>C.5 Environmental impact—global warming   | A1(a, b, c)<br>A2 | Written tests - SA   | Written tests | Research skills-<br>Exploration of how is world approaching to resolve the Energy crisis | Open-minded, Communicator, Reflective-<br>Students research and discuss various environmental issues and issues related Energy crisis (MUN model) | The release of energy during fission reactions can be used in times of peace to generate energy, but also can lead to destruction in time of war. Should scientists be held morally responsible for the applications of their discoveries? Is there any area of scientific knowledge the pursuit of which is morally unacceptable? | Connection with redox process - Cells and their functioning<br>Physics: concepts of nuclear reactions are explored using concepts of Nuclear physics |

### Course syllabus: Biology DP

| Unit title               | Duration (teaching periods) | Unit content (topics)  | Objectives                                       | Assessment tools; Assessment criteria  | Summative assessment   | ATL                | LP and CAS/Service links | Links with TOK/Critical thinking   | Links with other subjects/interdisciplinary links                            |
|--------------------------|-----------------------------|--|--|--|--|--------------------|--------------------------|--|--|
| Cell Biology             | 23                          | 1.1 – 1.6 Introduction to cells, Ultrastructure of cells, Membrane structure, Membrane transport, The origin of cells, Cell division   | A1(A,B,C)<br>A2((A,B,C)<br>A3(A, B, C, D)        | Oral questions<br>Learner's presentation on various cell organelles, Worksheet   | End of unit assessment, Lab on membrane permeability.                                  | Thinking, Social   | Inquirer, Knowledgeable  | There is a difference between the living and the non-living environment. How are we able to know the difference?     | Physics<br>Topic C.1 Introduction to imaging                                 |
| <b>Molecular biology</b> | 32                          | 2.1 Molecules to metabolism<br>2.2 -2.9 Water, Carbohydrates and lipids, Proteins, Enzymes, Structure of DNA and RNA, DNA replication, transcription and translation<br>Cell respiration<br>Photosynthesis | AO1(A, B, C)<br>AO2((A, B, C)<br>AO3(A, B, C, D) | Oral questions<br>Worksheets, DNA diagram, Data analysis questions, Lab activity | Written assessment consisting of MCQ, structured and questions on experimental skills. | Thinking, research | Risk taker, Reflective   | There are conflicting views as to the harms and benefits of fats in diets. How do we decide between competing views? | Chemistry<br>Topic 4 Chemical bonding and structure<br>Option B Biochemistry |

|                                   |    |  |  |  |  |                                 |  |  |   |
|-----------------------------------|----|--|--|--|--|---------------------------------|--|--|---|
| <b>Genetics</b>                   | 23 | 3.1 Genes<br>3.2 Chromosomes<br>3.3 Meiosis<br>3.4 Inheritance<br>3.5 Genetic modification and biotechnology   | AO1(A, B, C)<br>AO2((A, B, C)<br>AO3(A,)   | Oral questions<br>Worksheets,<br>Quiz,<br><b>Research</b> on any two genetic diseases      | Written assessment consisting of MCQ, and structured question  | Thinking                        | Knowledgeable  | There is a link between sickle cell anaemia and prevalence of malaria. How can we know whether there is a causal link in such cases or simply a correlation?                           | NA  |
| <b>Ecology</b>                    | 18 | 4.1 Species, communities and ecosystems<br>4.2 Energy flow<br>4.3 Carbon cycling<br>4.4 Climate change   | AO1(a, c)<br>AO2 (a,c)                     | Worksheets,<br>end of chapter questions, Quiz  | Written assessments  | Thinking                        | Thinker, Caring, Reflective<br><b>CAS-</b> Students prepare posters on climate change to spread awareness  | The precautionary principle is meant to guide decision-making in conditions where a lack of certainty exists. Is certainty ever possible in the natural sciences?                      | Geography<br>Part 2A: Fresh water-issues and conflicts<br>Environmental systems and societies<br>Topic 2.1 Species and populations<br>Physics<br>Topic 2.3 Work, energy |
| <b>Evolution and biodiversity</b> | 18 | 5.1 Evidence for evolution<br>5.2 Natural selection<br>5.3 Classification of biodiversity<br>5.4 Cladistics  | AO1(A, B, C)<br>AO2((A, B, C)              | Worksheets,<br>Quiz<br>Concept map<br><b>Research</b> work on Darwin's findings            | Written assessment   | Research, Communication         | Inquirers  | Natural Selection is a theory. How much evidence is required to support a Theory and what sort of counter evidence is required to refute it?   | Physics<br>Topic 7.1 Discrete energy and radioactivity<br>Geography<br>Part 1.3 Patterns in environmental quality and sustainability/Biodiversity                       |
| <b>Human physiology</b>           | 30 | 6.1 Digestion and absorption<br>6.2 The blood system<br>6.3 Defence against infectious disease<br>6.4 Gas exchange<br>6.5 Neurons and synapses<br>6.6 Hormones, homeostasis and reproduction | AO1(A,B,C)<br>AO2((A,B,C)<br>AO3 (A,B,C,D) | Oral questions<br>Student's presentation,<br>Worksheets,<br>end of chapter questions, Quiz | Written assessment,<br><b>Research Project</b> - research on the causes , symptoms ,prevention and treatment of two infectious diseases. | Research, Social, Communication | Thinker, Open minded, Caring<br><b>CAS-</b> Students will take a session of bus drivers and conductors to make them aware about the harmful effects of smoking | Our current understanding is that emotions are the product of activity in the brain rather than the heart. Is knowledge based on science more valid than knowledge based on intuition? | Chemistry<br>Topic D2 Aspirin and penicillin<br>Physics<br>Topic 3.2 Modelling a gas<br>Psychology<br>Core: Biological level of analysis                                |
| <b>Nucleic acids</b>              | 14 | 7.1 DNA structure and Replication<br>7.2 Transcription and gene expression<br>7.3 Translation  | AO1(A,B,C)<br>AO2((A,B,C)                  | Oral questions<br>Online quiz,<br>Online test<br>Research about Rosalind Franklin's X-     | Written assessment comprised of MCQ and structured questions   | Thinking                        | Knowledgeable, Inquirer  | Highly repetitive sequences were once classified as "junk DNA" showing a degree of confidence that it had no role. To  | NA  |

|  |    |   |   |  |  |                              |                           |   |   |
|--|----|---|---|--|--|------------------------------|---------------------------|---|---|
|  |    |   |   | Ray diffraction experiment,  |  |                              |                           | what extent do the labels and categories used in the pursuit of knowledge affect the knowledge we obtain?   |   |
| <b>Metabolism, respiration, photosynthesis</b> | 21 | 8.1 Metabolism<br>8.2 Cell respiration<br>8.3 Photosynthesis  | AO1(A,B,C)<br>AO2((A,B,C)<br>AO3<br>(A,B,C,D) | Oral questions<br>Worksheets,<br>Lab   | Written assessment comprised of MCQ, structured and questions based on experiment. | Self-management<br>,Research | Risk taker,<br>reflective | Many metabolic pathways have been described following a series of carefully controlled and repeated experiments.  | Chemistry<br>Topic 6.1 Collision theory and rates of reaction<br>Chemistry<br>Topic 9.1 Oxidation and reduction |
| <b>Plant biology</b>                           | 20 | 9.1 Transport in the xylem of plants<br>9.2 Transport in the phloem of plants<br>9.3 Growth in plants<br>9.4 Reproduction in plants | AO1(A, B,C)<br>AO2((A,B,C)<br>AO3 A,B,C,D     | Diagrams,<br>Worksheets,<br>Transpiration lab  | Written assessment comprised of MCQ, structured and questions based on experiments | Thinking,<br>Self-management | Research,<br>Open minded  | Plants communicate chemically both internally and externally. To what extent can plants be said to have language?   | NA  |
| <b>Genetics and evolution</b>                  | 12 | 10.1 Meiosis<br>10.2 Inheritance<br>10.3 Gene pools and speciation  | AO1(A,B,C)<br>AO2A,B,C                        | Preparation of 20 marks short answer type question paper and its marking scheme,<br>Oral questions,<br>Mind map  | Written assessment comprised of MCQ and structured questions                       | Communication,<br>Thinking   | Thinkers,<br>Inquirers    | The law of independent assortment was soon found to have exceptions when looking at linked genes. What is the difference between a law and a theory in science? | NA  |
| <b>Animal Physiology</b>                       | 24 | 11.1 Antibody production and vaccination<br>11.2 Movement<br>11.3 The kidney and osmoregulation<br>11.4 Sexual reproduction         | AO1(A,B,C)<br>AO2((A,B,C                      | Preparation of a 20 marks question paper on 11.4 Sexual Reproduction along with marking scheme.<br>Labelled diagram of a sarcomere.<br>Annotation of a diagram of human elbow. | Written assessment comprised of MCQ and structured questions                       | Thinking,<br>Self-management | Thinkers,<br>reflective   | NA  | NA  |

|                                    |    |   |   |  |  |                           |                      |   |  |
|------------------------------------|----|---|---|--|--|---------------------------|----------------------|---|--|
| <b>Option D – Human Physiology</b> | 38 | <p><b>Core topics</b><br/> D.1 Human nutrition<br/> D.2 Digestion<br/> D.3 Functions of the liver<br/> D.4 The heart</p> <p><b>Additional higher level topics</b></p> D.5 Hormones and metabolism<br>D.6 Transport of respiratory gases | AO1(A,B,C)<br>AO2((A,B,C)<br>AO3(A,B,C,D) | Oral questions<br>Worksheets,<br>end of chapter<br>questions, Quiz<br>Mind map | Written<br>assessment<br>comprised of MCQ<br>and structured<br>questions | Research,<br>Communicator | Inquirer,<br>Thinker | There are positive effects of exposure to sun such as the production of Vitamin D as well as health risks associated with exposure to UV rays. How can conflicting knowledge claims be balanced?<br>Excessive alcohol consumption may cause liver cirrhosis. Are attitudes to drugs and alcohol an example of something that is relative to culture? Is all knowledge dependent on culture? | Chemistry<br>Topic B5 Vitamins<br>Chemistry<br>Topic D4 pH regulation of stomach<br>Physics<br>Topic 3.2 Modelling a gas |
|------------------------------------|----|---|---|--|--|---------------------------|----------------------|---|--|

## ENVIRONMENTAL SYSTEMS AND SOCIETIES COURSE OVERVIEW

### **Course general description:**

ESS is an interdisciplinary group 3 and 4 course that is offered only at standard level (SL). As an interdisciplinary course, ESS is designed to combine the methodology, techniques and knowledge associated with group 4 (sciences) with those associated with group 3 (individuals and societies). Because it is an interdisciplinary course, students can study ESS and have it count as either a group 3 or group 4 course, or as both. If students choose the latter option, this leaves the opportunity to study an additional subject from any other group, including an additional group 3 or group 4 subject. ESS is a complex course, requiring a diverse set of skills from its students. It is firmly grounded in both a scientific exploration of environmental systems in their structure and function and in the exploration of cultural, economic, ethical, political, and social interactions of societies with the environment. As a result of studying this course, students will become equipped with the ability to recognize and evaluate the impact of our complex system of societies on the natural world. The interdisciplinary nature of the course requires a broad skill set from students and includes the ability to perform research and investigations and to participate in philosophical discussion. The course requires a systems approach to environmental understanding and problem solving and promotes holistic thinking about environmental issues. It is recognized that to understand the environmental issues of the 21st century and suggest suitable management solutions, both the human and environmental aspects must be understood. Students should be encouraged to develop solutions from a personal to a community and to a global scale

### **Course aims and goals:**

1. acquire the knowledge and understandings of environmental systems at a variety of scales
2. apply the knowledge, methodologies and skills to analyse environmental systems and issues at a variety of scales
3. appreciate the dynamic interconnectedness between environmental systems and societies
4. value the combination of personal, local and global perspectives in making informed decisions and taking responsible actions on environmental issues
5. be critically aware that resources are finite, and that these could be inequitably distributed and exploited, and that management of these inequities is the key to sustainability
6. develop awareness of the diversity of environmental value systems
7. develop critical awareness that environmental problems are caused and solved by decisions made by individuals and societies that are based on different areas of knowledge
8. engage with the controversies that surround a variety of environmental issues
9. create innovative solutions to environmental issues by engaging actively in local and global contexts.

### **Course objectives:**

- A. Demonstrate knowledge and understanding of relevant:
  - i) facts and concepts
  - ii) methodologies and techniques
  - iii) values and attitudes.
- B. Apply this knowledge and understanding in the analysis of:
  - i) explanations, concepts and theories
  - ii) data and models
  - iii) case studies in unfamiliar contexts
  - iv) arguments and value systems.
- C. Evaluate, justify and synthesize, as appropriate:
  - i) explanations, theories and models

- ii) arguments and proposed solutions
  - iii) methods of fieldwork and investigation
  - iv) cultural viewpoints and value systems.
- D. Engage with investigations of environmental and societal issues at the local and global level through:
- i) evaluating the political, economic and social contexts of issues
  - ii) selecting and applying the appropriate research and practical skills necessary to carry out investigations
  - iii) suggesting collaborative and innovative solutions that demonstrate awareness and respect for the cultural differences and value systems of others.

**Course assessment structure and criteria:**

| Assessment component                           | Weighting (%) | Approximate weighting of objectives in each component (%) |    | Duration (hours) |
|--|---------------|---|----|------------------|
|  |               | 1 and 2   | 3  |                  |
| Paper 1 (case study)                           | 25            | 50  | 50 | 1                |
| Paper 2 (short answers and structured essays)  | 50            | 50  | 50 | 2                |
| Internal assessment (individual investigation) | 25            | Covers objectives 1, 2, 3 and 4                           |    | 10               |

**Course main resources:**

Pearson Bacalaureate Environmental Systems and Societies – 2<sup>nd</sup> Edition by Andrew Davis and Garrett Nagle  
 Oxford Environmental Systems and Societies course companion- 2015 edition by Jill Rutherford and Gillian Williams

**Links with Diploma Programme teachers**

TOK link to Topic: Approaches to conservation of biodiversity?

Information will be given on species-based, habitat based and a mixture of both conservation strategies.

TOK Question: There are various approaches to the conservation of biodiversity—how can we determine when we should be disposed to act on what we know?

Task: - Group work – student will present their task in the class by using chart or ppt on rainforest conservation issue.

It helps students to consider and analyse their responses to conserving biodiversity. There are many factors to be considered such as the student’s own environmental value system. Ask them to think about whether their reasoning is based on emotional or rational thought and whether this affects how valid their responses are.

**Assessment components**

|             |                              |   |
|-------------|------------------------------|---|
| DP 1<br>Jan | Introduction of IA           | Formation of research question<br>Identification of environmental issue |
|             | IA rubrics and time duration | Discussion rubrics and time allocation                                  |
| Feb         | Analysing the IA exemplar    | Using rubrics analyse and evaluate IAs                                  |

|       |  |   |
|-------|--|---|
| Mar   | Designing mini IA  | IA based on lab activity or other environmental issues              |
| April | Mini IA presentation   | Individual presentation of mini IA and discussion on their progress |
| May   | IA topic finalising and progress of their investigation and survey | Individual discussion on their IA topics                            |

Paper 1 assessment component will be discussed on regular basis along with each Unit. They will be exposed to different case studies and get opportunity to answer paper 1 type of questions.

Paper 2 assessment component – structured questions will be used during lesson activities and will be given as a worksheet question. They will be introduced to long answer type of question on every unit and Formative assessment will be taken based on both structured and long answer type of questions.

### ***International mindedness***

Unit 6—Atmospheric systems and societies and Sub-topic 6.3 Photochemical smog

Topic discussion:

- Pollution is a highly diverse phenomenon of human disturbance in ecosystems
- Human activity produce pollutant
- Pollution impact ecosystem
- Pollution management strategies can be applied at different levels.

*Pollution cannot be contained by national boundaries and therefore can act either locally, regionally or globally.*

Task: - Through chart making on “smog in Delhi NCR” , International-mindedness will be developed

Student will show in the chart about ‘**Causes and consequences of smog in NCR**’. They will gather information available on different causes of smog formation in NCR

This activity chosen because it will allow the students to understand pros and cons of different human activities in our environment. It helps them to develop appreciation towards environment around them and the world.

This activity will start with photographs showing smog and choking in NCR. I will provide chart paper and sketch pen for their chart work

### ***Development of the IB learner profile***

Topic 7 – Climate change and energy production and Sub-topic 7.2 Climate change – causes and impacts

Topic discussion:

- Climate change has been a normal feature of the Earth’s history, but human activity has contributed to recent changes.
- There has been significant debate about the causes of climate change.
- Climate change causes widespread and significant impacts on a global scale.

Task: Fishbowl Activity

*“What value systems are at play in the causes and approaches to resolving issues addressed in this topic?”*

Prior to this fishbowl strategy, students will spend 1 lesson researching various viewpoints on climate change. They will come prepared to debate both sides of the topic.

On the day of this lesson fishbowl rules will be discussed and agreed. Half the class will be in the bowl while the other half listens in. After 20 minutes roles will be reversed.

Learner profile:

- They are encouraged to develop their communication skills
- They will develop the thinking skill
- They will gain information about different philosophy on environment and be knowledgeable

They will develop open-minded attitude by accepting others view

**Course syllabus:**

| Unit title   | Duration (teaching periods) | Unit content (topics)   | Objectives  | Assessment tools; Assessment criteria        | Summative assessment  | ATL                       | LP and CAS/Service links | Links with TOK/Critical thinking   | Links with other subjects/interdisciplinary links  |
|--|-----------------------------|---|---|--|---|---------------------------|--------------------------|--|--|
| Topic 1—<br>Foundations of environmental systems and societies | 16 hr                       | 1.1 Environmental value system<br>1.2 Systems and models<br>1.3 Energy and equilibria<br>1.4 Sustainability<br>1.5 Humans and pollution                                 | A. Demonstrate knowledge and understanding of relevant:<br>B. Apply this knowledge and understanding in the analysis of:<br>C. Evaluate, justify and synthesize, as appropriate:<br>D. Engage with investigations of environmental and societal issues at the local and global level through: | AO1 a, b, c<br>AO2 a, d<br>AO3 c, d<br>AO4 c | Paper 1- case study<br>Paper 2- structured questions<br>Lab/ investigation report | Self-management, Thinking | inquirer                 | EVSs shape the way we perceive the environment—which other value systems shape the way we view the world?<br>Models are simplified constructions of reality—in the construction of a model, how can we know which aspects of the world to include and which to ignore? | Diploma Programme: Social and cultural anthropology, geography (HL)<br>Diploma Programme: Design technology (topic 3), geography (option G), biology (topic 4)<br>DP: Physics (topic 2 and option B); chemistry (topics 5, 7 and 15; option C); biology (topic 6); design technology (topic 2)<br>Diploma Programme: Social and cultural anthropology; design technology (topics 2 and 8); geography (topic 3, options C and G); economics |
| Topic 2—<br>Ecosystems and ecology                             | 25                          | 2.1 Species and populations<br>2.2 Communities and ecosystems<br>2.3 Flows of energy and matter<br>2.4- 2.5 Biomes, zonation and succession<br>Investigating ecosystems | A- Demonstrate knowledge and understanding of relevant:<br>B. Apply this knowledge and understanding in the analysis of:<br>C. Evaluate, justify and synthesize, as appropriate:  | AO1 a<br>AO2 b, c<br>AO3 a, c<br>AO4 b       | Paper 1- case study<br>Paper 2- structured questions<br>Lab/ investigation report | Social, Self-management   | Knowledgeable            | Using specialized vocabulary, is the shaping of knowledge more dramatic in some areas of knowledge compared to others? Feeding relationships can be represented by different models how can we decide when one model is better than another?                           | Diploma Programme: Social and cultural anthropology; biology (topic 4)<br>Diploma Programme: Biology (topics 4 and 9; option C)<br>Diploma Programme: Biology (topics 4 and 9; option C); chemistry (option C); geography (topic 3); physics (sub-topic 2.8)<br>Diploma Programme: Geography (topic 3); biology (topic 4)  |
| Topic 3—<br>Biodiversity and conservation                      | 13                          | 3.1 An introduction to biodiversity<br>3.2 Origins of biodiversity  | A. Demonstrate knowledge and understanding of relevant:<br>B. Apply this knowledge and understanding in the analysis of:  | AO1 b, c<br>AO2 c, d<br>AO3 b, c<br>AO4 a, c | Paper 1- case study<br>Paper 2- structured questions                              | Communication             | Caring                   | The term “biodiversity” has replaced the term “nature” in much literature on conservation issues—does this represent a paradigm shift?   | Diploma Programme: Biology (topics 5 and 10)<br>Diploma Programme: Biology (topic 5)   |

|  |    |   |   |   |   |                            |              |   |  |
|--|----|---|---|---|---|----------------------------|--------------|---|--|
|  |    | 3.3 Threats to biodiversity<br><br>3.4 Conservation of biodiversity   | C. Evaluate, justify and synthesize, as appropriate:<br><br>D. Engage with investigations of environmental and societal issues at the local and global level through:   |   | Lab/<br>investigation<br>report   |                            |              | The theory of evolution by natural selection tells us that change in populations is achieved through the process of natural selection—is there a difference between a convincing theory and a correct one?  | Diploma Programme: Geography (topic 3); biology (topic 5 and option C)<br><br>Diploma Programme: Geography (topic 3); biology (option C)   |
| Topic 4—<br>Water and aquatic food production systems and societies        | 15 | 4.1 Introduction to water systems<br><br>4.2 Access to fresh water<br><br>4.3 Aquatic food production systems<br><br>4.4 Water pollution      | A. Demonstrate knowledge and understanding of relevant:<br><br>B. Apply this knowledge and understanding in the analysis of:<br><br>C. Evaluate, justify and synthesize, as appropriate:<br><br>D. Engage with investigations of environmental and societal issues at the local and global level through: | AO1 a<br>AO2 a, b<br>AO3 a, d<br>AO4 a, b | Paper 1- case study<br>Paper 2- structured questions<br>Lab/<br>investigation<br>report | Research,<br>Communication | Balanced     | The hydrological cycle is represented as a systems model—to what extent can systems diagrams effectively model reality, given that they are only based on limited observable features?<br>Aid agencies often use emotive advertisements around the water security issue—to what extent can emotion be used to manipulate knowledge and actions? | Diploma Programme: Social and cultural anthropology; geography (options A and D)<br><br>Diploma Programme: Social and cultural anthropology; geography (topic 3; options A, B and F); economics<br><br>Diploma Programme: Geography (option B); economics<br><br>Diploma Programme: Social and cultural anthropology; chemistry (topic 9; options B and D) |
| Topic 5—Soil systems and terrestrial food production systems and societies | 12 | 5.1 Introduction to soil systems<br><br>5.2 Terrestrial food production systems and food choices<br><br>5.3 Soil degradation and conservation | A. Demonstrate knowledge and understanding of relevant:<br><br>B. Apply this knowledge and understanding in the analysis of:<br><br>C. Evaluate, justify and synthesize, as appropriate:<br><br>D. Engage with investigations of environmental and societal issues at the local and global level through: | AO1 a, b<br>AO2 a c<br>AO3 c<br>AO4 c     | Paper 1- case study<br>Paper 2- structured questions<br>Lab/<br>investigation<br>report | Research,<br>Communication | Communicator | The soil system may be represented by a soil profile—since a model is, strictly speaking, not real, how can it lead to knowledge?<br><br>Consumer behaviour plays an important role in food production systems— are there general laws that can describe human behaviour?   | Diploma Programme: Geography (topic 3)<br><br>Diploma Programme: Biology (options B and C); chemistry (options B and C); geography (option F); economics<br><br>Diploma Programme: Chemistry (options A and C); geography (topic 3)  |
| Topic 6—<br>Atmospheric  | 10 | 6.1 Introduction to the atmosphere  | A. Demonstrate knowledge and understanding of relevant:   | AO1 c<br>AO2 c, d<br>AO3 c d<br>AO4 a     | Paper 1- case study   | Thinking and<br>research   | Caring       | The atmosphere is a dynamic system—how should we react when we  | Diploma Programme: Geography (topic 3); physics (sub-topic 8.2)  |

|   |    |  |   |  |   |                            |            |  |   |
|---|----|--|---|--|---|----------------------------|------------|--|---|
| systems and societies                         |    | 6.2 Stratospheric ozone<br>6.3 Photochemical smog<br>6.4 Acid deposition   | B. Apply this knowledge and understanding in the analysis of:<br>C. Evaluate, justify and synthesize, as appropriate:<br>D. Engage with investigations of environmental and societal issues at the local and global level through:  |  | Paper 2-structured questions<br>Lab/investigation report                        |                            |            | have evidence that does not fit with an existing theory?<br><br>The Montreal Protocol was an international agreement created by the UN— can one group or organization decide what is best for the rest of the world?   | Diploma Programme: Chemistry (topics 5 and 14); geography (option G); economics.<br><br>Diploma Programme: Chemistry (topic 5); geography (option G), economics<br><br>Diploma Programme: Chemistry (topic 8); economics  |
| Topic 7— Climate change and energy production | 13 | 7.1 Energy choices and security<br>7.2 Climate change—causes and impacts<br>7.3 Climate change—mitigation and adaptation           | A. Demonstrate knowledge and understanding of relevant:<br>B. Apply this knowledge and understanding in the analysis of:<br>C. Evaluate, justify and synthesize, as appropriate:<br>D. Engage with investigations of environmental and societal issues at the local and global level through: | AO1 a, c<br>AO2 a, b<br>AO3 a, c<br>AO4 b, c | Paper 1- case study<br>Paper 2-structured questions<br>Lab/investigation report | Research, Thinking         | Reflective | The choice of energy sources is controversial and complex—how can we distinguish between a scientific claim and a pseudoscience claim when making choices?<br><br>There has been considerable debate about the causes of climate change— does our interpretation of knowledge from the past allow us to reliably predict the future? | Diploma Programme: Social and cultural anthropology; chemistry (option C); design technology (topic 2); physics (topics 8 and 11); geography (topics 3 and 4); economics<br><br>Diploma Programme: Social and cultural anthropology; chemistry (option C); physics (topic 8); geography (topics 3 and 4); economics; biology (topic 4)<br><br>Diploma Programme: Physics (topic 8); economics   |
| Topic 8: Human systems and resource use       | 16 | 8.1 Human population dynamics<br>8.2 Resource use in society<br>8.3 Solid domestic waste<br>8.4 Human population carrying capacity | A. Demonstrate knowledge and understanding of relevant:<br>B. Apply this knowledge and understanding in the analysis of:<br>C. Evaluate, justify and synthesize, as appropriate:<br>D. Engage with investigations of environmental and societal issues at the local and global level through: |  | Paper 1- case study<br>Paper 2-structured questions<br>Lab/investigation report | Communication and thinking | Caring     | A variety of models and indicators are employed to quantify human population dynamics—to what extent are the methods of the human sciences “scientific”?<br>As resources become scarce, we must make decisions about how to use them—to what extent should potential damage to the environment limit our pursuit of knowledge?       | Diploma Programme: Biology (option C); social and cultural anthropology; sports, exercise and health science (option C); geography (topic 1); economics<br>Diploma Programme: Social and cultural anthropology; design technology (topics 2 and 8); physics (topic 8); geography (topic 4); economics<br>Diploma Programme: Chemistry (option A); geography (topic 4 and option B)<br>Diploma Programme: Geography (topic 4 and option G) |

## SUBJECT COURSE OVERVIEW – DESIGN TECHNOLOGY

### **Course general description: DP**

Design is the link between innovation and creativity, taking thoughts and exploring the possibilities and constraints associated with products or systems, allowing them to redefine and manage the generation of further thought through prototyping, experimentation and adaptation. It is human & environment centered and focuses on the needs, wants and limitations of the end user.

Competent design is within the reach of all. Through the practice and application of well-established design principles and methodologies, individuals can increase the likelihood that a design will be successful. These principles taken together make up what is known as the design cycle. Designing requires an individual to be imaginative and creative, while having a substantial knowledge base of important factors that will aid or constrain the process. Decision-making needs to be supported by adequate and appropriate research and investigation. Designers must think “out of the box” to develop innovative solutions, while thinking “in the box” to conform to requirements set by clients or research.

Both the ideas of design and the process of design can only occur in a human context. Design involves multidisciplinary teams and stakeholders with different backgrounds and traditions. It is important to understand, however, that to design is to be involved in a community of inquiry with certain common beliefs, methodologies, understandings and processes. Design is multidisciplinary and draws from many areas including the natural and social sciences, mathematics and arts. Diploma Programme design technology aims to develop internationally minded people whose enhanced understanding of design and the technological world can facilitate our shared guardianship of the planet and create a better world.

### **Course aims and goals:**

*Through studying design technology, students should become aware of how designers work and communicate with each other. While the design methodology may take on a wide variety of forms, it is the emphasis on a practical approach through design work that characterizes this subject. The aims of the subject state in a general way what the teacher may expect to teach or do, and what a student may expect to experience or learn.*

*The aims enable students, through the overarching theme of the nature of design, to develop:*

- 1. A sense of curiosity as they acquire the skills necessary for independent and lifelong learning and action through inquiry into the technological world around them*
- 2. An ability to explore concepts, ideas and issues with personal, local and global significance to acquire in-depth knowledge and understanding of design and technology*
- 3. Initiative in applying thinking skills critically and creatively to identify and resolve complex social and technological problems through reasoned ethical decision-making*
- 4. An ability to understand and express ideas confidently and creatively using a variety of communication techniques through collaboration with others*
- 5. A propensity to act with integrity and honesty, and take responsibility for their own actions in designing technological solutions to problems*
- 6. An understanding and appreciation of cultures in terms of global technological development, seeking and evaluating a range of perspectives*
- 7. A willingness to approach unfamiliar situations in an informed manner and explore new roles, ideas and strategies so they can articulate and defend their proposals with confidence*
- 8. An understanding of the contribution of design and technology to the promotion of intellectual, physical and emotional balance and the achievement of personal and social well-being*
- 9. Empathy, compassion and respect for the needs and feelings of others in order to make a positive difference to the lives of others and to the environment*
- 10. Skills that enable them to reflect on the impacts of design and technology on society and the environment in order to develop their own learning and enhance solutions to technological problems.*

**Course objectives:**

The assessment objectives for design technology reflect those parts of the aims that will be formally assessed either internally or externally. Wherever appropriate, the assessment will draw upon environmental and technological contexts and identify the social, moral and economic effects of technology.

It is the intention of the design technology course that students are able to fulfil the following assessment objectives.

1. Demonstrate knowledge and understanding of a. facts, concepts, principles and terminology; b. design methodology and technology  
c. methods of communicating and presenting technological information.
2. Apply and use: a. facts, concepts, principles and terminology; b. design methodology and technology; c. methods of communicating and presenting technological information.
3. Construct, analyse and evaluate: a. design briefs, problems, specifications and plans; b. methods, techniques and products  
c. data, information and technological explanations.
4. Demonstrate the appropriate research, experimentation, modelling and personal skills necessary to carry out innovative, insightful, ethical and effective designing.

**Course assessment structure and criteria:**

IBDP Assessment Outline – SL

| First assessment 2020                 |                       |  |    |                  |
|---------------------------------------|-----------------------|--|----|------------------|
| Component                             | Overall weighting (%) | Approximate weighting of objectives (%)      |    | Duration (hours) |
|                                       |                       | 1+2  | 3  |                  |
| Paper 1                               | 30                    | 30   |    | ¾                |
| Paper 2                               | 30                    | 12   | 18 | 1½               |
| Internal assessment<br>Design project | 40                    | All assessment objectives are tested equally |    | 40               |

IBDP Assessment Outline – HL

| First assessment 2020                 |                       |  |    |                  |
|---------------------------------------|-----------------------|--|----|------------------|
| Component                             | Overall weighting (%) | Approximate weighting of objectives (%)      |    | Duration (hours) |
|                                       |                       | 1+2  | 3  |                  |
| Paper 1                               | 20                    | 20   |    | 1                |
| Paper 2                               | 20                    | 8  | 12 | 1½               |
| Paper 3                               | 20                    | 10   | 10 | 1½               |
| Internal assessment<br>Design project | 40                    | All assessment objectives are tested equally |    | 60               |

Internal assessment is an integral part of the course and is compulsory for both SL and HL students. It enables students to demonstrate the application of their skills and knowledge, and to pursue their personal interests, without the time limitations and other constraints that are associated with written examinations. The internal assessment should, as far as possible, be woven into normal classroom teaching and not be a separate activity conducted after a course has been taught.

The internal assessment requirements at SL and at HL are different. The first four assessment criteria (A–D) are common between SL and HL; however, HL design projects have additional requirements, which are assessed using two additional criteria (E and F). This internal assessment section of the guide should be read in conjunction with the internal assessment section of the teacher support material

It is recommended that a total of approximately 40 hours (SL) and 60 hours (HL) should be allocated to the work. This should include:

### **SL IA component**

**Duration: 40 hours**

**Weighting: 40%**

Individual design project

This design project covers assessment objectives 1, 2, 3 and 4.

At SL, the design project is assessed against the 4 common criteria: Criterion A: Analysis of a design opportunity

Criterion B: Conceptual design

Criterion C: Development of a detailed design

Criterion D: Testing and evaluation

### **HL IA component**

**Duration: 60 hours**

**Weighting: 40%**

Individual design project

This design project covers assessment objectives 1, 2, 3 and 4.

At HL, the design project is assessed against the 4 common criteria and 2 HL only criteria: Criterion A: Analysis of a design opportunity

Criterion B: Conceptual design

Criterion C: Development of a detailed design

Criterion D: Testing and evaluation

Criterion E: Detailed development of a commercial product

Criterion F: Making choices for commercial production

### *Command Terms:*

Students should be familiar with the following key terms and phrases used in examination questions, which are to be understood as described below. Although these terms will be used frequently in examination questions, other terms may be used to direct students to present an argument in a specific way.

Assessment Objective 1 – Define, Draw, Find, Label, List, Measure, Present, State

Assessment Objective 2 – Annotate, Apply, Calculate, Describe, Distinguish, Estimate, Identify, Outline

**Course main resources:**

*IBDP Design Technology*

**Resources:**

*IBDP:*

<https://www.ruthtrumpold.id.au/destech/>

<https://sites.google.com/a/dc.edu.hk/diploma-design-technology/home>

<https://library.wab.edu/c.php?g=662054&p=5085712>

Metcalfe, Peter. "Design and Technology 2nd Edition (2 Ed)." *BrownsBfS*,/9781876659196.

**Links with Diploma Programme teachers**

*All Programme teachers should be familiar with TOK as they have to make connections with TOK questions in their own courses. They can also suggest some theoretical concerns that could be taken further in the TOK classroom. Within this context, how do you plan to work with your colleagues to ensure that TOK becomes a real link among all of them?*

TOK lessons can support students in their study of science, just as the study of science can support students in their TOK course. TOK provides a space for students to engage in stimulating wider discussions about questions such as what it means for a discipline to be a science, or whether there should be ethical constraints on the pursuit of scientific knowledge. It also provides an opportunity for students to reflect on the methodologies of science, and how these compare to the methodologies of other areas of knowledge.

It is now widely accepted that there is no one scientific method, in the strict Popperian sense. Instead, the sciences utilize a variety of approaches in order to produce explanations for the behaviour of the natural world. The different scientific disciplines share a common focus on utilizing inductive and deductive reasoning, on the importance of evidence, and so on. Students are encouraged to compare and contrast these methods with the methods found in, for example, the arts or in history.

In this way there are rich opportunities for students to make links between their science and TOK courses. One way in which science teachers can help students to make these links to TOK is by drawing students' attention to knowledge questions that arise from their subject content. Knowledge questions are open ended questions about knowledge such as:

- Do the methods of data collection used in design technology have more in common with disciplines in the human sciences or the natural sciences?
- How might the collection and interpretation of data be affected by the limitations of our sense perception?
- How do ethical limitations affect the sort of investigations that can take place where human subjects are involved?
- To what extent should potential damage to the environment limit our pursuit of knowledge?
- Does knowledge develop through paradigm shifts in all areas of knowledge?
- Can one group of people know what is best for others?
- There is no waste in nature. Should areas of knowledge look at natural processes beyond human endeavour?

**Assessment components**

Briefly explain how and when you will work on them. Include the date when you will first introduce the assessment components to your students. Explain the different stages, the timeline and how students will be prepared to undertake both.

| <b>Year 1</b> | <b>Activity / Plan</b>  | <b>Duration</b> |
|---------------|---|-----------------|
| July          | Introduction to IA's & Criterias  | 1 Hour          |
| August        | Criteria A  | 2 Hours         |
| October       | Criteria B  | 2 Hours         |
| January       | Discussion on Sample IA's   | 2 Hours         |
|               | Discussion on Sample Marking  | 1 Hour          |
|               | Criteria C & D  | 2 Hours         |
| February      | Introduction of Criteria E & F<br>Selection of Direction along with Background Research   | 3 Hours         |
| <b>Year 2</b> | <b>Activity / Plan</b>  | <b>Duration</b> |
| March         | Developing Final proposal for further research and development  | 2 Hours         |
| April         | Extended Essay: Interest Area & Research Question Formulation – with collection of data<br>IA - Developing ways to gather Primary and Secondary data along with initial mind mapping for the opportunity area (Criteria A)      | 2 Hours         |
| May           | EE - Finalisation of Research Question with possible arguments (Draft 1)  | 1 Hour          |
| July          | Extended Essay: Research Proposal Shared – Draft two submission - Proposing Interest area with supporting data<br>IA: Submitting Data Outcomes, and suggesting the way forward along with Ideas developed over the Summer Break | 3 Hours         |
| August        | EE: Compilation of data with analysis - Submission<br>IA: Detailing of Criteria C and E   | 4 Hours         |
| September     | EE – Comparative data analysis & an argumentative approach<br>IA – Discussing Design Development (Criteria C) and Evaluation & Testing (Criteria D) Data along with Commercial productions (Criteria E)                         | 4 Hours         |
| October       | Beginning Production (Criteria C)   | 1 Hour          |
| January       | Testing and Evaluation (Criteria C)<br>Changes to outcome along with processes (development and collated)<br>First Draft Submission IA  | 3 Hours         |
| February      | Final Draft Submission IA   | 1 Hour          |
|               | <b>Total</b>  | <b>34 Hours</b> |

### ***International mindedness***

*Every course should contribute to the development of international mindedness in students. As an example of how you would do this, choose one topic from your outline that would allow your students to analyse it from different cultural perspectives. Briefly explain the reason for your choice and what resources you will use to achieve this goal.*

By exploring the various dimensions of schools that may contribute toward promoting international mindedness, the concept of educating toward this purpose will be clearer for other schools aiming to achieve such a goal. It will highlight attitudes of students related to their sense of connection to, interest in, and responsibility for, the global community and the behaviours associated with this perspective, thus directing toward the affective change that might result from practices in the classroom and the broader school environment.

This, in turn, would empower schools to reconsider how they cater to and recognize international learning. In the words of Bill Gates, founder of Microsoft, "I do think the 21st-century is about a more global view. Where you don't just think, yes, my country is doing well, but you think about the world at large".



|                              |                  |   |                   |   |  |   |  |   |   |
|------------------------------|------------------|---|-------------------|---|--|---|--|---|---|
|                              |                  | Innovation and Consumers<br>Innovation, Design and Marketing Specifications   |                   | Failure – PLC / LCA, Developing ACCESSFM + Constraints as a way forward to analyse products   |  |   |  | thinking. Are other areas of knowledge confined to human influence and values?  |   |
| Modelling                    | 15 Block Lesson  | Conceptual modelling, Graphical modelling, Physical modelling<br>Computer Aided Design (CAD), Rapid Prototyping   | AO1<br>AO3<br>AO4 | Formative Assessments<br>Idea Generation using sketches<br>Detailing of ideas and development on CAD – Resource for IA documentation  | Practice Made Papers & Revision<br>Past Paper<br>Paper 1 - MCQ<br>Paper 2                      | Research Skills<br>Communication Skills | Communicators  | To what extent does graphical communication shape and limit our knowledge?  | Chemistry Topic 6<br>ESS Topic 1<br>Visual Arts   |
| Final Production             | 22 Block Lessons | Properties of materials <ul style="list-style-type: none"> <li>• Extraction</li> <li>• Use</li> <li>• Disposal</li> <li>• 3 R's</li> <li>• Reduce and Rethink</li> </ul> Metals and metallic alloys, Timber, Glass, Plastic, Textile, Composites, Scales of Production, Manufacturing processes & Production, Systems CAD Development & Model Development | AO1<br>AO2<br>AO3 | Formative Assessments<br>Quiz based Learning - Kahoot<br><br>Discussion based learning of topics and questions<br><br>live case studies for understanding and analysis                                    | Practice Made Papers & Revision<br>Past Paper<br><br>Paper 1 - MCQ<br>Paper 2 - Scenario Based | Research Skills<br>Management Skills    | Knowledge-able<br>Reflective<br>Through discussion with one another and application of the knowledge into given tasks, students will be able to develop skills to question, analyse and present their understanding while also connecting their learning with the need and the surrounding | How does classification and categorization help and hinder the pursuit of knowledge?<br><br>Is environment at the service of man? | Biology Topic 2<br>Chemistry Topic 4 & Option A<br>Physics Topic 7<br>Visual Arts<br>Business Management Topic 6<br>Economics |
| Human Factors and Ergonomics | 7 Block Lessons  | Anthropometrics<br><br>Psychological Factors<br><br>Physiological Factors   | AO1<br>AO2<br>AO3 | Formative Assessments<br>In groups of 3, learners should discuss the role of the artisan, designer, manufacturer. When given a tool they must discuss how their roles would have influenced its evolution | Practice Made Papers & Revision<br>Past Paper<br><br>Paper 1 - MCQ<br>Paper 2 - Scenario Based | Thinking Skills<br>Social Skills        | Inquirers<br>Caring  | How might the collection and interpretation of data be affected by the limitations of our sense perception?                       | Biology Topics 6 & 11 and Option A<br>Psychology part 1: core<br>Physics Topic 2<br>SEHS Topic 1, 2 & 4                       |
| Resource Management and      | 22 Block Lessons | Resources and Reserves  | AO1<br>AO2        | Formative Assessments   | Practice Made Papers   | Thinking Skills<br>Research Skills      | Inquirers<br>Principled  | To what extent should potentially damage to the   | Biology Topic 4<br>Chemistry Option C   |

|                        |                 |   |            |   |  |                   |             |  |   |
|------------------------|-----------------|---|------------|---|--|-------------------|-------------|--|---|
| Sustainable Production |                 | Waste Mitigation Strategies<br>Clean Technology<br>Green Technology<br>Eco Design | AO3<br>AO4 | Understanding mindsets and changing mindsets – discussion-based case studies.<br><br>MCQ's using Kahoot                       | & Revision<br>Past Paper<br><br>Paper 1 -<br>MCQ<br>Paper 2 -<br>Scenario Based                      | Management Skills |             | environment limit our pursuit of knowledge.<br><br>Does knowledge develop through paradigm shifts in all areas of knowledge? | Business Management Topic 5<br>Economics Topic 1<br>ESS Topic 1, 2, 4 & 8<br>Physics Topic 5, 8 & 11<br>Visual Arts |
| Classic Design         | 6 Block Lessons | Characteristics of classic design<br><br>Classic design, function & form          | AO1<br>AO3 | Formative Assessments<br>Case studies to discuss:<br>- Clarity<br>- Durability<br>- Dominance<br>- Omnipresence<br>- Emotions | Practice Made Papers & Revision<br>Past Paper<br><br>Paper 1 -<br>MCQ<br>Paper 2 -<br>Scenario Based | Social Skills     | Open Minded | Classic design often appeals to our emotions.<br>Are emotions universal?   | Visual Arts   |

*Course syllabus: IBDP Design (HL)*

| Unit title            | Duration (teaching periods) | Unit content (topics)  | Objectives | Assessment tools; Assessment criteria   | Summative assessment   | ATL                                    | LP and CAS/Service links | Links with TOK/Critical thinking  | Links with other subjects / interdisciplinary links |
|-----------------------|-----------------------------|--|------------|---|--|--|--------------------------|---|---|
| Innovation and Design | 12 Block Lessons            | Invention<br>Innovation<br>Strategies of Innovation<br>Stakeholders in Invention & Innovation<br>Product Life Cycle<br><br>Roger's characteristics of Innovation and Consumers | AO1<br>AO2 | Formative Assessments<br><br>Command Terms and Question Requirements – taken forward using Case Studies<br>Presenting an invention that either became or failed to become an innovation – along with reasons for its Success or Failure – PLC / LCA | Practice Made Papers & Revision<br>Past Paper<br><br>Paper 1 -<br>MCQ<br>Paper 2 -<br>Scenario Based | Thinking Skills<br><br>Research Skills | Knowledgeable            | Design is always looking to the future and new development. Do other areas of knowledge have universal, timeless truths or are they continually in flux?<br><br>Design considers areas other than man in its thinking. Are other areas of knowledge confined to human influence and values? | BM Topic 4, 5<br>ESS Topic 8                        |

|                              |                  |  |                   |   |   |   |                                   |   |   |
|------------------------------|------------------|--|-------------------|---|---|---|-----------------------------------|---|---|
|                              |                  | Innovation, Design and Marketing Specifications  |                   | Developing ACCESSFM + Constraints as a way forward to analyse products  |   |   |                                   |   |   |
| Modelling                    | 15 Block Lesson  | Conceptual modelling<br>Graphical modelling<br>Physical modelling<br>Computer Aided Design (CAD)<br>Rapid Prototyping  | AO1<br>AO3<br>AO4 | Formative Assessments<br>Idea Generation using sketches<br>Detailing of ideas and development on CAD – Resource for IA documentation  | Practice Made Papers & Revision Past Paper<br><br>Paper 1 - MCQ<br>Paper 2 – Scenario Based | Research Skills<br>Communication Skills | Communicators                     | To what extent does graphical communication shape and limit our knowledge?<br>Models that only show aspects of reality are widely used in design. How can they lead to new knowledge? | Chemistry Topic 6<br>ESS Topic 1<br>Visual Arts   |
| Final Production             | 22 Block Lessons | Properties of materials<br>Metals and metallic alloys<br>Timber, Glass, Plastic, Textile, Composites<br>Scales of Production<br>Manufacturing processes & Production Systems<br>CAD<br>Development & Model Development | AO1<br>AO2<br>AO3 | Formative Assessments<br>Quiz based Learning - Kahoot<br>Discussion based learning of topics and questions<br>live case studies for understanding and analysis  | Practice Made Papers & Revision Past Paper<br><br>Paper 1 - MCQ<br>Paper 2 – Scenario Based | Research Skills<br>Management Skills    | Knowledge-able able<br>Reflective | How does classification and categorization help and hinder the pursuit of knowledge?<br><br>Is environment at the service of man?   | Biology Topic 2<br>Chemistry Topic 4 & Option A<br>Physics Topic 7<br>Visual Arts<br>Business<br>Management<br>Topic 6<br>Economics |
| Human Factors and Ergonomics | 7 Block Lessons  | Anthropometrics<br>Psychological Factors<br>Physiological Factors  | AO1<br>AO2<br>AO3 | Formative Assessments<br><br>In groups of 3, learners should discuss the role of the artisan, designer, manufacturer. When given a tool they must discuss how their roles would have influenced its evolution | Practice Made Papers & Revision Past Paper<br><br>Paper 1 - MCQ                             | Thinking Skills<br>Social Skills        | Knowledgeable<br>Caring           | How might the collection and interpretation of data be affected by the limitations of our sense perception?   | Biology Topics 6 & 11 and Option A<br>Psychology part 1: core<br>Physics Topic 2<br>SEHS Topic 1, 2 & 4                             |

|  |                  |   |                               |   |  |   |                         |   |  |
|--|------------------|---|-------------------------------|---|--|---|-------------------------|---|--|
|  |                  |   |                               | Discussing Stereotypes in both physiological and psychological aspects using a set of 'out of the box' products.  | Paper 2 – Scenario Based   |   |                         |   |  |
| Resource Management and Sustainable Production | 22 Block Lessons | Resources and Reserves<br>Waste Mitigation Strategies<br>Clean Technology<br>Green Technology<br>Eco Design                                       | AO1<br>AO2<br>AO3<br>AO4      | Formative Assessments<br><br>Understanding mindsets and changing mindsets – discussion-based case studies.<br><br>MCQ's using Kahoot                                      | Practice Made Papers & Revision<br>Past Paper<br>Paper 1 - MCQ<br>Paper 2 – Scenario Based     | Thinking Skills<br>Research Skills<br>Management Skills | Inquirers<br>Principled | To what extent should potentially damage to the environment limit our pursuit of knowledge.<br><br>Does knowledge develop through paradigm shifts in all areas of knowledge?            | Biology Topic 4<br>Chemistry Option C<br>Business Management Topic 5<br>Economics Topic 1<br>ESS Topic 1, 2, 4 & 8<br>Physics Topic 5, 8 |
| Classic Design                                 | 6 Block Lessons  | Characteristics of classic design<br><br>Classic design, function & form  | AO1<br>AO3                    | Formative Assessments<br><br>Case studies to discuss:<br>- Clarity<br>- Functionality<br>- Durability<br>- Dominance<br>-Omnipresence<br>- Emotions<br>MCQ's using Kahoot | Practice Made Papers & Revision<br>Past Paper  | Social Skills   | Open Minded             | Classic design often appeals to our emotions. Are emotions universal?   | Visual Arts  |
| User Centered Design                           | 12 Block Lessons | UCD & it's Stages<br><br>Usability<br><br>Strategies of User Research<br>Strategies of UCD<br>Beyond Usability – Designing for Pleasure & Emotion | AO1<br>AO2<br>AO3<br>&<br>AO4 | Formative Assessments<br><br>Identify / Analyse / Discuss / Evaluate<br><br>inclusivity of Design in social sectors   | Practice Made Papers & Revision<br>Past Paper<br><br>Paper 1 - MCQ<br>Paper 2 – Scenario Based | Research Skills<br>Management Skills<br>Social Skills   | Caring<br>Inquirers     | Design considers the needs of individuals a sparamount. Is this the case in other areas of knowledge?<br><br>To what extent does the language used in questionnaires shape the results? | Business Management Topic 4 & 5<br>Visual Arts   |
| Sustainability                                 | 14 Block Lessons | Sustainable Development   | AO1<br>AO2<br>AO3             | Formative Assessments<br>How does Kaizen and Lean Production support sustainability   | Paper 1 - MCQ  | Thinking Skills<br>Research Skills                      | Caring<br>Principled    | Does the rightness or wrongness of an action depend on the situation?   | Environmental System and Societies topic 1 & 8   |

|                        |                  |   |                   |   |   |  |   |   |   |
|------------------------|------------------|---|-------------------|---|---|--|---|---|---|
|                        |                  | Sustainable Consumption<br>Sustainable Design<br>Sustainable Innovation   |                   | Discuss the consumer attitudes<br><br>How would eco label support radical and incremental approach? And which one would be better?  | Paper 2 – Scenario Based<br>Paper 3 – Scenario Based                  | Management Skills  |   |   | Economic topic 1  |
| Innovation and Markets | 14 Block Lessons | Corporate Strategies<br><br>Market Sectors and Segments<br><br>Marketing Mix<br><br>Market Research<br><br>Branding   | AO1<br>AO2<br>AO3 | Formative Assessments<br><br>Locate an example of a product that was a result of diversification.<br><br>What are the 3 ways in which companies promote CSR?  | Paper 1 - MCQ<br>Paper 2 – Scenario Based<br>Paper 3 – Scenario Based | Management Skills<br><br>Thinking Skills                             | Risk takers                                   | Adoption of corporate social responsibility by multinational companies can be used as a distraction from their core business practices.<br><br>To what extent do different areas of knowledge incorporate doubt as a part of their methods to understand the market?  | Business management topic 1 & 4<br>Economics topic 1  |
| Commercial Production  | 15 Block Lessons | JIT & JIC<br>Lean Production<br>Computer Integrated Manufacturing<br><br>Quality Management<br><br>Economic Viability | AO1<br>AO2<br>AO3 | Formative Assessments<br>What according to you can be considered as lean production approaches in a company?<br><br>How is Kaizen and Value Stream Mapping different.<br><br>What is a “Lead Time”? | Paper 1 - MCQ<br>Paper 2 – Scenario Based<br>Paper 3 – Scenario Based | Research Skills<br><br>Communication Skills<br><br>Management Skills | Risk Takers<br><br>Principled<br><br>Balanced | <i>To what extent is the implementation of lean production a benefit for the global environment”</i><br><i>To what extent is technology important to have a balance between man and machine?</i><br><i>Link:</i><br><a href="https://www.youtube.com/watch?v=QCC_GM2baX8">https://www.youtube.com/watch?v=QCC_GM2baX8</a> | Business management topic 5<br><br>Environmental systems and societies topic 1<br><br>Economics topic 1 |

## SUBJECT COURSE OVERVIEW: COMPUTER SCIENCE

### **Course general description:**

Computer science requires an understanding of the fundamental concepts of computational thinking as well as knowledge of how computers and other digital devices operate.

The Computer Science course is engaging, accessible, inspiring and rigorous. It has the following characteristics:

- draws on a wide spectrum of knowledge
- enables and empowers innovation, exploration and the acquisition of further knowledge
- interacts with and influences cultures, society and how individuals and societies behave
- raises ethical issues
- is underpinned by computational thinking

Computational thinking involves the ability to:

- think procedurally, logically, concurrently, abstractly, recursively and think ahead
- utilize an experimental and inquiry-based approach to problem-solving
- develop algorithms and express them clearly
- appreciate how theoretical and practical limitations affect the extent to which problems can be solved computationally

### **Course aims and goals:**

Computer Science students should become aware of how computer scientists work and communicate with each other and with other stakeholders in the successful development and implementation of IT solutions. While the methodology used to solve problems in computer science may take a wide variety of forms, the group 4 computer science course emphasizes the need for both a theoretical and practical approach.

It is in this context that the computer science course should aim to:

1. provide opportunities for study and creativity within a global context that will stimulate and challenge students developing the skills necessary for independent and lifelong learning
2. provide a body of knowledge, methods and techniques that characterize computer science
3. enable students to apply and use a body of knowledge, methods and techniques that characterize computer science
4. demonstrate initiative in applying thinking skills critically to identify and resolve complex problems
5. engender an awareness of the need for, and the value of, effective collaboration and communication in resolving complex problems

6. develop logical and critical thinking as well as experimental, investigative and problem-solving skills
7. develop and apply the students' information and communication technology skills in the study of computer science to communicate information confidently and effectively
8. raise awareness of the moral, ethical, social, economic and environmental implications of using science and technology
9. develop an appreciation of the possibilities and limitations associated with continued developments in IT systems and computer science
10. encourage an understanding of the relationships between scientific disciplines and the overarching nature of the scientific method.

**Course objectives:**

The objectives for Computer Science reflect those parts of the aims that will be assessed. It is the intention of the computer science course that students achieve the following objectives:

**1. Know and understand:**

- a. relevant facts and concepts
- b. appropriate methods and techniques
- c. computer science terminology
- d. methods of presenting information.

**2. Apply and use:**

- a. relevant facts and concepts
- b. relevant design methods and techniques
- c. terminology to communicate effectively
- d. appropriate communication methods to present information.

**3. Construct, analyse, evaluate and formulate:**

- a. success criteria, solution specifications including task outlines, designs and test plans
- b. appropriate techniques within a specified solution.

**4. Demonstrate the personal skills of cooperation and perseverance as well as appropriate technical skills** for effective problem-solving in developing a specified product.

**Course assessment structure and criteria:**

**Diploma Computer Science-**

The following tables show the approximate percentage weighting in a typical examination session for each of the assessment objectives across each of the components. This may differ from the allocation of time devoted to each of the assessment objectives in class.

**Computer Science- Standard level**

| Assessment objective                                   | Paper 1    | Paper 2    | Internal assessment | Overall     |
|--|------------|------------|---------------------|-------------|
| 1. Demonstrating knowledge and understanding           | 24         | 13         | 9                   | 46          |
| 2. Applying and using                                  | 13         | 7          | 8                   | 28          |
| 3. Constructing, analysing, evaluating and formulating | 8          | 5          | 4                   | 17          |
| 4. Using skills  | n/a        | n/a        | 9                   | 9           |
| <b>Component weighting</b>                             | <b>45%</b> | <b>25%</b> | <b>30%</b>          | <b>100%</b> |

### Computer Science- Higher level

| Assessment objective                                   | Paper 1    | Paper 2    | Paper 3    | Internal assessment | Overall     |
|--|------------|------------|------------|---------------------|-------------|
| 1. Demonstrating knowledge and understanding           | 21         | 10         | 9          | 6                   | 46          |
| 2. Applying and using                                  | 12         | 6          | 7          | 5                   | 30          |
| 3. Constructing, analysing, evaluating and formulating | 7          | 4          | 4          | 3                   | 18          |
| 4. Using skills  | n/a        | n/a        | n/a        | 6                   | 6           |
| <b>Component weighting</b>                             | <b>40%</b> | <b>20%</b> | <b>20%</b> | <b>20%</b>          | <b>100%</b> |

The following command terms will be used in examination questions. So, It is important that students are familiar with the definitions of the command terms:

The objective level associated with each command term (refer objective column) indicates the depth of treatment for a given assessment statement.

**Assessment objective 1:** classify, define, draw, label, list, state

**Assessment objective 2:** annotate, apply, calculate, describe, design, distinguish, estimate, identify, outline, present, trace

**Assessment objective 3:** analyse, comment, compare, compare and contrast, construct, contrast, deduce, demonstrate, derive, determine, discuss, evaluate, examine, explain, formulate, interpret, investigate, justify, predict, sketch, suggest, to what extent

### Course main resources:

#### Reference Textbooks:

- Core Computer Science: For the IB Diploma Program Authors: KOSTAS DIMITRIOU, Phd, MARKOS HATZITASKOS, MSc
- Advanced Computer Science: IB Diploma Program Paperback–2016 Authors: KOSTAS DIMITRIOU, Phd, MARKOS HATZITASKOS, MSc
- Wing, Jeannette. 2006. "Computational Thinking". *Communications of the ACM* (vol. 49, no. 3)
- McBride, Neil. 2007. "Death of Computing debate"

## Websites:

<http://csopedia.wikispaces.com>

<http://www.emjbe.net/moodle/course>

<http://compsci2014.wikispaces.com/>

<http://teachingibtechnology.wikispaces.com/>

<http://dpcsish.wikispaces.com/>

<http://wiki.ibcsstudent.org>

<http://st-julians-computer-science-2010.wikispaces.com/>

<http://www.bisnet.or.id/vle/course>

<http://www.cse.dmu.ac.uk/~nkm/The%20Death%20of%20Computing%20Debate.htm>.

Cambridge Teacher Support Hub <https://schoolsupporthub.cambridgeinternational.org/>

## **Links with Diploma Programme teachers**

All Programme teachers should be familiar with TOK as they have to make connections with TOK questions in their own courses. They can also suggest some theoretical concerns that could be taken further in the TOK classroom. **Within this context, how do you plan to work with your colleagues to ensure that TOK becomes a real link among all of them?**

## **Computer science and theory of knowledge**

There is no one scientific method of gaining knowledge or of finding explanations for the behaviour of the natural world. Computer science works through a variety of approaches to produce these explanations, but they all rely on data from observations and have a common underpinning rigour, whether using inductive or deductive reasoning. The explanation may be in the form of a theory, sometimes requiring a model that contains elements not directly observable. Producing these theories often requires an imaginative, creative leap. Where such a predictive theoretical model is not possible, the explanation may consist of identifying a correlation between a factor and an outcome. This correlation may then give rise to a causal mechanism that can be experimentally tested, leading to an improved explanation. All these explanations require an understanding of the limitations of data, and the extent and limitations of our knowledge.

Computer science requires freedom of thought and open-mindedness, and an essential part of the process of science is the way the international computer science community shares ideas through academic papers, conferences and open forums. The syllabus details sections in the group 4 guides give references in teacher's notes to appropriate topics where theory of knowledge can be addressed.

During the course in computer science a number of issues will arise that highlight the relationships between theory of knowledge and computer science. Some of the questions that could be considered during the course are identified in the following list:

- What is the difference between data, information, knowledge and wisdom? To what extent can computers store and impart data, information, knowledge and wisdom?
- It has been said that human memory is more like an improvised performance than a movie on a DVD. What does this mean? How does human memory differ from computer memory?
- How does a computer language differ from a natural language?
- If we attach a camera or microphone to a computer, it can receive data from the world. Does this mean that a computer can "perceive the world"? To what extent might human perception be a similar process?
- What are the differences between representing numbers in denary and in binary? In binary,  $1 + 1 = 10$ . Does this tell us anything about the nature of mathematical truth?
- What are the challenges of creating a computer model of some aspect of the world?
- A chess machine can beat the top human chess players. Does a machine therefore "know" how to play chess?
- To what extent does computational thinking challenge conventional concepts of reasoning?
- How do we know if other humans feel emotions? Can a machine ever feel an emotion? How would we know?

- Does information and communication technology, like deduction, simply allow the knower to arrange existing knowledge in a different way, without adding anything, or is this arrangement itself knowledge in some sense?

**Assessment components**

Briefly explain how and when you will work on them. Include the date when you will first introduce the assessment components to your students. Explain the different stages, the timeline and how students will be prepared to undertake both.

**Internal Assessment- DP-Computer Science**

Internal assessment will be briefly introduced during the orientation week just to provide a glimpse of the task at hand. Formally the internal assessment will be introduced towards the end of 2<sup>nd</sup> term of year 1. Sample IA will be used to explain the formal requirements. Sample IA marking will help the students to unpack the assessment criterion. The candidates are expected to submit the IA topic proposal and client before proceeding for the summer break. Summer break is to be used to develop the product. Post the summer break student work on the first draft during the class hours with the teacher. 1st draft to be submitted within 2 weeks of re-opening. Feedback to be provided by teachers within one week. Final draft to be submitted within 4 weeks' time post receiving the feedback.

**Internal Assessment - Timeline**

| Year 1   | Activity / Plan  | Duration        |
|----------|--|-----------------|
| October  | Introduction to IA   | 0.5 hour        |
|          | Assessment criteria  | 0.5 hour        |
|          | Sample IA discussion                                       | 0.5 hour        |
|          | Sample IA marking  | 0.5 hour        |
| April    | Choice of client and Problem                               | 0.5 hour        |
| May      | Finalise the topic to develop a product                    | 0.5 hour        |
| May      | Proposal submission- scenario, rationale, success criteria | 4 hours         |
| Year 2   |  |                 |
| July     | Submission of product & feedback                           | 7 hours         |
| August   | Written documentation report – 1 <sup>st</sup> Draft       | 8 hours         |
| August   | Feedback on 1 <sup>st</sup> draft                          | 2 hour          |
| November | Final Draft  | 6 hours         |
| December | IA submission to DPC                                       |                 |
|          | <b>Total</b>   | <b>30 hours</b> |

**International mindedness**

Every course should contribute to the development of international mindedness in students. As an example of how you would do this, choose one topic from your outline that would allow your students to analyse it from different cultural perspectives. Briefly explain the reason for your choice and what resources you will use to achieve this goal.

| Topic | Contribution to the development of international mindedness |
|-------|---|
|       |   |

|   |   |
|---|---|
| <p>2.1.10 <b>Binary representation</b></p> <p>Outline the way in which data is represented in the computer.</p> | <p>Students engage in comparing the number of characters needed in the Latin alphabet with those in Arabic and Asian languages to understand the need for <b>Unicode</b>.</p> <p><b>Task:</b> Learners are divided into four groups. Each group research on the following topic:</p> <p><i>“comparing the number of characters needed in the Latin alphabet with those in Arabic and Asian languages to understand the need for <b>Unicode</b>.”</i></p> <p>Each group designs a poster outline the ways in which data is represented in the computer across globe and culture. They collaborate and reflect on their findings with each other to show multi-culture understanding. Making connections across the globe helps students to understand that the world is much larger community in which they live in.</p> |
|---|---|

**Development of the IB learner profile**

Through the course it is also expected that students will develop the attributes of the learner profile. As an example of how you would do this, choose one topic from your course outline and explain how the contents and related skills would pursue the development of any attribute(s) of the learner profile that you will identify.

| Topic   | Contribution to the development of the attribute(s) of the IB learner profile   |
|---|---|
| <p><b>Thinking logically</b></p> <p>Applying thinking skills to identify and resolve a specified complex problem.</p> | <p><b>IB learner profile link: Be reflective and be a thinker</b></p> <p>Students will be asked to revisit the IB mission statement and attempt the task given below:</p> <p>The IBO mission statement states that: ‘The international Baccalaureate aims ...understanding and respect.’ Think and reflect on the extent to which Computer Science addresses the IB mission statement.</p> <p>Teacher to encourage students to share their opinions to the entire class.</p> <p><b>Post discussion students are divided into groups and showcase their understanding on a chart paper showing clear connections between Computer Science,</b></p> |

**Course syllabus: IB DP- Computer Science**

| Unit title                            | Duration (teaching periods) | Unit content (topics)   | Objectives  | Assessment tools; Assessment criteria   | Summative assessment               | ATL  | LP and CAS/Service links   | Links with TOK/Critical thinking  | Links with other subjects/interdisciplinary links   |
|---------------------------------------|-----------------------------|---|---|---|------------------------------------|--|--|---|---|
| 2 Computer organization<br>SL/HL Core | <b>6 hours</b>              | 2.1 Computer organization<br><br>2.1.1 to 2.1.5<br>Computer architecture.<br>Secondary memory | Students should be able to reproduce a block diagram showing the relationship between the elements of the CPU, input and output and storage.<br><br>Students should be able to explain the effect of cache memory in speeding up the system | Formative assessments: discussion, problem solving, quiz, IB based worksheet, presentations | End of unit assessment: class test | Research (Students work in groups to research and create a | Knowledgeable and Communicator (student work in group to share their findings and come up with a | <b>TOK</b> If there are no consequences of data loss, why is it stored.<br><br><b>TOK</b> There is no such thing as | <b>LINK</b> Consequences of data loss.<br><br><b>LINK</b> ICT: Types and components of computer systems |

|                                     |               |  |  |   |  |  |  |  |                                    |
|-------------------------------------|---------------|--|--|---|--|--|--|--|------------------------------------|
|                                     |               | 2.1.6 to 2.1.13<br>Operating systems and application systems<br>Binary representation<br>Simple logic  | Persistent storage is needed to store data in a non-volatile device during and after the running of a program.<br>Student should be able to describe the main functions of an operating system.<br><br>Students should be able to define the Boolean operators: AND, OR, NOT, NAND, NOR and XOR.<br>And should be able to construct truth tables using the above operators   | AO2, AO3<br><br>AO2   |  | presentation on the need for persistent storage) | common important point to create a presentation) | persistent storage.<br><b>TOK</b> Does binary represent an example of a lingua franca? |                                    |
| 1 System Fundamentals<br>SL/HL Core | <b>20 hrs</b> | 1.1 Systems in organizations<br>1.1.1 to 1.1.7<br>Planning and system installation<br><br>1.1.8 to 1.1.10<br>User Focus<br><br>1.1.11 to 1.1.13<br>System Backup<br><br>1.1.14 Software deployment | Student should be able to<br>-Identify the context for which a new system is planned;<br>-Describe the need for change management<br>-The benefits and drawbacks of SaaS (Software-as-a-Service)<br>-Discuss problems that may arise as a part of data migration.<br>-Students should be aware that there are programs that can test other programs, thereby automating parts of the testing process and reducing costs.<br><br>Student should be able to<br>-Describe the importance of user documentation.<br>-Evaluate different methods of providing user documentation.<br>-methods of delivering user training.<br>-Identify a range of causes of data loss.<br>-Outline the consequences of data loss<br>-Describe a range of methods that can be used to prevent data loss.<br><br>Student should be able to<br>Describe strategies for managing releases and updates.<br><br>Student should be able to<br>Define the terms: hardware, software, peripheral, network, human resources<br><br>Describe the roles that a computer can take in a networked world. | Formative assessments: discussion, problem solving, quiz, IB based worksheet, presentations<br><br>AO2,<br><br>AO3<br><br>AO2<br><br>AO3<br><br>AO2 |  |  |  |  | End of unit assessment: class test |

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|  |                | <p>1.2 System design basics</p> <p>1.2.1 to 1.2.3 Components of a computer system</p> <p>1.2.4 to 1.2.11 System design and analysis</p> <p>1.2.12 to 1.2.16 Human interaction with the system</p> | <p>Discuss the social and ethical issues associated with a networked world.</p> <p>Student should able to<br/>Identify the relevant stakeholders when planning a new system.<br/>Describe methods of obtaining requirements from stakeholders.<br/>Describe appropriate techniques for gathering the information. Construct suitable representations to illustrate system requirements<br/>Describe the purpose of prototypes to demonstrate the proposed system to the client</p> <p>Discuss the importance of iteration<br/>Explain the possible consequences of failing to involve the end-user in the design process</p> <p>Discuss the social and ethical issues associated with the introduction of new IT systems. Student should able to: Define the term usability<br/>Students should be aware of usability issues in a range of devices including<br/>Identify methods that can be used to improve the accessibility of systems<br/>Identify a range of usability problems that can occur in a system. Discuss the moral, ethical, social, economic and environmental implications of the interaction between humans and machines</p> | <p>AO3</p> <p>AO1</p> <p>AO2</p> <p>AO3</p> <p>AO2</p> <p>AO3</p> <p>AO2</p> <p>AO3</p> <p>AO2</p> <p>AO3</p> | <p>End of unit assessment: class test</p> | <p>Social and communication (students were asked to visit library or office to identify stake holder-create design a technique to gather information-survey, interview or observation)</p> | <p>Knowledgeable (prepare findings, analyse requirements &amp; share point of view for the new system requirement)</p> | <p><b>TOK</b><br/>Utilitarianism, the greatest good for the greatest number. The means justify the ends.</p> | <p><b>LINK</b> Flow chart symbols, flow charts and pseudocode<br/><b>MYP</b> Design cycle.</p> |
| <p><b>4 Computational thinking, problem-solving and programming SL/HL Core</b></p> | <p>5 Hours</p> | <p><b>4.1 General principles</b><br/>4.1.1 to 4.1.3 Thinking Procedurally</p>   | <p>Student should able to<br/>Identify the procedure appropriate to solving a problem.<br/>Evaluate whether the order in which activities are undertaken will result in the required outcome.</p>  | <p>Formative assessments: class discussion-different command terms used in</p>                                |   | <p>Thinking (procedure &amp; logical requirement of problem analysed creatively in</p>   | <p>Knowledgeable (students were asked to think for various scenario to determine their</p>                             |  |  |

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|  |  | <p>4.1.4 to 4.1.8<br/>Thinking Logically</p> <p>Explain the role of sub-procedures in solving a problem.</p> <p>Student should able to</p> <p>Identify when decision-making is required in a specified situation.</p> <p>Identify the decisions required for the solution to a specified problem.</p> <p>Identify the condition associated with a given decision in a specified problem.</p> <p>Explain the relationship between the decisions and conditions of a system.</p> <p>Deduce logical rules for real-world situations.</p>  | <p>CS, quiz, problem solving worksheet, group presentation, IB based worksheet</p> <p>AO2 &amp; AO3</p> |  | <p>providing solution to the problem)</p> | <p>understanding of knowledge)</p> |   | <p><b>MYP</b> Technology, step-by-step instructions.</p> |
|  |  | <p>4.1.9 to 4.1.13<br/>Thinking ahead</p> <p>Student should able to</p> <p>Identify the inputs and outputs required in a solution.</p> <p>Identify pre-planning in a suggested problem and solution.</p> <p>Explain the need for pre-conditions when executing an algorithm. Outline the pre- and post-conditions to a specified problem.</p> <p>Identify exceptions that need to be considered in a specified problem solution.</p> <p>Student should able to- Identify the parts of a solution that could be implemented concurrently.</p> <p>Describe how concurrent processing can be used to solve a problem.</p> <p>Student should able to</p> <p>Identify examples of abstraction.</p> <p>Students should be aware of the concept of objects, for example, the use of collections as objects in the design of algorithms.</p> <p>Distinguish between a real-world entity and its abstraction.</p> <p>Student should able to: Describe the characteristics of standard algorithms on linear arrays</p> | <p>AO2</p> <p>AO3</p> <p>AO2</p> <p>AO3</p>   |  |   |                                    | <p><b>TOK</b><br/>Reasoning as a form of decision-making.</p> |  |

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|  | 10 hours | <p>4.1.13 to 4.1.16<br/>Thinking concurrently</p> <p>4.1.17 to 4.1.20<br/>Thinking abstractly</p> <p><b>4.2<br/>Connecting computational thinking and program design</b></p> <p><b>4.3<br/>Introduction to programming</b></p> <p>4.3.1 to 4.3.5<br/>Nature of programming languages</p> | <p>Outline the standard operations of collections.<br/>Discuss an algorithm to solve a specific problem.<br/>Analyse an algorithm presented as a flow chart.<br/>Analyse an algorithm presented as pseudocode.<br/>Construct pseudocode to represent an algorithm.<br/>Suggest suitable algorithms to solve a specific problem.<br/>Deduce the efficiency of an algorithm in the context of its use.</p> <p>Determine the number of times a step in an algorithm will be performed for given input data.<br/>Student should able to: State the fundamental operations of a computer.<br/>Distinguish between fundamental and compound operations of a computer.<br/>Explain the essential features of a computer language.<br/>Explain the need for higher level languages.<br/>Outline the need for a translation process from a higher-level language to machine executable code.<br/>Student should able to: Define the terms: variable, constant, operator, object.<br/>Define the operators =, ≠, &lt;, &lt;=, &gt;, &gt;=, mod, div.<br/>Analyse the use of variables, constants and operators in algorithms.<br/>Construct algorithms using loops, branching.<br/>Describe the characteristics and applications of a collection.</p> <p>Construct algorithms using the access methods of a collection. Discuss the need for sub-programmes and collections within programmed solutions.<br/>Construct algorithms using pre-defined sub-programmes, one-dimensional arrays and/or collections.</p> | <p>AO2</p> <p>AO2</p> <p>AO2 &amp; AO3</p> <p>AO2</p> <p>AO3</p> <p>AO3</p> | <p>End of unit assessment:<br/>class test</p> |  |  | <p><b>TOK</b> The map as an abstraction of the territory</p> <p><b>TOK</b> Language and meaning.</p> | <p><b>LINK</b></p> <p>Databases: tables, queries</p> <p><b>MYP</b> Technology: design cycle (inputs, processes, outputs, feedback, iteration).</p> |
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|                        | 30 hrs         | 4.3.6 to 4.3.13 use of programming languages |  | Formative assessments: class discussion-different command terms used in CS, quiz, problem solving worksheet, group presentation, IB based worksheet<br>AO1<br><br>AO2<br><br>AO3 | End of unit assessment: class test |   |   |  | <b>MYP Mathematics:</b> forms of numbers, algebra— patterns and sequences, logic, algorithms.<br><b>MYP Technology:</b> use of software such as Alice. |
| A Databases SL/HL Core | <b>5 hours</b> | A.1 Basic concepts                           | Student should able to<br>Outline the differences between data and information.<br>Outline the differences between an information system and a database.<br>Discuss the need for databases.<br>Describe the use of transactions, states and updates to maintain data consistency<br>Define the term database transaction.<br>Explain concurrency in a data sharing situation.<br>Explain the importance of the ACID properties of a database transaction.<br>Describe the two functions databases require to be performed on them.<br>Explain the role of data validation and data verification.<br><br>Student should able to | Formative assessments: class discussion-different command terms used in CS, quiz, worksheet, group presentation, IB based worksheet<br>AO2<br><br>AO3<br><br>AO2                 |                                    | Thinking (Students are given scenario to analyse facts on database concepts to give their own view) | Thinker (Class brainstorm to identify appropriate contexts for learners' own database concepts, relevant to their experience) |  | <b>MYP Technology.</b>   |



|                              |                |   |  |   |                                    |  |  |  |  |
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|                              |                |   | Describe the difference between a simple and complex query.<br>Outline the different methods that can be used to construct a query.  | AO2   |                                    |  |  | <b>TOK</b><br>Utilitarianism, the greatest good for the greatest number. The ends justify the means. |  |
|                              |                |   |  | AO2   | End of unit assessment: class test |  |  |  | <b>MYP</b> Mathematics: forms of numbers, algebra—patterns and sequences, logic, algorithms. |
| <b>3 Networks SL/HL Core</b> | <b>9 hours</b> | <b>3 Networks</b><br>3.1.1 to 3.1.5<br>Network fundamentals<br><br>3.1.6 to 3.1.11<br>Data transmission | Student should able to<br>Identify different types of networks.<br>Outline the importance of standards in the construction of networks.<br>Describe how communication over networks is broken down into different layers.<br>Identify the technologies required to provide a VPN.<br>Evaluate the use of a VPN.<br>Student should able to<br>Define the terms: protocol, data packet.<br>Explain why protocols are necessary.<br>Explain why the speed of data transmission across a network can vary.<br>Explain why compression of data is often necessary when transmitting across a network.<br>Outline the characteristics of different transmission media.<br>Student should able to<br>Explain how data is transmitted by packet switching. | Formative assessments:<br>Class discussion,<br>Group task,<br>Quiz, MCQ worksheet, IB based worksheet<br><br>AO2<br><br>AO3<br><br>AO1<br><br>AO3 |                                    |  | thinking (Teacher leads discussion of what is meant by transmission of data and why the speed of data transmission | Knowledgeable (In pairs, students identify factors affecting speed of data transmission))            |  |



|   |                 |   |  |   |   |   |  |  |   |
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|   |                 | <p>A.4 Further database models and database analysis<br/><b>(HL Extension)</b></p>  | <p>Describe how data in a warehouse is updated in real time.</p> <p>Describe the advantages of using data warehousing.</p> <p>Explain the need for ETL processes in data warehousing.</p> <p>Describe how ETL processes can be used to clean up data for a data warehouse.</p> <p>Compare the different forms of discovering patterns using data mining.</p> <p>Describe situations that benefit from data mining.</p> <p>Explain the nature of database segmentation.</p> <p>Explain the nature and purpose of link analysis.</p> <p>Describe the process of deviation detection.</p> | <p>Formative assessments:<br/>Class discussion,<br/>Group presentation,<br/>Quiz on database models,<br/>worksheet based on past IB papers</p> <p>AO3</p> <p>AO1</p> <p>AO2</p> <p>AO3</p> <p>AO2</p> | <p>End of unit assessment:<br/>class test</p> | <p>benefits from data mining and give presentation)</p> | <p>(using brainstorm session to evaluate their findings and come at conclusion for different situations)</p> | <p><b>TOK</b><br/>Social and ethical issues when data mining</p>             |   |
| <p><b>5 Abstract data structures (HL Extension)</b></p> | <p>23 hours</p> | <p><b>5.1 Abstract data structures</b><br/>5.1.1 to 5.1.3<br/>Thinking recursively</p> <p>5.1.4 to 5.1.10<br/>Abstract data structure</p> | <p>Student should able to</p> <p>Identify a situation that requires the use of recursive thinking.</p> <p>Identify recursive thinking in a specified problem solution.</p> <p>Trace a recursive algorithm to express a solution to a problem.</p> <p>Describe the characteristics of a two-dimensional array.</p> <p>Construct algorithms using two-dimensional arrays.</p> <p>Describe the characteristics and applications of a stack.</p> <p>Construct algorithms using the access methods of a stack.</p>  | <p>Formative assessments:<br/>Class discussion,<br/>think- pair and share, Problem solving worksheet, IB based worksheet</p> <p>AO2</p> <p>AO2</p>  |   |   |  | <p><b>TOK</b><br/>Why do we need abstract data structure in programming?</p> | <p><b>LINK</b> Binary trees.</p> <p><b>LINK</b> One-dimensional arrays and basic algorithms.</p> <p><b>LINK</b> Connecting computational thinking and program design.</p> |

|   |         |  |  |   |   |  |   |   |  |
|---|---------|--|--|---|---|--|---|---|--|
|   |         |  | <p>Describe the characteristics and applications of a queue.</p> <p>Student should able to</p> <p>Construct algorithms using the access methods of a queue.</p> <p>Explain the use of arrays as static stacks and queues.</p> <p>Describe the features and characteristics of a dynamic data structure.</p> <p>Describe how linked lists operate logically.</p> <p>Sketch linked lists (single, double and circular)</p> <p>Describe how trees operate logically (both binary and non-binary).</p> <p>Define the terms: parent, left-child, right-child, subtree, root and leaf.</p> <p>State the result of inorder, postorder and preorder tree traversal.</p> <p>Sketch binary tree, dynamic data structure.</p> <p>Compare the use of static and dynamic data structures.</p> | <p>AO3</p> <p>AO2</p> <p>AO3</p> <p>AO2</p> <p>AO1</p> <p>AO3</p>   | <p>End of unit assessment: class test</p> | <p>Social (students were asked to role situation to implement the concept of Linked list with each one has a link for other and so on)</p>                     | <p>Knowledgeable (students were asked to observe the nature of activity and record their own responses, then introduce the concept of Linked list through sketch)</p> | <p><b>TOK</b><br/>To what extent tree is better than linked list? discuss</p> | <p><b>LINK</b> Logical thinking.</p> <p><b>LINK</b> Recursive thinking.</p> <p><b>LINK</b> One-dimensional arrays.</p> |
| <b>6 Resource Management (HL Extension)</b> | 8 hours | <b>6.1 Resource management</b><br><br>6.1.1 to 6.1.4<br>System resources | <p>Students should be able to</p> <p>Identify the resources that need to be managed within a computer system.</p> <p>Evaluate the resources available in a variety of computer systems.</p> <p>Identify the limitations of a range of resources in a specified computer system.</p> <p>Describe the possible problems resulting from the limitations in the resources in a computer system.</p> <p>Students should be able to</p> <p>Explain the role of the operating system in terms of managing memory, peripherals and hardware interfaces.</p>  | <p>Formative assessments:<br/>Class debate, case discussion, class worksheet, IB based worksheet</p> <p>AO2</p> <p>AO3</p> <p>AO2</p> |   | <p>Research (students were asked to work in group and prepare presentation to identify different resources and evaluate their need within computer system)</p> | <p>knowledgeable and communicator (present their findings and brainstorm discussion in group to evaluate their need)</p>  |   |  |



## GROUP 5: MATHEMATICS COURSE OVERVIEW

### **Course general description:**

Mathematics in the IBDP promotes both inquiry and application, helping students to develop problem solving techniques that transcend the discipline and that are useful in the world beyond school. Students also learn how to communicate and reason using mathematical concepts. They will also be fascinated by exploring real and abstract applications of these ideas, with and without the use of technology.

Additional Mathematics enables learners to extend the mathematical skills, knowledge and understanding developed in the Cambridge IGCSE Mathematics course and use skills in the context of more advanced techniques. The syllabus has a Pure Mathematics only content which enables learners to acquire a suitable foundation in Mathematics for further study in the subject.

### **Course aims and goals:**

**IBDP:** The mathematics courses aim to contribute to students' personal attributes, subject understanding and global awareness by enabling them to:

1. develop a curiosity and enjoyment of mathematics, and appreciate its elegance and power
2. develop an understanding of the concepts, principles and nature of mathematics
3. communicate mathematics clearly, concisely and confidently in a variety of contexts
4. develop logical and creative thinking, and patience and persistence in problem solving to instil confidence in using mathematics
5. employ and refine their powers of abstraction and generalization

6. take action to apply and transfer skills to alternative situations, to other areas of knowledge and to future developments in their local and global communities
7. appreciate how developments in technology and mathematics influence each other
8. appreciate the moral, social and ethical questions arising from the work of mathematicians and its applications
9. appreciate the universality of mathematics and its multicultural, international and historical perspectives
10. appreciate the contribution of mathematics to other disciplines, and as a particular “area of knowledge” in the TOK course.
11. develop the ability to reflect critically upon their own work and the work of others
12. independently and collaboratively extend their understanding of mathematics.

**Course objectives:**

**IBDP:** Analysis and Approaches - In this course students will be able to:

- emphasis on algebraic methods;
- both problem solving with and without technology is required;
- develop strong skills in mathematical thinking;
- real and abstract mathematical problem solving.

Applications and Interpretation – In this course students will be able to:

- emphasis on modelling and statistics;
- develop strong skills in applying mathematics to the real-world;
- deal with real mathematical problem-solving using technology.

**Course assessment structure and criteria:**

**In IBDP, the formative and summative are conducted.**

1. Formative assessment - Formative assessment is interwoven with daily instruction and assists the teacher in planning for the next stage of learning. It provides regular and frequent feedback to the teacher and the student. It also gives students an opportunity to improve their understanding and to cultivate enthusiasm for learning. Formative assessment can also help to improve teaching quality, as it can provide information to monitor progress towards meeting the course aims and objectives. Teachers use various assessment tools to keep a record of student progress. **Formative will be held at least two per unit, which be comment based and posted on Manage Bac.**
2. Summative Assessment- Summative assessment takes place at the end of the teaching and learning process and provides students with an opportunity to show what they have learned. It also shows how effectively students understand the central idea of the unit. Summative assessments are used to determine a grade/mark for a student. Summative assessment gives an overview of previous learning and is concerned with measuring student achievement. **Summative will be held at the end of every unit.**

**Assessment criteria are as follows:**

**IBDP: The assessment objectives are:**

**Application and Interpretation**

| Assessment objectives            | Paper 1<br>% | Paper 2<br>% | Paper 3<br>%<br>HL only | Exploration<br>% |
|----------------------------------|--------------|--------------|-------------------------|------------------|
| Knowledge and understanding      | 20-30        | 20-30        | 10-20                   | 5-15             |
| Problem solving                  | 20-30        | 20-30        | 20-30                   | 5-20             |
| Communication and interpretation | 20-30        | 20-30        | 20-30                   | 15-25            |
| Technology                       | 20-35        | 20-35        | 10-30                   | 10-20            |
| Reasoning                        | 5-15         | 10-20        | 10-20                   | 5-25             |
| Inquiry approaches               | 5-15         | 5-20         | 15-30                   | 25-35            |

**Application and analysis:**

| Assessment objectives            | Paper 1<br>% | Paper 2<br>% | Paper 3<br>%<br>HL only | Exploration<br>% |
|----------------------------------|--------------|--------------|-------------------------|------------------|
| Knowledge and understanding      | 20-30        | 15-25        | 10-20                   | 5-15             |
| Problem solving                  | 20-30        | 15-25        | 20-30                   | 5-20             |
| Communication and interpretation | 20-30        | 15-25        | 15-25                   | 15-25            |
| Technology                       | 0            | 25-35        | 10-30                   | 10-20            |
| Reasoning                        | 5-15         | 5-10         | 10-20                   | 5-25             |
| Inquiry approaches               | 10-20        | 5-10         | 15-30                   | 25-35            |

**There are four mathematics with the assessment criteria as follows:**

**1. Analysis and Approaches HL**

**Internal assessment** - 20% This component is internally assessed by the teacher and externally moderated by the IB at the end of the course. **Mathematical exploration** Internal assessment in Mathematics is an individual exploration. This is a piece of written work that involves investigating an area of Mathematics.

**External assessment** – 80% There are three written examination papers:

- Paper 1 (2 hrs): 30% of final assessment (no calculator allowed)
- Paper 2 (2 hrs): 30% of final assessment (graphic display calculator (GDC) required)
- Paper 3 (1 hr) : 20% of final assessment (graphic display calculator (GDC) required)

**2. Analysis and Approaches SL**

**Internal assessment** - 20% This component is internally assessed by the teacher and externally moderated by the IB at the end of the course. **Mathematical exploration** Internal assessment in Mathematics is an individual exploration. This is a piece of written work that involves investigating an area of Mathematics.

**External assessment** – 80% There are two written examination papers:

- Paper 1 (1.5 hrs): 40% of the final assessment (no calculator allowed)
- Paper 2 (1.5 hrs): 40% of final assessment (graphic display calculator (GDC) required)

### **3.Applications and Interpretation HL**

**Internal assessment** - 20% This component is internally assessed by the teacher and externally moderated by the IB at the end of the course. *Mathematical exploration* Internal assessment in Mathematics is an individual exploration. This is a piece of written work that involves investigating an area of Mathematics.

**External assessment:**

- Paper 1 (Duration: 2 hours) Weighting: 30%: This paper consists of compulsory short-response questions. A GDC is required for this paper, but not every question will necessarily require its use.
- Paper 2 (Duration: 2 hours) Weighting: 30% • This paper consists of compulsory extended-response questions. A GDC is required for this paper, but not every question will necessarily require its use.
- Paper 3 (Duration: 1 hour) Weighting: 20% • This paper consists of two compulsory extended-response problem-solving questions. A GDC is required for this paper, but not every question part will necessarily require its use.

### **4. Applications and Interpretation SL**

**Internal assessment** - 20% This component is internally assessed by the teacher and externally moderated by the IB at the end of the course. *Mathematical exploration* Internal assessment in Mathematics is an individual exploration. This is a piece of written work that involves investigating an area of Mathematics.

**External assessment:**

- Paper 1 (Duration: 1 hour 30 minutes) Weighting: 40%. This paper consists of compulsory short-response questions. A GDC is required for this paper, but not every question will necessarily require its use. This paper will be of 80 marks
- Paper 2 (Duration: 1 hour 30 minutes) Weighting: 40%. This paper consists of compulsory extended-response questions. A GDC is required for this paper, but not every question will necessarily require its use. This paper will be of 80 marks

**Course main resources:**

***Textbook Haese and Haris for AI IBDP Mathematics Core, SL and HL, Oxford Publication for AI IBDP Mathematics, Pearson's Applications and Interpretations***

***Textbook Haese and Haris for AA IBDP Mathematics Core and HL, Core and SL Oxford Publication for AA IBDP Mathematics.***

***Links with Diploma Programme teachers***

In IBDP the structure of the mathematics guide provides links to real-life applications, where appropriate, that allow students to contextualize their mathematical learning. The topics in the course have many applications to other disciplines. Mathematical concepts are taught in a real-world context where appropriate to help students understand local and global phenomena. Students will be given the right content and context in order for them to be able to interpret the given mathematical concept in the global sense. For example, students can learn exponential growth and decay within the context of spread of disease in order to better understand the spread of cholera in Africa.

***Assessment components***

Students will be introduced to the assessment criteria of the course early on and these will be regularly referred to in terms of the skills being developed throughout the learning process. Students would have a clear understanding of how they will be assessed, and the expectations of the course. In the formatives with at least two per unit teacher’s feedback is crucial and will allow students to monitor their progress and reflect upon their learning and skills development.

First formative will be within 15 days of starting of course and summative at the end of each unit.

Both the internal and external assessment tasks of IBDP mathematics reflect the aims of the course. Being able to demonstrate critical thinking and problem solving is essential to mathematics and the assessments are designed to facilitate this. The internal assessment exploration is an opportunity for students to demonstrate their understanding and insights into an area of mathematics that is of interest to them, and to participate in an activity which gives them an insight into what it means to be a mathematician.

### ***International mindedness***

In the Number system, the origin of irrational number (story of Hippacus) can be discussed. How across the globe these numbers were studied, and it came into existence? Resources: <https://www.youtube.com/watch?v=gwUAqOgtmtA>

Students will learn how mathematics was developed by mathematicians from all over the world. As mathematical knowledge was added, the ways of representing the ideas was systematized so that mathematicians could understand each other through the symbols and words used. Students will learn where these ideas originated and how to use the symbols, as in number system, functions, sets, trigonometry and calculus.

**Or** in Statistics across the curriculum discussion on representing data universally for all to understand a survey done by students in class.

Resources used are <https://www.youtube.com/watch?v=jbkSRLYSojo>

How much, do you think, does an average family spend on food in a week? <https://www.youtube.com/watch?v=osSpWbmEYF4>

- The amount spent on food each week varies by culture and region
- Discuss similarities and differences
- Notice the number of people fed for the amount of money spent
- Rank by the cost of food
- Find locations on a world map
- Research to find out average daily wage and calculate the percentage of food cost.

### ***Development of the IB learner profile***

Statistics IX: Through the activity students would **inquire** the best central tendencies to be used in the given situation. Also, they get **knowledgeable** of use of each mean, median or mode. Also, they are **risk takers** as they are growing from known (operation of numbers) to unknown (the three central tendencies)

Card activity for measures of central tendencies:

There is a deck of cards placed on each group. There are 4 groups in the class. (**Thinkers**)

1. Students will be asked to pick 11 cards at random after shuffling them well. The class will be instructed that the number associated to Jack-11; queen-12 and King-13.
2. Arrange the cards in ascending order.
3. Find the average or mean of your 11 cards, which would be discussed further. Also, they will fill an observation sheet.
4. Students will be asked to fold cards on both ends and continue the process. This will help them find the middle most card. Again, in group they would fill the observation sheet.
5. Last will be a question that which number occurring the most?

So, mean, median, mode will be discussed and finally defined in class using a link <https://www.khanacademy.org/math/probability/data-distributions-a1/summarizing-center-distributions/a/choosing-the-best-measure-of-center>.

6. Pick one more card. So, in all each group has 12 cards. How would you calculate the middle most value: MEDIAN?

A student from each group will define mean, median and mode along with an example from daily life. (**Communication**)

### **Course syllabus:**

| Unit title                           | Duration (teaching periods)      | Unit content (topics)  | Objectives   | Assessment tools; Assessment criteria  | Summative assessment  | ATL                       | LP and CAS/ Service links  | Links with TOK/ Critical thinking                          | Links with other subjects/interdisciplinary links  |
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| <b>DP1 AI</b>                        |                                  |  |  |  |   |                           |  |  |  |
| Number and Algebra                   | SL: 16 hours<br><br>HL: 29 hours | 1)Errors and approximation, bounds.<br>2)Finances- Amortization and Annuity, Compound Interest, Arithmetic and Geometric progressions.<br>3)Solving Polynomial Equations using algebra and GDC up to three variables.<br>AHL:<br>1.9 Laws of logarithm<br>1.10 Simplifying expressions, both numerically and algebraically involving rational exponents.<br>1.11 The sum of infinite geometric sequences<br>1.12 Complex numbers – cartesian form, conjugate, modulus and argument, sums and differences. Products and quotients by hand and technology, powers of complex numbers, complex plane, complex numbers as solutions to quadratic equations<br>1.13 Modulus argument (polar form), exponential form, conversion between cartesian, polar and exponential forms by hand and technology, Products, quotients and integer powers in polar and exponential forms<br>adding sinusoidal functions with same frequencies but different phase shift angles.<br>Geometric interpretation of complex numbers.<br>1.14 Matrix definition, Matrix Algebra, Matrix multiplication, Identity and zero matrix, Determinant and an inverse of $n \times n$ matrices by technology and by hand for $2 \times 2$ matrices.<br>Awareness' of $Ax= b$<br>Solutions of a system of equations using inverse matrix.<br>1.15 Eigen values and Eigen vectors<br>Characteristic of polynomial $2 \times 2$ matrices<br>Diagonalization of $2 \times 2$ matrices<br>Application to powers of $2 \times 2$ matrices. | A) Knowledge and understanding.<br>B) Use of technology<br><br>1.Knowledge and understanding.<br>2.Problem solving.<br>3. Communication and interpretation<br>4. Technology.<br>5. Reasoning.<br>6.Inquiry approaches. | <b>Formative:</b><br>Investigations on finding the Sum of n terms of AP and G.P.<br>Class Tests<br><br><b>Formative:</b><br>Homework assignments<br>In-class questioning<br>In-class problem solving | Summative - End of the Unit assessment<br><br><b>Summative:</b><br>End of unit/topic test<br>Investigations (Toolkit) | 1.Thinking<br>2. Research | <b>Inquirer:</b> The complex planes and its use in real life. How can we study of something imaginary?<br><br><b>knowledgeable:</b> How knowledge of matrices helps in simulation of encoding and decoding messages. | Is taking Loan good or bad? Share your perspectives        | Exchange rate (Business management)<br>Loans and inflation rate(Economics)<br><br>Invariant states, representation of conics |
| Functions and Mathematical Modelling | 21<br><br>AHL 42 hours           | Linear, Piecewise, Quadratic, Cubic, Variation exponential, Logarithmic. (With base 10 only), sinusoidal functions.<br><br>AHL:<br>2.7 Composite functions   | 1. Knowledge and understanding.<br>2.Problem solving.  | <b>Formative: Investigation of a Linear model. Unit Review on Khan Academy</b>   | Summative Task Based on the GRASPS model.   |                           | <b>Inquirer:</b> How the various graphical form defines each function,   | Can every real world problem be modelled into a functions? | Projectile motion in physics.  |

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|                           |                | <p>inverse function including domain restriction, finding inverse functions.</p> <p>2.8 Transformation of graphs, translations, reflections, vertical stretch, horizontal stretch, composite transformations.</p> <p>2.9 Exponential models to find half-life, Natural logarithm models, sinusoidal models, logistic models, piecewise models.</p> <p>2.10 Scaling very large or small numbers using logarithms, Linearizing data using logarithms, interpretation of log –log and semi-log graphs</p>  | <p>3. Communication and interpretation</p> <p>4. Technology.</p> <p>5. Reasoning.</p> <p>6. Inquiry approaches.</p>   | <p><b>Creating a Quadratic Model.</b></p> <p><b>Formative:</b><br/>Test on khan academy, kahoot quiz,</p>  |  |   |   |   |
| Trigonometry and Geometry | SL<br>18 hours | <p>Distance between two points in 3D Space</p> <p>Volume and Surface area of 3D solids, Angle size between intersecting lines or between a line and a plane, Using Sine, cosine and tangent ratios find a side and angle of right-angled triangles.</p> <p>The sine rule, the cosine rule and area of a triangle as <math>\frac{1}{2}ab\sin C</math> (Ambiguous case of the sine rule is not included here), Applications of right and non-right-angled trigonometry, including Pythagoras theorem.</p> <p>Angles of elevation and depression</p> <p>Construction of labelled diagrams from written statements, The circle- length of an arc, area of sector, Equations of perpendicular bisectors. Voronoi diagrams: sites, vertices, edges, cells</p> <p>Nearest neighbour interpolation</p> <p>Application of the “toxic waste dump” problem.</p> <p>AHL:</p> <p>3.7 Radian definition and conversion between degrees and radians, using radians to calculate the area of sector, length of arc</p> <p>3.8 Unit circle, Pythagorean identity, definition of tan, extension of sine rule to ambiguous case.</p> <p>Graphical method of solving trigonometric equations in a finite interval</p> <p>3.9 Geometric transformations of points in 2D using matrices, reflections, stretches, enlargements, translations and rotations. Composition of the above functions, geometric interpretation of determinant of a transformation matrix</p> <p>3.10 Concept of vectors and scalar, unit vectors, base vectors, component of vectors, column representation, the zero vector, position vectors, rescaling and normalizing vectors</p> <p>3.11 Vector equation of a line in 2D and 3D</p> | <p>1. Knowledge and understanding.</p> <p>2. Problem solving.</p> <p>3. Communication and interpretation</p> <p>4. Technology.</p> <p>5. Reasoning.</p> <p>6. Inquiry approaches.</p> | <p>Formative: <b>Triangular Tangles (TSM)</b></p> <p>Using GeoGebra</p> <p>How the trigonometric ratios remain same irrespective of the sides of the triangle.</p> <p><b>Voronoi Diagrams:</b></p> <p>Investigation on where to locate the fourth Police Station in the given area.</p> <p>Formative: In-class questioning</p> | <p><b>Summative</b></p> <p>: Activity on finding the radian measures using quilling strips.</p> <p>Summative Exam style questions on Trigonometry and geometry</p> | <p>Research: Seki Takakazu calculating <math>\pi</math> to ten decimal places; Hipparchus, Menelaus and Ptolemy; why are there 360 degrees in a complete turn? Why do we use minutes and seconds for time? Links to Babylonian mathematics.</p> | <p>Which is the better measure of an angle, degrees or radians? What criteria can/do/should mathematicians use to make such judgments? Pythagoras theorem traces were available in the Indian and Chinese civilization 500 years before Pythagoras found it. Was it fair to give it the name of Pythagoras theorem?</p> | <p>Diffraction patterns and circular motion (physics)</p> |

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|  |                | <p>3.12 Vector applications to kinematics, Modelling linear motions with constant velocity in 2D and 3D.<br/>Motion with variable velocity in 2D</p> <p>3.13 Scalar product of 2 vectors, angle between 2 vectors, acute angle between 2 lines, vector product of two vectors.<br/>Geometric interpretation of the vector product, component of vectors</p> <p>3.14 Graph Theory, simple graphs, complete graphs, weighted graphs, directed graphs, subgraphs; trees.</p> <p>3.15 Adjacency matrices, walks, number of k-length walks between the vertices, Weighted adjacency, transition matrix</p> <p>3.16 Tree and cycle algorithms, Eulerian trails and circuits, Hamilton paths and cycles, MST graph algorithms, Kruskal's and Prim's algorithms for finding a minimum spanning tree., Chinese Postman problems and algorithm problems to find the shortest route</p> <p>Travelling salesman problem to determine the Hamilton cycle of least weigh</p> <p>Nearest neighbour algorithm</p> <p>Deleted vertex algorithm</p>                                       |   | In-class problem solving, student exercises on desmos.com  |   |  |   |   |   |
| <b>DP2: Statistics and Probability</b> | SL<br>36 hours | <p>4.1 Discrete and Continuous data, Sampling, population, random sample<br/>Reliability of data sources and bias in sampling<br/>Interpretation of outliers<br/>Sampling techniques and their effectiveness</p> <p>4.2 Data presentation – frequency distribution tables, Histograms, Cumulative frequency, c f curves, finding median, quartiles, percentiles and IQR<br/>Production and understanding of box and whisker diagrams.</p> <p>4.3 Measures of central tendency, estimation of mean from grouped data, Modal class, measures of dispersion – IQR, S.D and variance<br/>Effects of constant change on the original data<br/>Quartiles of discrete data.</p> <p>4.4 Linear correlation of bivariate data, Pearson's product-moment correlation coefficient, r.<br/>Scatter diagrams, lines of best fit, by eye, passing through the mean point.<br/>Equation of the regression line of y on x<br/>Use of equation of the regression line to predict.<br/>Interpreting the meaning of parameters, a and b on a linear regression <math>y = ax + b</math></p> | <p>1. Knowledge and understanding.</p> <p>2. Problem solving.</p> <p>3. Communication and interpretation</p> <p>4. Technology.</p> <p>5. Reasoning.</p> <p>6. Inquiry approaches.</p> | <p>Formatives: Quizzes on quiz let, In-class questioning</p> <p>In-class problem solving, worksheets</p> | <p>Summative: Situational questions from the toolkit.</p> | <p><b>Communication:</b> How to represent the understanding of the concept using graphs and tables.</p> <p>Self-management skills: Present one global issue using Statistics</p> | <p><b>Reflective:</b> Presenting our understanding of a concept in the internal assessment.</p> | <p>To what extent can mathematical models such as the Poisson distribution be trusted? What role do mathematical models play in other areas of knowledge?</p> | <p>Data collection in field work (biology, psychology, environmental systems and societies, sports exercise and health science, geography, business management and design technology); data from social media and marketing sources (business management)</p> |

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|  | <p>4.5 Concepts of trial, outcome, equally likely outcomes, relative frequency, sample space and the event.</p> <p>Probability of an event A is <math>P(A)=n(A)/n(U)</math><br/> The complimentary even of A AND A'<br/> Expected number of occurrences.</p> <p>4.6 Venn diagrams, tree diagrams, sample space diagrams and tables of outcome to calculate probabilities.<br/> Combined events<br/> Mutually exclusive events<br/> Conditional probability<br/> Independent events.<br/> Concept of a discrete random variable and probability distributions<br/> Expected value (mean) <math>E(X)</math> for discrete data<br/> Applications</p> <p>4.8 Binomial distribution<br/> mean and variance of binomial distribution</p> <p>4.9 Normal distribution curve, properties of normal distribution, Diagrammatic representation,<br/> Normal probability calculations<br/> Inverse normal calculations.</p> <p>4.10 Spearman's rank correlation coefficient, <math>r_s</math><br/> Awareness of the appropriateness and limitations of r and <math>r_s</math> and the effect of outliers on each.<br/> Formulation for null and alternative hypothesis, significance levels, p- values<br/> Expected and observed frequencies<br/> Chi-square test for a independence, degree of freedom, critical value<br/> The chi-square goodness of fit test. The t –test, use of p value to compare the means of two populations, using one-tailed and two-tailed tests.</p> <p>AHL</p> |  |  |  |  |  |  |  |
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|          | AHL: 52 hrs                     | <p>4.12 Design of valid data collections methods such as surveys and questioners, selecting relevant variables from many, choosing relevant and appropriate data to analyse, Categorizing numerical data in chi-square test table and justifying choice of categorisation, Choosing an appropriate number of degrees of freedom, definition of reliability and validity, Reliability tests<br/>Validity tests</p> <p>4.13 Non-linear regression, least square regression curves using the technology, sum of square residuals, coefficient of determination (<math>R^2</math>), evaluation of <math>R^2</math> using technology.</p> <p>4.14 linear transformation of a single random variable, expected value of linear combinations of n random variables, mean as an unbiased estimate of <math>\mu</math></p> <p>4.15 A linear combination of an independent normal random variables, central limit theorem,</p> <p>4.16 Confidence intervals for the mean of a normal population</p> <p>4.17 Poisson distribution, its mean and variance, sum of two independent poisson distributions has a poisson distribution.</p> <p>4.18 critical values and regions, test for the population mean for normal distribution, 4.19 Transition matrices, powers of transition matrices<br/>Regular Markov chains,<br/>Initial state probability matrices,<br/>Calculation of steady state and long-term probabilities by repeated multiplication of transition matrix or by solving a system of linear equations.</p> |   |  |  |  |   |   |
| Calculus | SL 19 hours<br><br>AHL 41 hours | <p>5.1 Concept of limit<br/>derivative as gradient function and rate of change</p> <p>5.2 Increasing and decreasing functions<br/>Graphical interpretation of <math>f'(x) &gt; 0</math>, <math>= 0</math> and <math>&lt; 0</math></p> <p>5.3 Derivative of <math>f(x)</math> using power rule</p> <p>5.4 Tangents and Normal at a given point and their equations</p> <p>5.5 Anti-differentiation<br/>Anti-differentiation with a boundary condition to determine constant term.<br/>Definite integrals using technology<br/>Area of the region enclosed by a curve</p> <p>5.6 Values of <math>x</math> where the gradient of a curve is zero<br/>Local maximum and minimum points</p> <p>5.7 Optimisation problem in context</p>   | <p>1. Knowledge and understanding.</p> <p>2. Problem solving.</p> <p>3. Communication and interpretation</p> <p>4. Technology.</p> <p>5. Reasoning.</p> | Formative:<br>Puzzle using the limit of functions and writing a reflection | Summative:<br>Exam type questions-based test | Social Skills:<br>help others to create success for themselves during group work | What value does the knowledge of limits have? Is infinitesimal behaviour applicable to real life? Is intuition a valid way of knowing in mathematics? | Marginal cost, marginal revenue, marginal profit, market structures (economics); kinematics, induced emf and simple harmonic motion (physics); interpreting the gradient of a curve (chemistry) |

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|                           |          | <p>5.8 Approximation of the area using trapezoidal rule</p> <p>5.9 The derivative of trig functions, the chain, product and quotient rules, related rates of change</p> <p>5.10 the second derivative, use of second derivative to distinguish between maximum and minimum point</p> <p>5.11 Definite and indefinite integration of <math>x^n</math> integration by inspection, or substitution</p> <p>5.12 Area of region enclosed by a curve and the x or y axes.</p> <p>5.13 Kinematic problems involving displacement, velocity and acceleration.</p> <p>5.14 Setting up differential equation from a context, solving by separation of variables.</p> <p>5.15 Slope fields and their diagrams</p> <p>5.16 Euler's method for finding an approximate solution to 1<sup>st</sup> ODE. Numerical solutions of <math>dy/dx = f(x,y)</math></p> <p>Numerical solutions of coupled systems</p> <p>5.17 Phase portrait for the solutions of coupled differential equations, qualitative analysis of future paths for distinct, real, complex and imaginary eigen values</p> <p>Sketching trajectories</p> <p>5.18 using a Euler's method to second derivative equations.</p> | 6. Inquiry approaches.   |  |  |  |                      |   |   |
| Tool Kit                  | 30 hours | The toolkit and the mathematical exploration Investigative, problem-solving and modelling skills development leading to an individual exploration. The exploration is a piece of written work that involves investigating an area of mathematics.  | <p><b>Criterion A:</b> Presentation</p> <p><b>Criterion B:</b> Mathematical communication</p> <p><b>Criterion C:</b> Criterion</p> <p><b>D:</b> Reflection</p> <p><b>Criterion E</b></p> | Continuous feedback since the onset of Internal assessment | Final scoring out of 20 on the final draft | Communication, Social,   | All                  |   |   |
| DP1 AA                    |          |  |  |  |  |  |                      |   |   |
| Unit 1 Number and Algebra | 19 hours | <p>Operations with numbers in the form <math>a \times 10^k</math> where <math>1 \leq a &lt; 10</math> and <math>k</math> is an integer.</p> <p>Arithmetic sequences and series.</p> <p>Use of the formulae for the <math>n</math>th term and the sum of the first <math>n</math> terms of the sequence.</p> <p>Use of sigma notation for sums of arithmetic sequences.</p> <p>Analysis, interpretation and prediction where a model is not perfectly arithmetic in real life.</p> <p>Geometric sequences and series.</p>   | <p>1. Knowledge and understanding.</p> <p>2. Problem solving.</p> <p>3. Communication and interpretation</p>   | Formative: In class questioning, Class test                | End of unit test based on GRASP model.     | Thinking and communication: Analysis, interpretation and prediction where a model is not perfectly | Inquirer and thinker | Do the names that we give things impact how we understand them? For instance, what is the impact of the fact that | Chemistry (Avogadro's number); physics (order of magnitude); biology (microscopic measurements); sciences group subjects (uncertainty and precision of measurement) |

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|  | <p>Use of the formulae for the <math>n</math>th term and the sum of the first <math>n</math> terms of the sequence.</p> <p>Use of sigma notation for the sums of geometric sequences.</p> <p>Financial applications of geometric sequences and series:</p> <ul style="list-style-type: none"> <li>• compound interest</li> <li>• annual depreciation.</li> </ul> <p>Laws of exponents with integer exponents.</p> <p>Introduction to logarithms with base 10 and e.</p> <p>Numerical evaluation of logarithms using technology.</p> <p>Simple deductive proof, numerical and algebraic; how to lay out a left-hand side to right-hand side (LHS to RHS) proof.</p> <p>The symbols and notation for equality and identity.</p> <p>Laws of exponents with rational exponents.</p> <p>Laws of logarithms.</p> $\log_a xy = \log_a x + \log_a y$ $\log_a \frac{x}{y} = \log_a x - \log_a y$ $\log_a x^m = m \log_a x$ <p>for <math>a, x, y &gt; 0</math></p> <p>Change of base of a logarithm.</p> <p>Solving exponential equations, including using logarithms.</p> <p>Sum of infinite convergent geometric sequences.</p> <p>The binomial theorem:<br/>expansion of <math>(a + b)^n, n \in \mathbb{N}</math>.</p> <hr/> <p>Use of Pascal's triangle and <math>{}^n C_r</math>.</p> <p>AHL</p> <p>Counting principles, including permutations and combinations.</p> <p>Extension of the binomial theorem to fractional and negative indices, ie <math>(a+b)^n, n \in \mathbb{Q}</math>.</p> <p>Partial fractions.</p> <p>Complex numbers: the number <math>i</math>, where <math>i^2 = -1</math>.</p> <p>Cartesian form <math>z = a + bi</math>; the terms real part, imaginary part, conjugate, modulus and argument.</p> <p>The complex plane.</p> <p>Modulus-argument (polar) form:<br/><math>z = r(\cos \theta + i \sin \theta) = r \operatorname{cis} \theta</math></p> <p>Euler form:<br/><math>z = r e^{i\theta}</math></p> <p>Sums, products and quotients in Cartesian, polar or Euler forms and their geometric interpretation.</p> <p>Complex conjugate roots of quadratic and polynomial equations with real coefficients.</p> | <p>4. Technology.</p> <p>5. Reasoning.</p> <p>6. Inquiry approaches.</p> |  |  | <p>arithmetic in real life.</p> <p>Use of sigma notation for sums of arithmetic sequences.</p> |  | <p>some large numbers are named, such as the googol and the googolplex, while others are represented in this form?</p> |  |
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|                     | 39 hours | <p>De Moivre's theorem and its extension to rational exponents.<br/> Powers and roots of complex numbers.<br/> Proof by mathematical induction.<br/> Proof by contradiction.<br/> Use of a counterexample to show that a statement is not always true.<br/> Solutions of systems of linear equations (a maximum of three equations in three unknowns), including cases where there is a unique solution, an infinite number of solutions or no solution.</p>  |  |  |                            |           |  |   |  |
| Unit 2<br>Functions |          | <p>Different forms of the equation of a straight line.<br/> Gradient; intercepts.<br/> Lines with gradients <math>m_1</math> and <math>m_2</math><br/> Parallel lines <math>m_1 = m_2</math><br/> Perpendicular lines <math>m_1 \times m_2 = -1</math></p> <p>Concept of a function, domain, range and graph.<br/> Function notation, for example <math>f(x)</math>, <math>v(t)</math>, <math>C(n)</math><br/> The concept of a function as a mathematical model.<br/> Informal concept that an inverse function reverses or undoes the effect of a function.<br/> Inverse function as a reflection in the line <math>y=x</math>, and the notation <math>f^{-1}(x)</math><br/> The graph of a function; its equation <math>y=f(x)</math></p> <p>Creating a sketch from information given or a context, including transferring a graph from screen to paper.</p> | <ol style="list-style-type: none"> <li>1. Knowledge and understanding.</li> <li>2. Problem solving.</li> <li>3. Communication and interpretation</li> <li>4. Technology.</li> <li>5. Reasoning.</li> <li>6. Inquiry approaches.</li> </ol> | Formative:<br>In the class questioning, unit test on the Khan academy. | End of the unit assessment | Thinking: |  | The development of functions by Rene Descartes (France), Gottfried Wilhelm Leibnitz (Germany) and Leonhard Euler (Switzerland); the notation for functions was developed by a number of | Exchange rates and price and income elasticity, demand and supply curves (economics); graphical analysis in experimental work (sciences group subjects). |

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|  | <p>Using technology to graph functions including their sums and differences.<br/> Determine key features of graphs.<br/> Finding the point of intersection of two curves or lines using technology.<br/> Composite functions, Identity function. Finding the inverse function <math>f^{-1}(x)</math>.</p> <p>The quadratic function <math>f(x)=ax^2+bx+c</math>: its graph, <math>y</math>-intercept <math>(0,c)</math>. Axis of symmetry.<br/> The form <math>f(x)=a(x-p)(x-q)</math>, <math>x</math>-intercepts <math>(p,0)</math> and <math>(q,0)</math>.<br/> The form <math>f(x)=a(x-h)^2+k</math>, vertex <math>(h,k)</math>.<br/> Solution of quadratic equations and inequalities.<br/> The quadratic formula.<br/> The discriminant <math>\Delta = b^2 - 4ac</math> and the nature of the roots, that is, two distinct real roots, two equal real roots, no real roots.</p> <p>The reciprocal function = <math>f(x) = \frac{1}{x}, x \neq 0</math>:<br/> its graph and self-inverse nature.</p> <p>Rational functions of the form <math>f(x) = \frac{ax+b}{cx+d}</math> and their graphs.<br/> Equations of vertical and horizontal asymptotes.<br/> Exponential functions and their graphs:<br/> <math>f(x) = a^x, a &gt; 0, f(x) = e^x</math></p> <p>Logarithmic functions and their graphs:<br/> <math>f(x) = \log_a x, x &gt; 0, f(x) = \ln x, x &gt; 0</math>.</p> <p>Solving equations, both graphically and analytically.<br/> Use of technology to solve a variety of equations, including those where there is no appropriate analytic approach.<br/> Applications of graphing skills and solving equations that relate to real-life situations.<br/> Transformations of graphs.<br/> Translations: <math>y=f(x)+b; y=f(x-a); y=f(x)+b; y=f(x-a)</math>.<br/> Reflections (in both axes): <math>y=-f(x); y=f(-x); y=-f(x); y=f(-x)</math>.<br/> Vertical stretch with scale factor <math>p</math>: <math>y=pf(x)</math>.<br/> Horizontal stretch with scale factor <math>q</math>: <math>y=f(qx)</math>.</p> <p>Composite transformations.</p> |  |  |  |  |  | <p>different mathematicians in the 17th and 18th centuries—how did the notation we use today become internationally accepted?</p> | <p>Projectile motion and energy changes in simple harmonic motion (physics); equilibrium equations (chemistry).</p> |
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|                           |          | <p>AHL Content</p> <p>Polynomial functions, their graphs and equations; zeros, roots and factors.</p> <p>The factor and remainder theorems.</p> <p>Sum and product of the roots of polynomial equations.</p> <p>Odd and even functions</p> <p>Finding the inverse function, <math>f^{-1}(x)</math>, including domain restriction.</p> <p>Self-inverse functions.</p>   |   |  |                  |          |                           |   | Radioactive decay (physics); modelling (sciences group subjects); production possibilities curve model (economics). |
| Geometry and Trigonometry | 18 hours | <p>The distance between two points in three-dimensional space, and their midpoint.</p> <p>Volume and surface area of three-dimensional solids including right-pyramid, right cone, sphere, hemisphere and combinations of these solids. The size of an angle between two intersecting lines or between a line and a plane, use of sine, cosine and tangent ratios to find the sides and angles of right-angled triangles.</p> <p>The sine rule: <math>\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}</math>.</p> <p>The cosine rule: <math>c^2 = a^2 + b^2 - 2ab\cos C</math>;<br/> <math>\cos C = \frac{a^2 + b^2 - c^2}{2ab}</math>.</p> <p>Area of a triangle as <math>\frac{1}{2}ab\sin C</math>.</p> <p>Applications of right and non-right-angled trigonometry, including Pythagoras's theorem. Angles of elevation and depression. Construction of labelled diagrams from written statements.</p> <p>The circle: radian measure of angles; length of an arc; area of a sector.</p> <p>Definition of <math>\cos\theta</math>, <math>\sin\theta</math>, <math>\tan\theta</math> in terms of the unit circle. All measures of multiple of 15 degrees. Extension of the sine rule to the ambiguous case.</p> <p>The Pythagorean identity <math>\cos^2\theta + \sin^2\theta = 1</math>. Double angle identities for sine and cosine</p> <p>The relationship between trigonometric ratios.</p> <p>The circular functions <math>\sin x</math>, <math>\cos x</math>, and <math>\tan x</math>; amplitude, their periodic nature, and their graphs Composite functions of the form <math>f(x) = a\sin(b(x + c)) + d</math></p> <p>Transformations, Real life context. Solving trigonometric equations in a finite interval, both graphically and analytically. Equations leading to quadratic equations in <math>\sin x</math>, <math>\cos x</math> or <math>\tan x</math>. Definition of the reciprocal trigonometric ratios <math>\sec\theta</math>, <math>\operatorname{cosec}\theta</math> and <math>\cot\theta</math>. Pythagorean identities: <math>1 + \tan^2\theta = \sec^2\theta</math> <math>1 + \cot^2\theta = \operatorname{cosec}^2\theta</math>, The inverse functions <math>f(x) = \arcsin x</math>, <math>f(x) = \arccos x</math>, <math>f(x) = \arctan x</math>; their domains and ranges; their graphs. Compound angle identities. Double angle identity for tan,</p> | <p>1. Knowledge and understanding.</p> <p>2. Problem solving.</p> <p>3. Communication and interpretation</p> <p>4. Technology.</p> <p>5. Reasoning.</p> <p>6. Inquiry approaches.</p> | In class questioning, informal testing, comment based worksheets | End of unit test | Thinking | Knowledgeable, Reflective | TOK: What is an axiomatic system? Are axioms self-evident to everybody? | Architecture and design, Design technology; volumes of stars and inverse square law (physics).                      |

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|  | <p>AHL 46<br/>hours</p> | <p>Relationships between trigonometric functions and the symmetry properties of their graphs.<br/>         Concept of a vector; position vectors; displacement vectors. Representation of vectors using directed line segments. Base vectors <math>i, j, k</math>. Components of a vector:</p> $\mathbf{v} = \begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix} = v_1\mathbf{i} + v_2\mathbf{j} + v_3\mathbf{k}.$ <p>Algebraic and geometric approaches to the following: • the sum and difference of two vectors • the zero vector <math>0</math>, the vector <math>-\mathbf{v}</math></p> <ul style="list-style-type: none"> <li>• multiplication by a scalar, <math>k\mathbf{v}</math>, parallel vectors</li> </ul> <p>magnitude of a vector, <math> \mathbf{v} </math>; unit vectors, <math>\frac{\mathbf{v}}{ \mathbf{v} }</math></p> <p>position vectors <math>\vec{OA} = \mathbf{a}</math>, <math>\vec{OB} = \mathbf{b}</math></p> <p>displacement vector <math>\vec{AB} = \mathbf{b} - \mathbf{a}</math></p> <p>Proofs of geometrical properties using vectors.<br/>         The definition of the scalar product of two vectors. The angle between two vectors. Perpendicular vectors; parallel vectors. Vector equation of a line in two and three dimensions, angle between two lines, Simple applications to kinematics.<br/>         Coincident, parallel, intersecting and skew lines, distinguishing between these cases. Points of intersection.<br/>         The definition and properties of the vector product of two vectors. Vector and Cartesian equation of a plane, Intersections of a line with a plane; two planes; three planes. Angle between a line and a plane; two planes.</p> |  |  |  |  |  |  |  |
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|          |                              | Mode and median of continuous random variables. Mean, variance and standard deviation of both discrete and continuous random variables. The effect of linear transformations of X.   |  |                                  |                             |                    |                           |   |   |
| Calculus | 19 Hours<br><br>AHL 30 hours | <p>Introduction to the concept of a limit, Derivative interpreted as gradient function and as rate of change, Increasing and decreasing functions. Graphical interpretation of <math>f'(x) &gt; 0</math>, <math>f'(x) = 0</math>, <math>f'(x) &lt; 0</math>.</p> <p>Derivative of <math>f(x) = ax^n</math> is <math>f'(x) = anx^{n-1}</math>, <math>n \in \mathbb{Z}</math><br/> The derivative of functions of the form<br/> <math>f(x) = ax^n + bx^{n-1} + \dots</math><br/> where all exponents are integers.</p> <p>Tangents and normal at a given point, and their equations. Introduction to integration as anti-differentiation of functions of the form, Anti-differentiation with a boundary condition to determine the constant term, Anti-differentiation with a boundary condition to determine the constant term. Derivative of <math>x^n</math> (<math>n \in \mathbb{Q}</math>), <math>\sin x</math>, <math>\cos x</math>, <math>e^x</math> and <math>\ln x</math>. Differentiation of a sum and a multiple of these functions. The chain rule for composite functions. The product and quotient rules. The second derivative. Graphical behaviour of functions, including the relationship between the graphs of <math>f</math>, <math>f'</math> and <math>f''</math>. Local maximum and minimum points. Testing for maximum and minimum. Optimization. Points of inflexion with zero and non-zero gradients.</p> <p>Kinematic problems involving displacement <math>s</math>, velocity <math>v</math>, acceleration <math>a</math> and total distance travelled,</p> <p>Indefinite integral of <math>x^n</math> (<math>n \in \mathbb{Q}</math>), <math>\sin x</math>, <math>\cos x</math>, <math>\frac{1}{x}</math> and <math>e^x</math>.</p> <p>The composites of any of these with the linear function <math>ax + b</math>, Integration by inspection (reverse chain rule) or by substitution for expressions of the form. Definite integrals, including analytical approach. Areas of a region enclosed by a curve <math>y = f(x)</math> and the <math>x</math>-axis, where <math>f(x)</math> can be positive or negative, without the use of technology. Areas between curves.</p> <p><b>AHL content:</b><br/> Informal understanding of continuity and differentiability of a function at a point. Understanding of limits (convergence and divergence). Definition of derivative from first principles, higher derivatives,<br/> The evaluation of limits of the form <math>\lim_{x \rightarrow a} \frac{f(x)}{g(x)}</math> and <math>\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)}</math> using l'Hôpital's rule or the Maclaurin series.<br/> Repeated use of l'Hôpital's rule,<br/> Implicit differentiation. Related rates of change. Optimisation problems.</p> | <ol style="list-style-type: none"> <li>1. Knowledge and understanding.</li> <li>2. Problem solving.</li> <li>3. Communication and interpretation</li> <li>4. Technology.</li> <li>5. Reasoning.</li> <li>6. Inquiry approaches.</li> </ol> | Formative: Ongoing concept tests | Summative end of unit test. | Thinking, Research | Reflective, Knowledgeable | What value does the knowledge of limits have? Is infinitesimal behaviour applicable to real life? Is intuition a valid way of knowing in mathematics? | Profit, area, volume, Velocity-time graphs, simple harmonic motion graphs and kinematics (physics); allocative efficiency (economics), Uniform circular motion and induced emf (physics). |

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|          |          | <p>Derivatives of <math>\tan x</math>, <math>\sec x</math>, <math>\operatorname{cosec} x</math>, <math>\cot x</math>, <math>a^x</math>, <math>\log a x</math>, <math>\arcsin x</math>, <math>\arccos x</math>, <math>\arctan x</math>, Indefinite integrals of the derivatives of any of the above functions. The composites of any of these with a linear function, Use of partial fractions to rearrange the integrand, Integration by substitution, Integration by parts, repeated integration by parts, Area of the region enclosed by a curve and the y-axis in a given interval. Volumes of revolution about the x-axis or y-axis. First order differential equations. Numerical solution of <math>dy/dx = f(x, y)</math> using Euler's method. Variables separable, Homogeneous differential equation <math>dy/dx = f(y/x)</math> using the substitution <math>y = vx</math>, Solution of <math>y' + P(x)y = Q(x)</math>, using Maclaurin series to obtain expansions for <math>e^x</math>, <math>\sin x</math>, <math>\cos x</math>, <math>\ln(1+x)</math>, <math>(1+x)^p</math>, the integrating factor, <math>p \in \mathbb{Q}</math>.</p> <p>Use of simple substitution, products, integration and differentiation to obtain other series, Maclaurin series developed from differential equations</p> |   |   |  |  |     |  |  |
| Tool Kit | 30 hours | <p><b>The toolkit and the mathematical exploration</b><br/>Investigative, problem-solving and modelling skills development leading to an individual exploration. The exploration is a piece of written work that involves investigating an area of mathematics.</p>  | <p><b>Criterion A</b><br/><b>Criterion B:</b> Mathematical communication<br/><b>Criterion C</b><br/><b>Criterion D:</b> Reflection<br/><b>Criterion E</b></p> | Continuous feedback since the onset of Internal assessment. | Final scoring out of 20 on the final draft | Social, Research, Self-management and Thinking | All |  |  |